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SOUTH AFRICA

PLASTICS: FACTS AND FUTURES

MOVING BEYOND POLLUTION MANAGEMENT TOWARDS A CIRCULAR PLASTICS ECONOMY IN SOUTH AFRICA

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An informal waste reclaimer carries plastic chairs and bags filled with recyclable plastic bottles to sell at a buyback centre in Cape Town, South Africa.

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Eva Mokoena, a South African informal waste reclaimer, drags a sack, filled up with recyclables, at the Palm Springs landfill on the outskirts of Johannesburg, South Africa, on 28 June 2019.

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ABBREVIATIONS AND ACRONYMS

AMCEN	African Ministerial Conference on the Environment
AU	African Union
BPA	Bisphenol A
CSIR	Council for Scientific and Industrial Research
DEFF	Department of Environment, Forestry and Fisheries
DSI	Department of Science and Innovation
DTIC	Department of Trade, Industry and Competition
EPR	extended producer responsibility
EPS	expanded polystyrene
GHG	greenhouse gas
HDPE	high-density polyethylene
HIPS	high-impact polystyrene
IndWMP	Industry Waste Management Plan
IWMP	Integrated Waste Management Plan
LCA	Life Cycle Assessment
LCSA	Life Cycle Sustainability Assessment
LDPE	low-density polyethylene
LLDPE	linear low-density polyethylene
MIC	material identification code
MRF	material recovery facility
NRCS	National Regulator for Compulsory Specifications
NWMS	National Waste Management Strategy
OPRL	on-pack recycling label
ORASA	Organics Recycling Association of South Africa
PBAT	polybutylene adipate terephthalate
PC	polycarbonate
PET	polyethylene terephthalate
PHA	polyhydroxyalkanoates
PLA	polylactic acid
PP	polypropylene
PPE	personal protective equipment
RDI	Research, Development and Innovation
SAPRO	South African Plastics Recycling Organisation
SAWIS	South African Waste Information System
SDGs	Sustainable Development Goals
UNEP	UN Environment Programme

Plastic beverage bottles found in Blue Lagoon at the Umgeni River Mouth in KwaZulu-Natal, a popular tourist attraction for bird watchers and nature lovers.

KEY MESSAGES

Plastic meets a multiplicity of needs in our society while also posing significant environmental, social and economic risks. The way in which plastic is produced and used needs to be fundamentally redesigned.

1. Plastic is a complex material that provides value across several industries, yet its strength and durability have resulted in widespread persistence in the environment, threatening human health and the health of our marine, terrestrial and freshwater ecosystems. These negative externalities, once quantified, reveal the true costs of plastic.

2. Tackling the plastic pollution challenge requires a life cycle approach – failures occurring at each stage of the plastics life cycle all contribute to the problem.

3. South Africa consumes both locally produced and imported fossil-fuel-based plastic raw material, which is often cheaper than recycled material. There are significant climate change impacts at every stage of the value chain, from production to disposal. Projected expansion in plastic production to meet the exponential increase in consumption will significantly increase the plastics sector's contribution to global greenhouse gas emissions, from 4% in 2015 to 15% by 2050.

4. Plastic packaging is a plastic leakage hotspot. More than half – 52% – of plastic raw material produced in and imported into South Africa is used for packaging applications.

5. Plastic leakage in the form of litter and illegal dumping is symptomatic of a weak and fragmented waste management system. This is a result of the inadequate collection and sorting infrastructure, combined with a lack of capacity in municipalities.

6. Plastic pollution in the marine environment is a transboundary issue. Most plastic in the ocean comes from land-based sources and gets transported across national borders via waterways and atmospheric and ocean currents.

7. The circular economy model provides the framework in which to guide collective action. Plastic recycling is only one of a suite of interventions required across the plastics life cycle. Others include elimination of unnecessary and problematic plastic items, product design for reuse and new product delivery models such as own-container dispensing schemes.

8. South Africa has a well-developed plastic recycling sector; however, it is facing huge challenges, worsened by the limitations imposed by the COVID-19 lockdown regulations. The price of oil is also a considerable factor that contributes to the instability of the recycling system in South Africa and globally.

9. A preventative approach that tackles the plastic pollution crisis at the source will be critical, instead of solely focusing on mitigating the impacts after the fact.

10. All actors in the plastics value chain have a role to play dealing with the plastic pollution challenge. While there are various policies and actions in place, little can be achieved without deep collaboration, accountability and transparency. Critical decisions need to be made in the short term, including the alignment towards a common vision, the fast-tracking of a mandatory extended producer responsibility scheme underpinned by time-bound national targets, and supporting a new global treaty to address plastic pollution.

WWF'S WORK IN PLASTICS

WWF works in partnership with key stakeholders across the South African plastics value chain to promote a transition to a circular plastics economy, reduce plastic leakage into nature and ensure that plastic remains at its highest value.

Sustainable production and consumption require greater accountability and transparency and behaviour change in all stages of the plastics life cycle.

WWF identifies three primary points of leverage:

1. **Strengthening policy instruments**

- Supporting the development and implementation of effective national and regional[1] policy and regulations according to circular economy principles
- Advocating for a new global treaty to address plastic pollution

2. **Accelerating market transformation**

- Supporting collective action to shift market practices to reduce virgin plastic consumption and move towards circularity for plastic products and packaging through product redesign and manufacturing innovation, new product delivery and circular business models

3. **Promoting best available scientific practice and knowledge transfer**

- Conducting and assimilating research to support best practices for product and packaging design, certification and labelling guidelines
- Sharing our learnings with local and regional partners

ABOUT THIS REPORT

The *Plastics: Facts and Futures* report provides an overview of the plastic pollution challenge in South Africa and proposes the necessary interventions to address it.

This report is aimed at researchers, industry actors, policymakers and interested individuals. It explores the environmental and socio-economic impacts of plastic pollution in the South African context, with a focus on plastic packaging as a major contributor. There are also plastic products beyond packaging that need to be given attention in Africa and South Africa and these are identified in the report. These products include hygiene products such as sanitary towels and nappies, cigarette butts and certain types of fishing gear, all of which are not currently well managed and add to plastic leakage into nature.

The *Plastics: Facts and Futures* report aims not only to consolidate the mounting evidence to highlight the risks of a business-as-usual path but also to provide ideas for first steps and identify the levers to deliver significant positive impact in this complex system. This complexity means that no single organisation can solve the plastic pollution challenge by itself and that an inclusive, collaborative process with multiple stakeholders across the plastics value chain is needed, with a strong focus on prevention rather than mitigating impacts once they have already occurred. Addressing the plastic pollution crisis must not be done at the expense of other increasing environmental problems, but if done right, addressing plastic pollution will result in net positive environmental outcomes for our planet across a range of environmental and social stressors.

For ease of reference, we have included a Glossary as well as an Index at the back of the report.

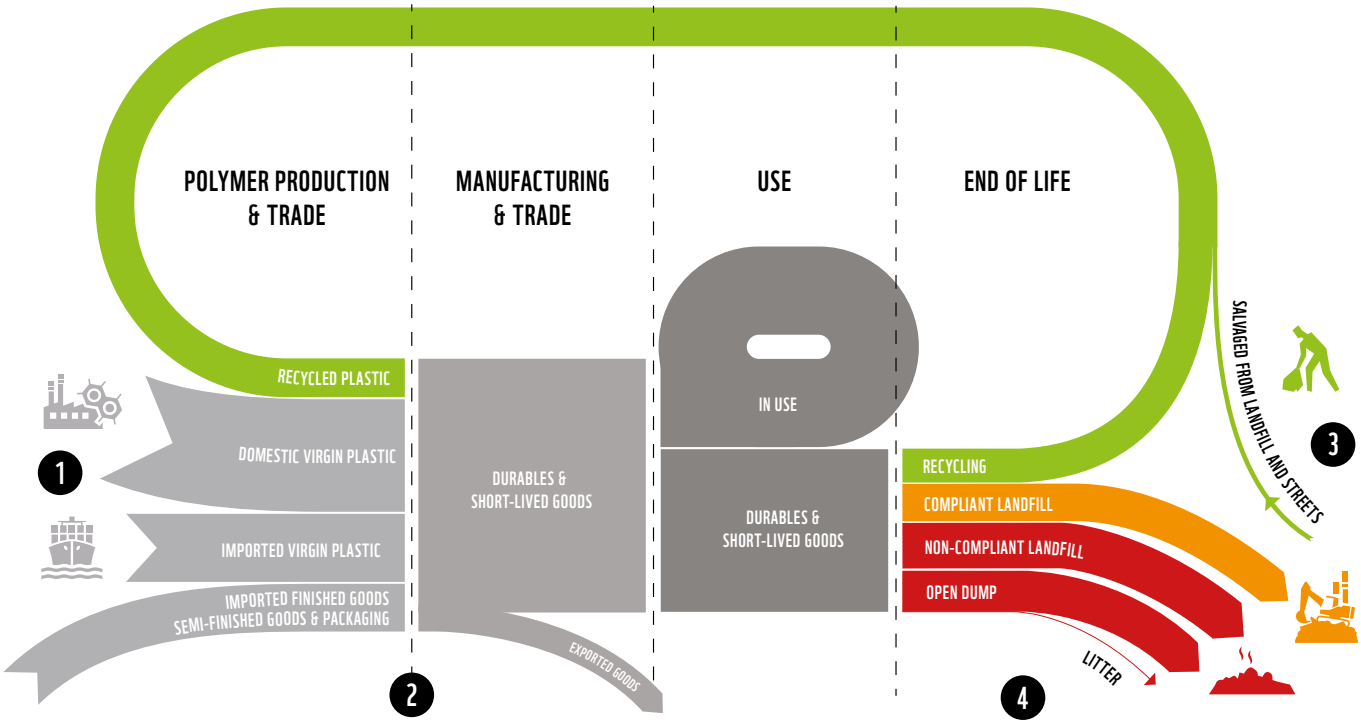
1 "Regional" here refers to the African continent.

THE CURRENT PLASTICS ECONOMY

South Africa's current plastics economy is almost entirely based on the linear "take-make-waste" approach.

South Africa's linear model is illustrated through the large dependency on virgin material for its plastics production and presents several barriers to the transition to a circular plastics economy. Almost half the goods consumed are designed for a short lifespan, and landfilling or open dumping are the primary waste treatment methods. However, the first milestones towards circularity are present in the form of the struggling recycling economy, which is characterised by the vulnerable and under-supported informal waste collection, sorting and recycling sector. A visual representation of the current material flow* tracks the volumes of unnecessary and unmanaged plastic scrap and waste generated in the current approach.

MATERIAL FLOW IN THE CURRENT LINEAR PLASTICS ECONOMY



Primary barriers to achieving a circular plastics economy

1. The current economic cost of virgin plastic does not account for the negative impacts of plastic pollution on nature and people.
2. The plastic production system is largely dependent on fossil-fuel-based virgin materials and unsustainable, non-circular design of products and packaging.
3. A weak and already strained waste management system is supported by a marginalised but growing informal waste sector.
4. There are several but disjointed initiatives throughout the plastics value chain with a narrow focus on end-of-pipe solutions.
5. There is a lack of a cohesive and trusted local evidence base and a lack of sector-wide collaboration and trust between industry and civil society, and with government.

These challenges at a systems level and at each life-cycle stage cause a cluster of negative impacts on the environment and human well-being.

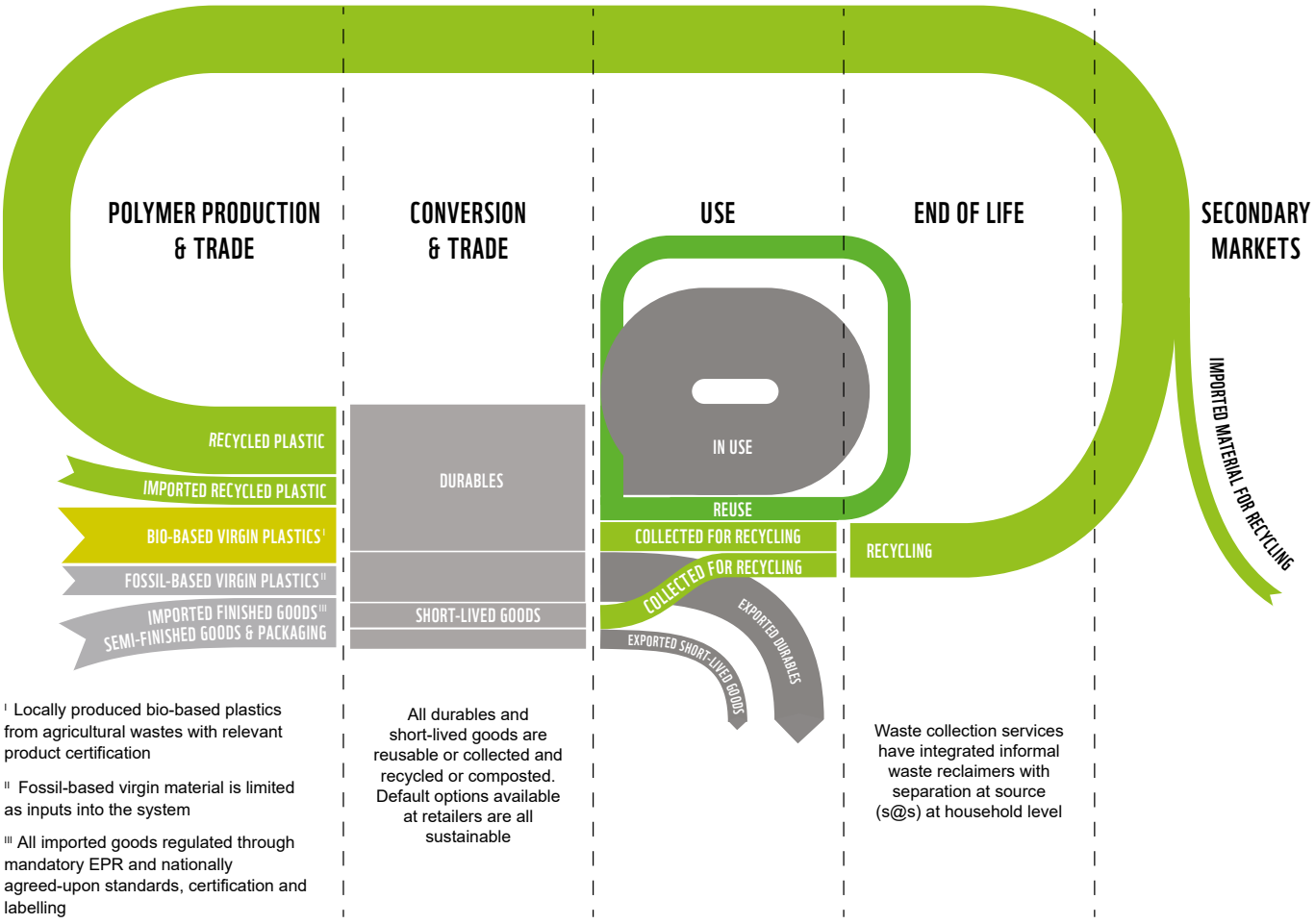
*All data flows refer to 2018 values based on calculations and estimates extrapolated from the following data sources: Plastics SA, 2019a; Von Blotnittz et al., 2018; UN Comtrade, 2019.

A CIRCULAR PLASTICS ECONOMY

By 2030, South Africa can make progress towards a circular plastics economy.

This ideal state for South Africa in 2030 is founded on the principles of circular design, innovative reuse and refill schemes, a thriving recycling economy and established markets for secondary resources. A visual representation of the ideal material flow** helps us start envisaging the milestones that will close the gap between our current and the ideal state.

PLASTICS MATERIAL FLOW IN 2030 - THE IDEAL CASE



[I] Locally produced bio-based plastics from agricultural wastes with relevant product certification

[II] Fossil-based virgin material is limited as inputs into the system

[III] All imported goods regulated through mandatory EPR and nationally agreed-upon standards, certification and labelling

All durables and short-lived goods are reusable or collected and recycled or composted. Default options available at retailers are all sustainable

Waste collection services have integrated informal waste reclaimers with separation at source (s@s) at household level

Necessary actions towards a circular plastics economy

1. **Strengthen the regulatory environment** through mandatory extended producer responsibility and other policy instruments, recognising the informal waste sector and supporting a new global legally binding treaty to address plastic pollution

2. **Unlock investment** for a circular plastics economy through implementing an industry-wide strategy, supporting the South African Plastics Pact, and increasing capacity, knowledge, infrastructure and innovation for circularity

3. **Ensure accountability** through systems for local evidence sharing, ambitious target setting and transparent reporting based on accurate and trusted data

4. **Support the local industry** through a level playing field, educated and mobilised citizens and increased local markets for recycled materials

To be successful, these actions depend on **systems thinking, deep collaboration** and **shifts in mindset**.

**All data flows are fictional estimates for an ideal future state of a circular plastics economy in South Africa.

SECTION 1

A COMPLEX MATERIAL, A COMPLEX PROBLEM

The qualities that make plastics fundamental to our lives – their malleability and resistance to degradation – also make them persist in our environment for centuries.

An array of plastic litter items collected during a clean-up event on Ganger Bay beach, Mouille Point, Cape Town.

A BRIEF INTRODUCTION TO PLASTIC

Plastic is a versatile material used in a variety of applications in many of our daily activities.

The term "plastic" originally meant "pliable and easily shaped". Plastic forms a large part of the category of materials called polymers, or long-chain molecules, which includes plastics, textiles, adhesives, explosives and rubbers.

Polymers can be found in nature or can be synthetically produced. Cellulose, the primary cell wall of green plants, is an example of a naturally occurring polymer. Most of the commercial polymers are synthetically produced from ethylene and propylene gas, which are both product streams of the refining process of fossil fuels such as crude oil, natural gas or coal in the petrochemical industry.

Ethylene and propylene gas are polymerised, sometimes along with other chemicals, to produce a variety of polymers in powder form. These powders are then pelletised into what is commonly known as nurdles before being sold to plastic converters. The plastic converters manufacture various plastic products and packaging from the nurdles, often adding various additives to modify the physical and chemical properties of the plastic.

Some plastics are also produced from bio-based feedstocks such as sugar cane, cassava, maize and wood wastes. The natural starches and sugars from these feedstocks are processed to form bio-propylene and bio-ethylene, which are then polymerised in a similar way to the fossil-based plastics. Other bio-based products such as lactic acid and hydroxyalkanoates can be polymerised to produce polylactic acids (PLAs) and polyhydroxyalkanoates (PHAs), which are examples of biodegradable plastics.

Plastics produced from fossil fuels are referred to as conventional plastics, whereas plastics produced from bio-based feedstocks are referred to as bioplastics (not to be confused with biodegradable plastics, see page 13).

PLASTIC PROPERTIES AND BENEFITS

Plastics have revolutionised various industries and have distinct advantages over alternative materials. Some of the main desirable properties of plastics include:

- High strength-to-mass ratio
- Colourability
- Insulating properties (acoustics, thermal and electrical)
- Selective resistance to certain chemicals (depending on the polymer type)
- Recyclability

Because plastic is a lightweight material, the transportation of products of equal volume generates fewer carbon emissions than the same products packaged in heavier materials such as glass and some metal. Plastic is also very durable and could result in less spoilage or breakage during transportation and handling compared to paper or glass packaging. Maintaining the integrity of the container safeguards the product, saves resources and reduces the carbon and water footprints associated with manufacturing that product.

The medical industry, for example, relies on plastic packaging to ensure that equipment remains sterile. Medicines can also be securely stored in plastic containers.

Plastic packaging plays a major role in creating a barrier for preserving and ensuring the safety of food, which reduces overall food waste.

MOST COMMON TYPES OF PLASTIC

The six most common types of plastic used for consumer goods are listed in the sidebar on page 11. The types are numbered one to six as part of the material identification code (MIC). The material identification code is recognised internationally and helps waste collectors, sorters and recyclers to identify the type of plastic.[2] The material identification code can be found either within the plastic product mould itself or on the product or packaging label. It consists of a number inside a triangle with three chasing arrows and an abbreviation for the type of plastic.

2 These material identification codes are not meant for consumers; a separate labelling system is required to give consumers specific disposal and recycling instructions (see Box 3).

BOX 1: THE UNIVERSAL RECYCLING LOGO

The universal recycling logo consists of the Möbius loop made up of three chasing arrows. The chasing arrows represented on the material identification code are often confused with this logo.

The universal recycling logo indicates that the product or packaging item is recyclable, whereas the material identification code only indicates the material type; it does not mean that the material is recyclable. However, the universal recycling logo does not indicate whether the material is currently being recycled in South Africa. This information is important for consumers as they need to know which plastics should be sorted into the recycling bin and which should go into the general waste bin destined for landfill.

Changing the material identification code representation

To avoid the confusion between the universal recycling logo and the material identification code, it is recommended that the material identification code be represented as a solid triangle instead of the three chasing arrows. However, many plastic manufacturers still use the three arrows due to the high costs of changing plastic moulds for rigid products.

Takeaway cutlery is made from PP (MIC 5), PS (MIC 6) and ABS (MIC 7). This mixed material stream is difficult to recycle due to the reasons mentioned on page 38 and 39.

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1 PET

PET: Polyethylene terephthalate

2 PE-HD

HDPE: High-density polyethylene

3 PVC

PVC-P/PVC-U: Polyvinyl chloride plasticised (flexible) or unplasticised (rigid)

4 PE-LD

LDPE/LLDPE: Low-density or linear low-density polyethylene

5 PP

PP: Polypropylene

6 PS

PS/HIPS: Polystyrene (general or high-impact)

BOX 2: NUMBER 7 PLASTICS – NOT RECYCLED IN SOUTH AFRICA

In theory, most plastics can be recycled if the correct infrastructure, technology and end-markets exists. The clear exception is multilayer materials made up of more than one type of plastic. These materials are not recycled in South Africa due to economic implications and technical difficulties in separating the layers. Multilayer materials are often represented by material identification code (MIC) 7.

MIC 7 plastics also represent less common plastic types such as polyamide (PA), polycarbonate (PC) and acrylonitrile butadiene styrene (ABS). The tonnages of these materials recycled are small compared to the other plastic types.

Dealing with non-recyclables

Products and packaging made up of materials that are not reused or recycled in South Africa should be avoided where possible, or infrastructure to recycle these materials should be put in place. If these materials cannot be avoided, then technical difficulties to recycle or reuse them should be overcome, and the low demand for the recyclate (recycled material) should be addressed.

BOX 3: SYMBOLS AND LABELLING – THE NEED FOR A STANDARD APPROACH

Although plastics may appear identical or similar to the naked eye, they have different physical properties and therefore need to be sorted and recycled separately. There is also a varying demand for the different recycled plastics, therefore each plastic type has a different economic value.

On-pack recycling labels (OPRLs) are needed to assist consumers in separating materials at source for recycling. The use of various symbols on plastic packaging creates a great deal of confusion for consumers, who need to manage their plastic recycling more effectively.

Improving on-pack recycling labels

Retailers and brands have a responsibility to educate consumers on what the labels mean and what to do with the product and packaging after use. Retailers and brand owners can do the following:

- Make use of the evolving guideline for retailers and brand owners (see Box 13)
- Become involved in the discussions taking place on on-pack recycling labels within the South African Plastics Pact to determine the applicable labels for the specific packaging placed on the market
- Ensure that on-pack recycling labels are clear, legible and easily understood
- Given the increase in use of biodegradable plastic alternatives, provide clear labels to guide consumers on how to manage these items
- Give specific information about how to separate products that are recycled in South Africa (or not)
- Provide special instructions on whether to separate, wash or remove components such as lids, containers or stickers
- Use the universal recycling logo only if the material is currently recycled in South Africa, and update on-pack recycling labels regularly if this changes

BIODEGRADABLE PLASTIC ALTERNATIVES AND THEIR UNINTENDED CONSEQUENCES

Biodegradable and/or compostable materials are erroneously regarded as a silver-bullet solution for the persistence of plastic pollution. However, these materials should not be blindly adopted as a solution but rather treated with caution on a case-by-case basis depending on the context.

The decision to move from conventional plastics to biodegradable alternatives should be evidence based, using methods such as Life Cycle Assessment to make sure that the environmental impacts are not simply transferred from one area to another.

There are several types of alternatives to conventional plastics that visibly appear to be the same and are often confused with one another. This confusion adds to the risk of contamination or mixing of materials, causing difficulty in sorting and treatment processes (recycling or composting).

Bioplastics is a blanket term for plastic materials that are either produced from bio-based feedstocks, are biodegradable, or features both properties. Plastics that do not fall in this category are conventional plastics.

Biodegradable materials fully degrade only under very specific conditions such as particular temperatures, pressures, humidity and oxygen concentration. If conditions are not ideal, these materials will take longer to degrade fully. The end products are gases (carbon dioxide and/or methane), water, biomass and mineral components, which are not the same as good-quality compost. The degradation process varies considerably across material types and environments, and can take up to a year or more.

Items made from biodegradable plastics are not suitable for, and should not be marketed as being able to degrade in natural environments such as land, landfill, freshwater or marine environments. It is most likely that they will persist like conventional plastics, behaving and posing similar threats to ecosystems (see Section 3).

Biodegradable bioplastics

Biodegradable bioplastics cannot be recycled with conventional plastics as this will contaminate the recycling stream and compromise the durability of the recyclate (recycled material). Biodegradable materials are often not labelled clearly to distinguish them from conventional plastics. Polylactic acid (PLA) and polybutylene adipate terephthalate (PBAT) products are the most common biodegradable alternatives used for straws, coffee-cup linings, films, bags and cutlery. Some of these products do not have certification for biodegradability or compostability in home and industrial applications. Even when they do, these certifications are not widely agreed upon and adopted in South Africa, therefore commercial composting facilities are not currently accepting biodegradable plastics.

Increasingly, more and more biodegradable plastic alternatives are being imported into South Africa. The perception is that these products are a solution to the plastic pollution challenge. However, these products have the potential to contaminate the plastic recycling stream and to add to the waste destined for landfill and that which ends up in nature.

Non-biodegradable bioplastics

Non-biodegradable bioplastics can be recycled with conventional plastics. For example, a Valpré® water bottle consists of 70% conventional PET and 30% bio-based, non-biodegradable PET produced from sugar cane imported from Brazil. This blend can be recycled with other conventional PET bottles.

"ORASA supports the use of correctly certified and clearly labelled compostable products that do not adversely affect compost or soils. The processing of these products is at the discretion of the individual composting facility and will depend on the technology used."

– Organics Recycling Association of South Africa (ORASA)

BIODEGRADABLE PLASTICS ARE NOT SUITABLE TO MIX WITH CONVENTIONAL PLASTICS DESTINED FOR RECYCLING

SOME COMMERCIAL COMPOSTING FACILITIES ARE NOT CURRENTLY ACCEPTING BIODEGRADABLE PLASTICS

Four things should be considered before introducing biodegradable products into South Africa:[3]

1. The environmental and socio-economic impacts of the bio-based feedstock supply chain
2. Implementation of national regulations for compostability standards and certification
3. An Integrated Waste Management Plan for the separation, collection and processing of biodegradable materials, including precautions to prevent materials from contaminating the conventional plastic recycling stream
4. Necessary infrastructure for industrial composting in accessible locat

PLASTIC ADDITIVES AND THEIR POTENTIAL DANGERS

Additives are substances added when plastic nurdles are converted to products and packaging. Various additives are used to modify or enhance certain properties of plastics, depending on the application of the final product. However, some of these additives are toxic and can have a negative impact on the recyclability of a product.

Examples of common additives include:

- Anti-microbial additives, which result in plastics on which no bacteria can survive
- Slip additives, which reduce friction between two polymers (making it easier to open plastics lids)
- UV protection, which can be added so that a clear plastic will protect whatever is inside from ultraviolet radiation
- Flame retardants, which are used in certain electrical and electronic equipment, as well as construction material applications to prevent fire hazards
- Foaming agents, which are used in certain plastics such as expanded polystyrene for more lightweight, cushioning properties

Hazardous additives

Additives containing persistent organic pollutants (POPs) have a high environmental risk, therefore most of these substances are currently controlled through legislation. Bisphenol A (BPA), which was used to increase the strength and anti-corrosive properties of plastic materials, has been banned in baby products and food packaging in South Africa since 2011.[4] Polychlorinated biphenyls (PCBs), which were used in plasticisers in plastics and rubber products, as well as brominated flame retardants, are currently being phased out in South Africa since regulation was passed in 2014.[5]

Additives to increase biodegradability

Oxo-plastics/oxo-degradable/oxo-biodegradable plastics contain additives, such as mineral salts, that speed up the degradation process of plastics in the presence of oxygen. These materials are essentially conventional plastics that degrade, or fragment, at a faster rate. Oxo-degradable plastics have been used for plastic carrier bags and other disposable plastic packaging products. Although these products may be visibly perceived to degrade completely, they could still carry the risks associated with microplastics (see Box 4).

The risks of these products are well documented in various position papers. There is concern about the uncertainty of the degradation time-frame under different environmental conditions, contamination of existing plastic recycling streams, formation of microplastics and insufficient infrastructure for collection and treatment.[6] While some European countries have already implemented restrictions or bans on oxo-degradable plastics, South Africa does not have any legislation in this regard yet.

Additives and recycling

Different types of plastic additives affect different aspects of the mechanical plastic recycling process. Technical difficulties in material separation and processing could arise. Also, the overall quality of the recycled product could be compromised due to property changes in the material and potential build-up of additives in the recycling loop.

Fillers, for example calcium carbonate, are used as a cost-saving mechanism in plastics such as plastic carrier bags to reduce the amount of plastic used. This changes the overall density of the material, which makes it difficult to separate in certain recycling operations that use density separators.

Some additives, such as hazing agents, fluorescence agents and oxygen scavengers, are added for visual and technical effects and impact negatively on the recyclability of the packaging.[7] Oxo-degradable plastics affect the quality of the recycled material due to the pro-degradation additive.

3 Adapted from CGCSA, 2020.
4 GN R879: Regulations in terms of the Foodstuffs, Cosmetics and Disinfectants Act 54 of 1972.
5 GN R589: Regulations in terms of the National Environmental Management Act 107 of 1998.
6 WWF, 2020; CGCSA, 2020.
7 Packaging SA, 2017.

It is especially important to know the risk of potential leaching, or migration, of hazardous additives into foodstuffs when it comes to food-grade applications (products that come into contact with food for consumption). In order to mitigate the risk of potential human and ecosystem harm, responsible recyclers should have a process in place for quality control of each batch of recycled material. One of the tests conducted is called the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) assessment, which tests for the presence of any hazardous chemicals.

PLASTIC DEGRADATION AND THE BURDEN ON NATURE

Plastic degradation in nature

After the useful life of a plastic product, it slowly begins to degrade over extended periods of time, years, decades or even centuries, depending on the external environment. Plastics can degrade in the natural environment through exposure to ultraviolet (UV) light and oxygen. This is called photodegradation. Mechanical abrasion in natural mediums such as wind, sand or wave action also leads to material break-up. This process takes much longer in freshwater or the ocean environment, where there is less UV exposure.

Degradation rates depend on the conditions in the environment, with the result that plastic can take as long as several decades or centuries to fully degrade. This is a stark reminder of the fact that once disposed of, plastic does not simply disappear but persists for years in landfills or the natural environment due to its durability.

Through these processes, larger plastics break down into smaller particles or fragments. Plastics fragments are categorised according to size, into mega- (> 1 m), macro- (> 50 mm), meso- (5–25 mm), micro- (1 µm–5 mm) and nanoplastics (< 1 µm). The majority of plastics found in the environment are macro-, meso- and microplastics.

BECAUSE PLASTIC IS SO DURABLE, IT DOES NOT SIMPLY DISAPPEAR ONCE DISPOSED OF; IT CAN PERSIST FOR DECADES OR EVEN CENTURIES IN LANDFILLS OR THE NATURAL ENVIRONMENT

City of Cape Town Stormwater department cleaning up the Lotus River, supported by the Litterboom Project and Pristine Earth Collective after a rainfall event.

BOX 4: MICROPLASTICS AND THE RESULTANT POLLUTION

Microplastics (1 µm to 5 mm) can be categorised into two types, namely primary and secondary microplastics. Primary microplastics are deliberately manufactured to a specific size, such as plastic nurdles, or microbeads found in personal-care products such as toothpaste and face wash and some household cleaning products. Secondary microplastics form through the breakdown (or fragmentation) of larger items. Sources include microfibres from textiles, dust from tyres and plastic fragments formed by the degradation of plastic in the environment.

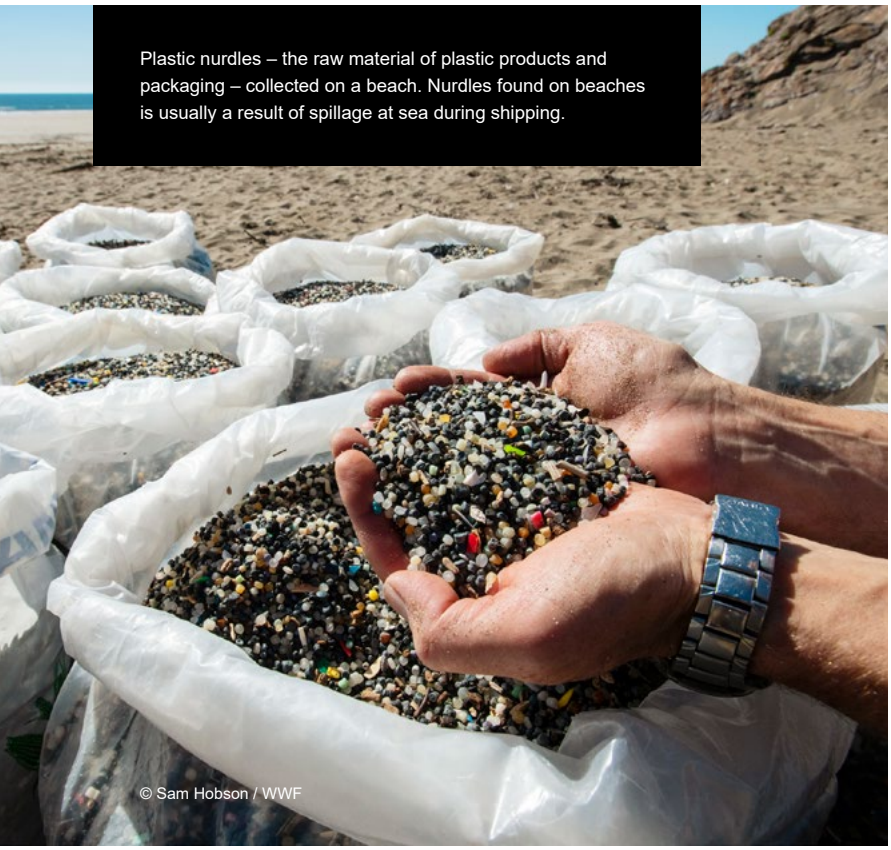
Research has shown that the process of degradation of plastics, which involves the breaking of long-chain polymers into short-chain molecules, releases methane and other greenhouse gases into both air and water environments under ambient conditions. However, a prediction of the estimated contribution of how much degrading plastics contribute to overall greenhouse gas emissions is at an early stage of research.[8]

The degradation of plastics may also release toxins into the surrounding environment via two sources:

From the plastic itself: Some additives are known toxins and will be harmful if they leach out of the plastic as it breaks down into soil and water or migrate from packaging into food. Potentially, this is not common as strict precautions are in place to ensure the safety of food packaging and its additives through the REACH assessment mentioned (see page 15). However, this may be a risk when it comes to children's toys.

From the environment: Plastics attract persistent organic pollutants (POPs) from water, meaning that the concentration of these pollutants on microplastics is many times higher than the concentration in the surrounding water. Microplastics thus become increasingly toxic for marine species that ingest them (the ecological impacts of plastic degradation are further discussed in Section 3).

8 Royer et al., 2018.



Plastic nurdles – the raw material of plastic products and packaging – collected on a beach. Nurdles found on beaches is usually a result of spillage at sea during shipping.

© Sam Hobson / WWF

Plastic degradation during recycling

As in the rest of the world, South Africa's recycling infrastructure is largely mechanical as opposed to chemical recycling. This means that plastic polymers are processed via physical processes for size reduction (grinding and shredding) and melting into plastic pellets that are used for plastic manufacturing. Some recyclers also include a wash-and-dry stage in their processing to get rid of contaminants.

Plastic polymers degrade in quality with each round of mechanical recycling, meaning that long molecular chains break into shorter chains, thus changing the properties of the material. Degradation affects the impact strength and viscosity of the material. This means that plastics cannot be recycled indefinitely. Recycled materials may also contain contaminants that affect the smell and colour of the plastic, and additives, which build up with each successive cycle, potentially reaching hazardous levels. This causes recycled material to be undesirable for the manufacturing of food packaging in particular.

A COMPLEX MATERIAL, A COMPLEX PROBLEM

IN SUMMARY

Understanding the complexities of plastic in terms of its physical properties is the first step towards addressing the resultant challenges that it presents as a persistent pollutant.

1. **A persistent pollutant despite its benefits:** Plastic is a versatile, durable, lightweight and relatively cheap material (when not including the resultant environmental, social and economic costs of plastic pollution) and is therefore used extensively in just about every industry. Although plastic provides important benefits in many industrial and domestic applications, it is a widespread and persistent pollutant, threatening the health of our marine, terrestrial and freshwater ecosystems. The complexity of how plastic is produced, used and managed results in a complex plastic pollution problem.
2. **Feedstocks:** The majority of plastics are produced from fossil fuels, which makes the plastics industry a carbon-intensive sector. While alternative feedstocks are being explored, including waste and bio-based materials, the sustainability of those supply chains need to be considered.
3. **Biodegradable materials:** There is a perception that biodegradable materials are a silver-bullet solution to address the negative impacts of plastic pollution. However, these materials are currently unsuitable for the South African context due to the lack of infrastructure for effective separation, collection and treatment in industrial composting facilities, as well as the lack of certification and labelling standards. Biodegradable materials also pose the risk of contaminating the conventional plastic recycling stream.
4. **Additives:** Plastic additives are used to modify the properties of the material or save on cost; however, certain plastic additives are toxic and pose an environmental and human health risk. Additives may also negatively affect the recycling process and the quality of recycled material.
5. **An essential service:** Plastic packaging and products for medical use have been in high demand, and played a vital role in hygiene and safety during the COVID-19 lockdown period. Plastic manufacturing of these items has thus been deemed an “essential service” and operations were allowed to continue.

SECTION 2

STAGES IN THE PLASTICS LIFE CYCLE

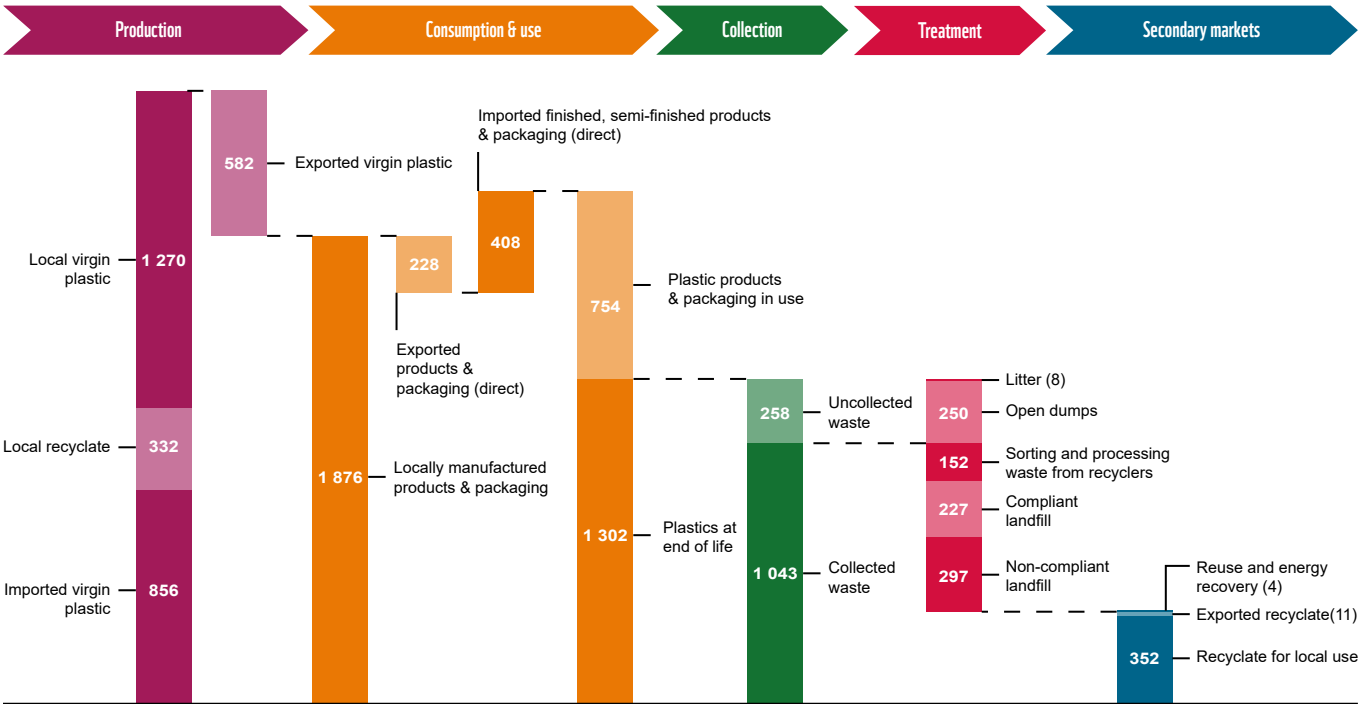
The growing global plastics production and consumption rate has increased 200-fold since the 1950s. This excessive production and consumption of plastics will continue to increase if we continue with business as usual.

“Bottled water is viewed by [South African] consumers not simply as water but alternatively as a health beverage. Its consumption is therefore lifestyle related.” – South African National Bottled Water Association

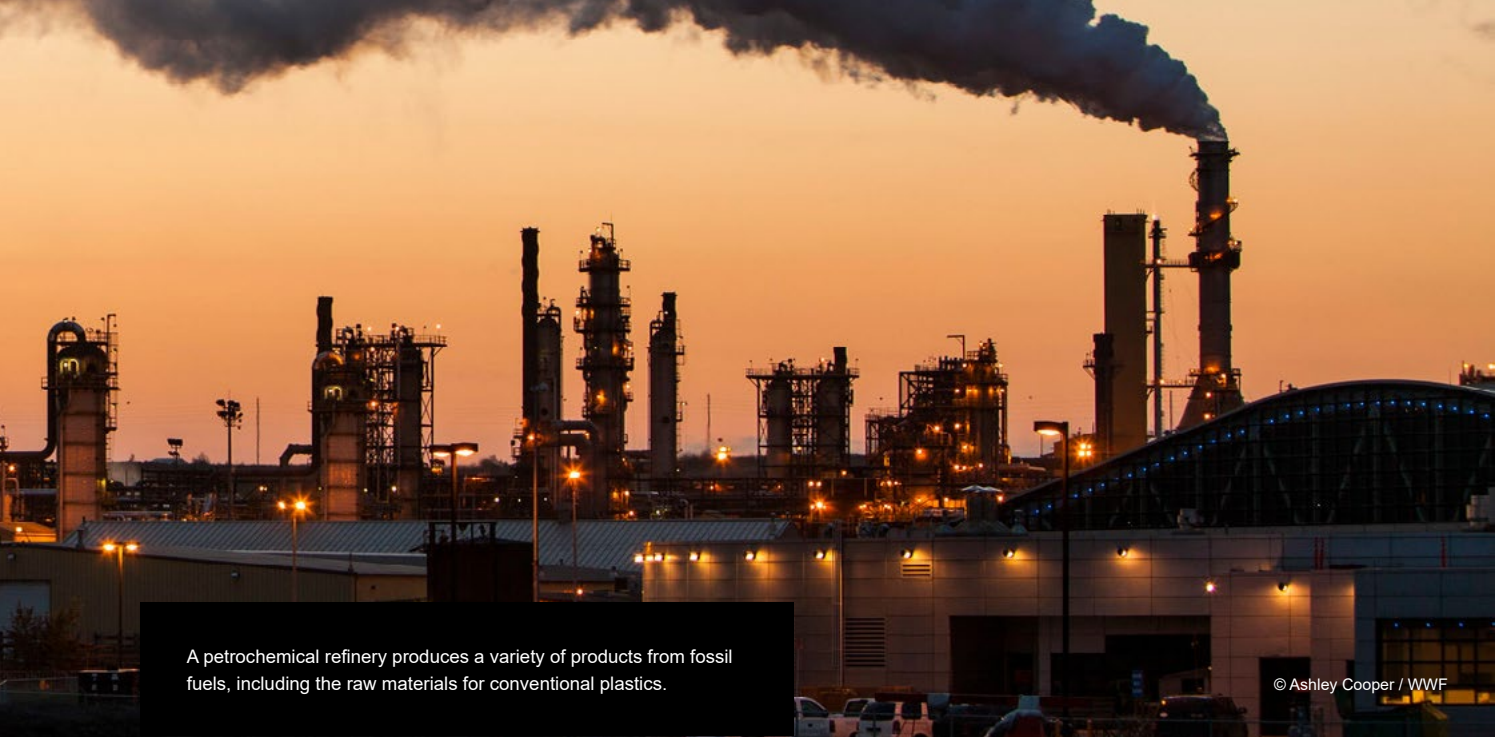
STAGE 1: PRODUCTION

The world is consuming more plastic than ever before. Plastic is a relatively new material – production only started in the 1950s but has increased exponentially since then.

A SNAPSHOT OF THE PLASTICS LIFE CYCLE IN SOUTH AFRICA IN NUMBERS ('000 TONNES)*



*All volumes refer to 2018 values based on calculations and estimates extrapolated from the following data sources: Plastics SA, 2019a; Von Blotnittz et al., 2018; UN Comtrade, 2019.



A petrochemical refinery produces a variety of products from fossil fuels, including the raw materials for conventional plastics.

© Ashley Cooper / WWF

GLOBAL PLASTIC PRODUCTION AND CONSUMPTION

As of 2016, a cumulative total of 8,3 billion tonnes of plastic have been produced globally over the past 65 years. Half of this was produced in the 2000s.[9] This saw an average growth rate of 4% every year since 2000.

The global production in the year 2016 amounted to 396 million tonnes of plastic, which was the equivalent of 53 kg of plastic per person. Global plastic production is projected to increase by 40% by 2030[10] due to investments into new ethylene plants in the USA, Europe and China.[11] About 100 companies produce all the polymers used in plastic production worldwide, which points to a highly concentrated industry.[12] Plastic polymer producers and petrochemical companies are often one and the same, representing some of the biggest companies in the world.

Global plastic production is currently concentrated in Asia, which is contributing 51% of total production (with 30% in China alone). Only 7% is produced in Africa and the Middle East combined.[13] However, due to plastics trade dynamics, global consumption values[14] per region may differ from production values. China, for example, may have a global production value of 30% but a consumption value of about 20% as it exports virgin plastic and finished goods.[15]

PLASTIC PRODUCTION AND TRADE IN SOUTH AFRICA

In South Africa, the primary plastic raw-material producers are Sasol Polymers and Safripol (a division of KAP Industrial Holdings). There are also a number of plastic raw-material importers such as Dow Chemicals. In 2018, 1 270 000 tonnes[16] of virgin plastic were locally produced. Of that, 582 000 tonnes[17] were exported and 688 000 tonnes were used for manufacturing locally. In addition, 856 000 tonnes[18] of virgin plastic were imported (see page 20).

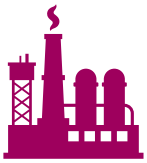
8,3 bn

TONNES PRODUCED GLOBALLY OVER THE PAST 65 YEARS

9 Geyer et al., 2017.
10 De Wit et al., 2019.
11 CIEL, 2017.
12 Forrest, 2019.
13 PlasticsEurope, 2019.
14 Consumption values refer to what products are used in the country, including domestic production and imported goods, but excluding exported goods.
15 Ryberg et al., 2018.
16 Local virgin plastic manufactured locally (Plastics SA, 2019) + exported virgin plastic (UN Comtrade, 2018).
17 UN Comtrade export data tariff codes 3901, 3902, 3903, 3904, 3905, 3905, 3906, 3907, 3908, 3909.
18 UN Comtrade import data for tariff codes 3901, 3902, 3903, 3904, 3905, 3905, 3906, 3907, 3908, 3909.

STAGE 2: CONSUMPTION AND USE

In South Africa, plastic consumption per capita is predicted to increase over the next few years due to urbanisation, urban-rural migration and an increase in middle-income households. Measures should be taken to prevent tipping the scale to overconsumption, especially in higher-income households.



3% p.a.

2010-2018
PLASTIC PRODUCTION IN SOUTH AFRICA

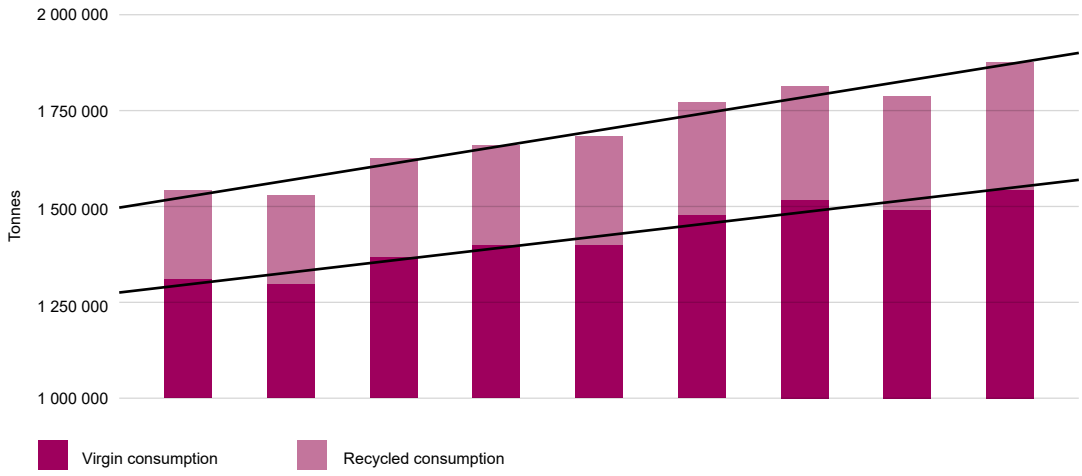
In 2018, South Africa consumed 1 876 000 tonnes[19] of locally converted manufactured plastic products and packaging. In addition, 408 000 tonnes[20] of finished and semi-finished plastic products were imported.

There are still a few data gaps for plastic consumption values in South Africa, specifically related to traded goods. These goods include:

- Indirect import or export of plastic through primary, secondary and tertiary plastic packaging for goods not covered under plastic tariff codes
- Direct import and export of plastics that form part of goods not covered under plastic-related tariff codes, such as electrical and electronic goods, automotive plastics, cosmetics, textiles, toys and sporting goods

Over eight years, from 2010 to 2018, the total plastic consumption in South Africa (volumes converted into products) increased by 24%, from 1 510 000 tonnes to 1 876 000 tonnes. This is an average increase of 3% per year.

FIGURE 1: DOMESTIC POLYMER CONSUMPTION OVER EIGHT YEARS IN SOUTH AFRICA[21]



19 Plastics SA, 2019a.
20 UN Comtrade import data for tariff codes 3916, 3917, 3918, 3919, 3920, 3921, 3922, 3923, 3924, 3925, 3926.
21 Plastics SA, 2019a.

BOX 5: PLASTIC MANUFACTURING – AN ESSENTIAL SERVICE DURING COVID-19 LOCKDOWN IN SOUTH AFRICA

During the COVID-19 Level 5 lockdown period in South Africa, only services categorised as essential were allowed to operate; all others were forced to shut down. While plastic manufacturing is not necessarily an "essential service" on its own, it supports the delivery of products and services in the retail and medical sector and thus forms part of category 24 of essential services as specified by the South African government.[22] Plastic packaging for food, toiletries, medicine and other grocery items saw a steady demand during the lockdown period, requiring packaging manufacturers to operate at full capacity. This also meant that virgin plastic polymer producers and suppliers were deemed essential. Arrangements were not clear for the plastic recycling industry, which supplies recycled material to plastic manufacturers. Only limited plastic recyclers remained operational, differing across municipalities, while recycling collection, including buy-back centres and informal waste collectors, were only allowed to operate under alert Level 4 and lower.[23]

The local plastic industry has also received a boost thanks to increased demand for medical products such as intravenous bags, tubes, oxygen masks, gloves and protective gear, which previously had been imported in South Africa.[24] Medical waste is deemed hazardous and is therefore not recycled or treated with general waste. It is either treated using electro-thermal technology before going to landfill, or is incinerated.[25]

22 See gov.za/Coronavirus/essential-services for the categories of essential services (as amended from time to time).
23 Under lockdown alert Level 5; this changed during Level 4.
24 Slater, 2020.
25 Le Roux, 2019.

SOUTH AFRICA'S PLASTIC CONSUMPTION PER PERSON

The total plastic consumption in South Africa for 2018 was approximately 2 million tonnes,[26] which amounts to 36 kg per person for 2018.[27] This consumption value increased from 1,6 million tonnes[28] in 2017, which amounted to 29 kg per person.[29]

Total global plastic consumption in 2018 was estimated at 385 million tonnes[30] (including virgin and recycled material), with a per capita consumption of 51 kg. South Africa's average consumption figure is significantly lower than the global average.

Due to the major economic inequalities in South Africa, the plastic consumption per capita will show major disparities between higher- and lower-income households. It will also differ at a regional scale between urban and rural areas. More research is needed to quantify this.

MOST PLASTIC PRODUCTS ARE MADE TO HAVE A SHORT LIFESPAN

Almost half of the total plastic products produced globally are designed for a lifespan of less than three years. Most of these products are designed as packaging.[31] However, plastic is also used in a variety of sectors such as building and construction, agriculture and consumer electronics, where products have a longer lifespan.

In South Africa, rigid and flexible packaging made up 52% of the plastics market sectors in 2018.[32] This was much higher than Europe's 39,9% and the global average of 26%.[33] South Africa's relatively higher percentage of plastic packaging as a proportion of the total plastic sector compared to global figures may be attributed to the fact that the manufacturing sector for non-packaging plastic products has not been developed to the same extent as in other countries.

2018 PLASTIC CONSUMPTION

36 kg
PER PERSON

2 Mt
IN TOTAL

2018 PLASTIC CONSUMPTION

51 kg
PER PERSON

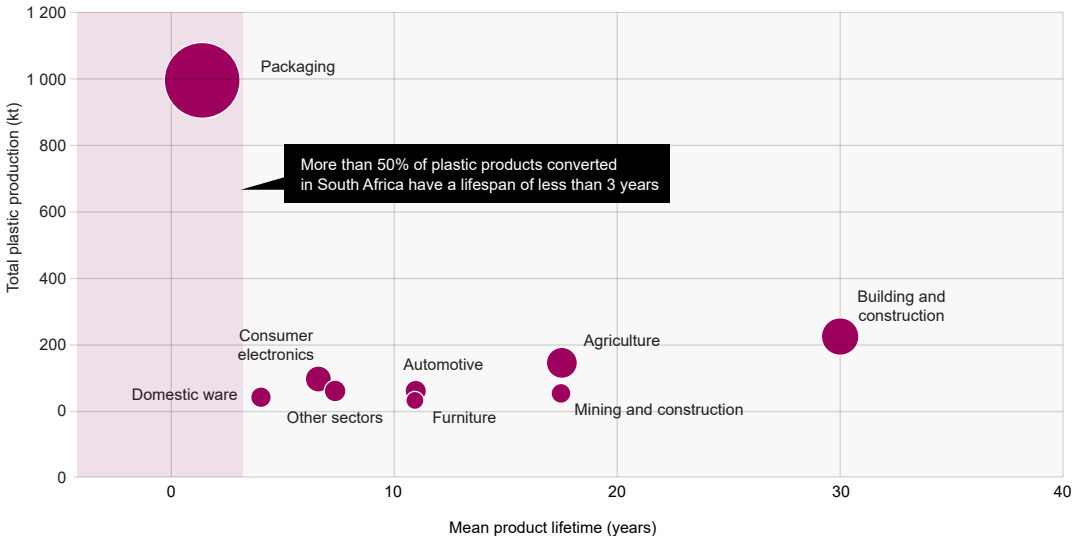
385 Mt
IN TOTAL

26 Total material converted into product plus imported plastic products minus exported plastic products.
27 Using 2018 mid-year population estimate of 57,73 million (StatsSA, 2018a).
28 Von Blottnitz et al., 2018.
29 Using 2017 mid-year population estimate of 56,52 million (StatsSA, 2017).
30 Conversio, 2019.
31 De Wit et al., 2019.
32 Plastics SA, 2019b.
33 The Ellen MacArthur Foundation et al., 2016.

Most plastic packaging has a lifespan for intended use of less than 1–3 years (see Figure 2) and is often disposed of after a single use. This means that more than 50% of plastic products converted in South Africa has a lifespan of less than three years. Sometimes this packaging is only used for a few days (or even minutes, in the case of takeaway food applications) before disposal. This is largely a result of our changing lifestyles, specifically when it comes to foodstuffs.

In contrast, applications such as plastic building and construction materials have a lifespan for intended use of up to 30 years.[34] Packaging therefore makes up the bulk of post-consumer plastic waste generated every year.

FIGURE 2: AVERAGE PRODUCT LIFESPAN PER PLASTIC PRODUCT CATEGORY FOR SOUTH AFRICA (2018)[35]



OUR CHANGING LIFESTYLES AND A SURGE IN PLASTIC PACKAGING

~1 bn UNITS

OF CRISPS, BISCUITS AND CHOCOLATES ARE SOLD IN SOUTH AFRICA EVERY YEAR, AND MUCH OF THIS PLASTIC PACKAGING ENDS UP AS LITTER

As modern life becomes busier, there is little to no time to prepare meals. As a result, there is a greater demand for ready-to-eat foods, often consumed in smaller portion sizes as snacks throughout the day. A study examining changing consumption patterns has shown that an average of 43% of adolescents worldwide drink a carbonated soft drink at least once a day and consume at least one fast-food meal per week.[36]

Convenience foods require packaging to keep pre-prepared foods fresh for longer and to make them easy to consume while on the go. Since 1994, there has been a more than 50% increase in processed and packaged food available and consumed in South Africa.[37] In 2017 alone, the South African crisps market increased by 10,4%.[38]

The flexible, lightweight packaging of on-the-go snacks is a growing concern. Every year almost 1 billion units of crisps, biscuits and chocolates are sold through formal retail markets in South Africa. This generates 1 600 tonnes of plastic packaging waste that is not currently recycled in South Africa.[39] Although by weight the value is a negligible fraction of the total waste generated in the country, a huge concern is the total number of units (almost 1 billion) that will most likely end up in landfills, open dumps or as litter.

Another element of our changing lifestyles is the growing number of small households, made up of three persons or fewer. In a 2018 survey, more than a quarter of households consisted of a single person, and 62% of households contained fewer than four persons.[40] This is relevant to the packaging discussion because a shift to smaller portion sizes of foodstuffs for smaller households require more packaging compared to bulk foods for larger households.

34 Geyer et al., 2017.
35 Adapted from De Wit et al., 2019b, using South African volumes sourced from Plastics SA, 2019a.
36 Beal et al., 2019.
37 Ronquest-Ross et al., 2015.
38 Nielsen, 2018.
39 The Moss Group, 2019.
40 StatsSA, 2019.

In the last two decades, cheaper and lightweight plastic packaging has not only been used for new products but has also replaced traditional reusable containers. Glass bottles, which sometimes carried a deposit and could be returned to the retailer or brand owner for a refund, have been replaced by plastic ones for milk (HDPE plastic), edible oils and cool drinks (PET plastic).

Packaging also enables a much wider range of foodstuffs to be marketed in supermarkets and through e-commerce. New products in supermarkets include packaged ready-made, frozen or microwave meals, prepared ingredients for quick meals, and smaller volumes of products for a single serving as opposed to bulk packaged goods. Moreover, the meals and drinks served by fast-food restaurant chains or takeaway counters in supermarkets are all accompanied by disposable cutlery, cups and containers with a lifespan of but a few minutes.

Out-of-season and "out-of-region" or imported food products, whether being transported by ship or road, are also more accessible now due to improved transit packaging.

The ease and low cost of plastic packaging may be encouraging a few unintended consequences, such as:

- Using more packaging than is necessary for food and other consumer products
- Encouraging an eat-as-you go fast-food culture, which can be more expensive and less nutritious than traditionally home-prepared balanced meals
- Importing and transporting much more food over longer distances with corresponding negative environmental impacts such as increased greenhouse gas emissions

BOX 6: "SINGLE-USE" AND "PROBLEM" PLASTICS

Single-use plastic

The term "single-use" plastic includes a broad range of plastic products – largely plastic packaging – that have a short useful lifespan and are made to be disposed of by the consumer after using the product only once. These items also correspond to those that are commonly found in the natural environment as litter and therefore have a negative connotation attached to them. Items belonging to this category include straws, earbuds, crisps packets, sweet wrappers, disposable coffee and smoothie cups, takeaway cutlery and food tubs.

The definition and scope of the term "single-use" is not clear-cut, for various reasons:

- Plastic items used in the medical industry are also designed to be used only once for the sake of sterility and hygiene, and are therefore necessary. These items should not be categorised together with problematic and largely unnecessary items.
- Some items, such as plastic carrier bags, may be used more than once by some users (but not everyone).
- The plastics industry or businesses argue that products that are collected and recycled should not be defined as "single-use" items as the material will be used again for another product.

The term "single-use" is therefore not very useful as it only evaluates items based on the number of uses. It makes more sense to have a category to describe plastic items that are unnecessary and that will most likely contribute to pollution.

Problem plastics

WWF prefers not to use the term "single-use" but rather "problematic" or "unnecessary" plastic items (or "problem plastics", for short). Problem plastics are identified by criteria defined in the Ellen MacArthur Foundation's New Plastics Economy:[41]

1. The item is not reusable, recyclable or compostable.
2. It contains, or its manufacturing requires, hazardous chemicals that pose a significant risk to human health or the environment.
3. It can be avoided (or replaced by a reuse model) while maintaining utility.
4. It hinders or disrupts the recyclability or compostability of other items.
5. It has a high likelihood of being littered or ending up in the natural environment.

41 The Ellen MacArthur Foundation, 2019a.

PLASTIC PACKAGING TRADE-OFFS: POSITIVE PROPERTIES VS NEGATIVE IMPACTS

LCAs CURRENTLY DO NOT ASSESS THE IMPACT OF PLASTIC LITTER ON HUMAN HEALTH AND BIODIVERSITY

Plastic packaging provides major benefits. Particularly in the food sector, it ensures food safety, reduces food loss and improves access to food by making it possible to keep food fresh during transport over long periods and distances. But how do we measure whether these benefits are worth the negative environmental and socio-economic threats posed by the vast amounts of plastic packaging waste generated?

Life Cycle Assessment (LCA) is a standardised assessment tool that quantifies a range of environmental metrics (such as carbon footprint, water-scarcity footprint, human health damage and ecosystem quality) across the entire value chain of a product. This methodology is often used in cases where decisions need to be made between alternative materials based on their environmental performance. In the case of plastic packaging versus alternative materials, many Life Cycle Assessments have been conducted with results favouring plastic.

Up until now, Life Cycle Assessments have revealed that the greatest environmental impact over the life cycle of products packaged in plastic is associated with the product within the packaging. Unfortunately, it needs to be noted that the current Life Cycle Assessment methodology does not capture the impacts of plastic pollution in the marine, freshwater or terrestrial environments or on human health. A lack of data and standardised assessment methods on plastics in the environment means that Life Cycle Assessment is not yet able to assess the impacts of plastics "leaked" into the natural environment. Most Life Cycle Assessment models assume that plastic is disposed of in sanitary landfills, recycled or incinerated because there is no option (data set) for littering or plastic leakage into the environment with its subsequent negative impacts. Thus, whereas Life Cycle Assessment results reflect the environmental impacts of producing and disposing of plastics, e.g. in landfills, dumps and by burning it, they do not include the biodiversity and potential human health impacts arising from littered plastics degrading in soils, waterways and oceans.

The current industry rule of thumb is that packaging represents only 10% of the energy required to make and deliver food to the consumer.[42] Advocates for plastic point out that any reduction in that 10% should not come at the expense of the other 90%. Rather, current packaging formats can be changed without causing more food waste in the form of spoiled food. Decision-makers also tend to focus on carbon footprint impacts only as these Life Cycle Assessment studies are relatively cheap and easy to perform compared to more comprehensive Life Cycle Assessments that take into account a range of environmental and socio-economic impacts.

Current ongoing research to better understand (and quantify) the impact of plastic in the environment on ecosystems and human health, and to develop an indicator than can be used in Life Cycle Assessment models, will ensure a better representation of the ecosystem and human health impacts of plastic packaging in Life Cycle Assessment results.

Moving forward, the equation for determining the value of plastic packaging will need to include more than the ability of plastic to extend the shelf life of products and the energy needed to transport the packaged goods. The most obvious of these are the impact of chemicals used in production and of plastic packaging on the natural environment.

42 Tullo, 2016.

CASE STUDY 1: GROCERY CARRIER BAGS

A Life Cycle Sustainability Assessment on grocery carrier bags in South Africa has been completed by the Council for Scientific and Industrial Research (CSIR) as part of the Waste Research, Development and Innovation (RDI) Roadmap programme.[43] In the study, 16 types of carrier bags were assessed, including paper, polyester and biodegradable bags, in terms of environmental and socio-economic performance. Overall, reusable plastic bags (particularly the 70 µm HDPE bag with 100% recycled content) perform better than single-use bags, assuming that they are in fact reused as often as possible.[44] The best single-use bag is the common 24 µm HDPE bag, provided that it has 100% (or at least 75%) recycled content. This study also developed a novel impact category for the associated impacts of plastic pollution based on the persistence of the material in the environment.

PLASTIC CARRIER BAGS OFFERED BY SOME RETAILERS IN SOUTH AFRICA

43 Russo, et al. 2020.

44 These results are based on the assumption that each single-use bag will only be used once, and that each reusable bag will be reused continuously for one year.

CASE STUDY 2: WOOLWORTHS FRESH PRODUCE LIFE CYCLE ASSESSMENT

WWF South Africa in association with Woolworths conducted a study to better understand – and quantify – the trade-off between the benefits plastics bring to fresh-produce supply chains and the environmental impacts of plastics. The study was undertaken by The Green House.

High yields and efficiencies are achieved in modern farming methods, with fruit and vegetables increasingly grown in plastic pots under plastic sheeting (in tunnels or greenhouses), while drip irrigation – with water delivered in plastic pipes – dramatically decreases water consumption. Further up the supply chain, plastics used in getting fresh fruit and vegetables to consumers improve shelf-life and reduce food losses during transport, retail and storage. However, while the benefits of using plastics in fresh produce value chains are undeniable, so are the environmental impacts of producing and disposing of plastics.

Life Cycle Assessment (LCA) was chosen for the analysis. Although LCA results do not currently reflect the biodiversity and human health impacts arising from plastic pollution in the environment, The Green House developed and applied an interim measure in this study – a plastic footprint derived from the European Commission's Circular Footprint Formula (CFF) (part of their Product Environmental Footprint (PEF) guidance). The CFF-based plastic footprint recognises that all plastics are not equal when it comes to their potential to become litter, by considering the inherent recyclability of the different plastic types as well as their respective recycling markets in South Africa. Essentially, a weighting was developed for the different plastic types that reflects not only whether they can be recycled but also whether they are actually being recycled in South Africa.

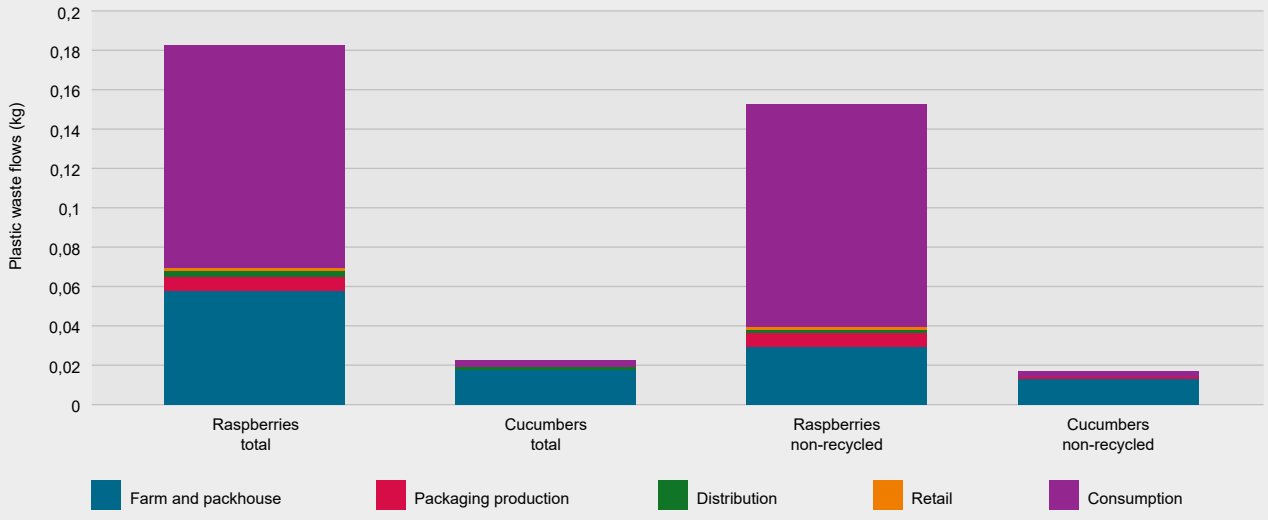
Cucumbers and raspberries were chosen as the products for assessment. Two Western Cape farms supplied data for the study, providing detailed inventories of all the many materials that go into producing and packing raspberries and cucumbers. Woolworths provided data on the distribution and retail of the products, and facilitated a consumer survey with 4 000 respondents.

The degree of plastic use and the plastic footprint "hotspot" – the propensity of the plastic to become litter because it is not being recycled in South Africa – of the value chain differs between cucumbers and raspberries (Figure 3). As anticipated, both cucumbers and raspberries have high plastic use at the farming stage. Producing, packing and distributing a kilogram of raspberries produces between 150 and 200 g of plastic waste, with just under a third of this arising at the farming stage and more than half arising from consumption (as the stage in the value chain where the packaging waste manifests).

However, when looking only at those plastic waste flows that are not recycled, the "hotspot" at consumption – the chance that the plastic will end up in the environment – is even more pronounced. This is because a fair proportion of the farm plastics are recycled at end of life, whereas the PET punnets in which raspberries are packaged are not currently recycled in South Africa due to low economic feasibility and the lack of mechanical recycling technology available in South Africa.

The plastic waste generated across the life cycle of English cucumbers is markedly lower than that of raspberries. Furthermore, the plastic sleeve wrapping of the cucumber is so light that the farming stage dominates the life cycle plastic waste of the cucumber more considerably than for raspberries (with 80% of plastic waste arising at the farming stage).

FIGURE 3: PLASTIC USE ACROSS THE LIFE CYCLE OF CUCUMBERS AND RASPBERRIES, PER KG OF FRESH PRODUCE SOLD



So what does knowing the plastic use across the life cycle of a product tell us?

For raspberries, a comparison of growing raspberries in plastic tunnels versus under shade net showed that, despite requiring more plastic, tunnel-grown raspberries had carbon and water-scarcity footprints less than half of raspberries grown under shade net, and their potential impact on ecosystem health was lower by nearly 80%. This means tunnel-grown raspberries need less water, pesticides, fertilisers and electricity. Thus, although high, plastic use at the farm stage translates to clear environmental benefits. However, the benefits of the PET punnets are less clear, with relatively high product loss indicated by the consumer survey and relatively high energy-related impacts at retail.

The results showed that for English cucumbers, the packaging adds extremely little to the plastic footprint (as well as to the other environmental metrics considered in the study). However, greater reductions in the overall environmental footprint can be achieved by focusing on the "hotspots" rather than on the packaging. Shelf-life trials conducted as part of the study showed that wrapped cucumbers kept at 22 °C lasted well over the time-frame within which most consumers consume a cucumber after purchase.

Avoiding refrigeration at retail has the potential of decreasing the carbon footprint of a cucumber by at least 25% (while the wrapping adds less than 0,5% to the carbon footprint). Furthermore, keeping cucumbers at too cold a temperature can cause cold damage and increase food loss. The high embedded plastic consumption across the cucumber value chain, specifically at the farm stage, means the impacts of producing and disposing of the plastic wrapping (packaging) is insignificant compared to preventing just 2,5% of the cucumber from being wasted.

Packaging that allows greater packing density in fridges (thereby decreasing electricity consumption in retail fridges), that prevents berries getting squashed in consumers' shopping bags and that is recycled at end of life would address the plastic footprint and climate "hotspots" in the raspberry life cycle.

Raspberries from Haygrove farm in Cape Town are packed in plastic punnets and crates to avoid damage during transport to supply Woolworths stores.

STAGE 3: COLLECTION

1,2 Mt

OF PLASTIC WASTE[49] GENERATED BY SOUTH AFRICANS

=

20 kg

PER CAPITA[50]

Only 9% of plastic ever made globally has been recycled, 12% has been incinerated and the rest either ends up in landfill or in the natural environment.[45]

THE WIDER WASTE PROBLEM

Using 2010 waste generation data, a widely cited 2017 study ranked the top 20 coastal countries in the world in terms of the volume of mismanaged plastic at end of life. South Africa was ranked number 11 out of 192 coastal countries, and was therefore identified as a significant contributor to marine plastic pollution.[46] However, the accuracy of the estimates used in this study is questionable due to the lack of actual waste generation and management data in most countries.

Recent local research funded through the Waste RDI Roadmap has indicated that the estimated leakage of plastics[47] into South African coastal waters is significantly lower than what was estimated in the study by Jambeck et al. (2015). However, this does not detract from the urgency to address this problem in South Africa.

> Although the 2017 study uses data that is almost a decade old, these are still the best available estimates. This highlights the need for regularly updated and more accurate waste data globally.

South Africa's waste data is still largely inaccurate due to inconsistent use of the South African Waste Information System (SAWIS) by waste managers and municipalities. In addition, there is a lack of characterisation of waste at landfill sites, as well as a lack of data for littering and illegal dumping. However, there have been efforts to estimate waste data in the National Waste Information Baseline Report for 2011, and the South Africa State of Waste Report for 2017. These reports were produced by the Department of Environmental Affairs (now the Department of Environment, Forestry and Fisheries) and use multiple sources and extrapolation of best available data.[48]

Plastic waste made up 2% of the total volume of general waste[51] (including municipal, commercial and industrial waste) (Figure 4), which was 55,6 million tonnes in 2017. The bulk of this was organic waste.[52] The percentage of plastic in the total waste stream is substantially lower than that reported in the 2018 UNEP Africa Waste Management Outlook report,[53] which reports 13% plastic waste for sub-Saharan Africa and 10% globally. This may be attributed to the inclusion of industrial wastes such as fly ash, bottom ash and slag, as well as agricultural wood waste (as part of organic waste) in the total waste tonnage. These items were added in the 2017 South Africa State of Waste Report but not in the UNEP Africa Waste Management Outlook report, thus skewing the results.

SOUTH AFRICA WAS RANKED 11TH IN THE TOP 20 COASTAL COUNTRIES WITH POOR MANAGEMENT OF PLASTIC WASTE

45 Geyer et al., 2017.
46 Jambeck et al., 2015.
47 Verster & Bouwman, 2020.
48 Plastic consumption minus 40% durable materials in use.
49 DEA, 2012 and 2018.
50 Plastics SA, 2019a.
51 Excluding waste streams classified as hazardous waste in South Africa (DEA, 2018).
52 DEA, 2018.
53 UNEP, 2018a.

The Coastal Park Waste Landfill Site near Strandfontein is one of only two active landfill sites in the City of Cape Town (the other is Vissershok). This site sees up to 600 trucks of municipal rubbish, garden waste or building rubble each day.

~11 kt

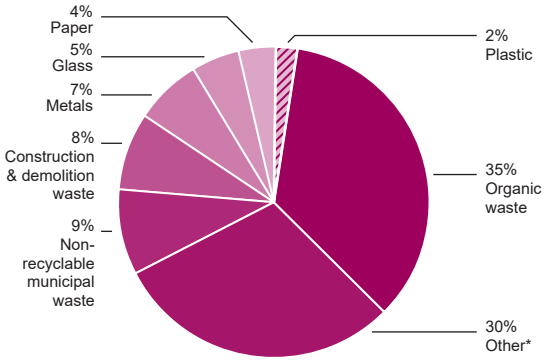
OF PLASTIC WASTE LITTERED IN THE ENVIRONMENT IN 2017

=

10 bn

SIMBA NIKNAKS PACKETS[60]

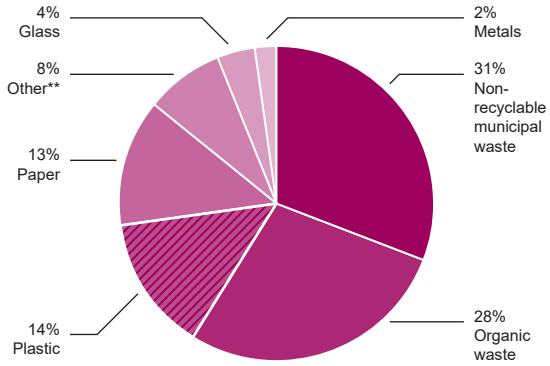
FIGURE 4: BREAKDOWN OF GENERAL WASTE GENERATED IN SOUTH AFRICA IN 2017[54]



*Other refers to commercial and industrial waste, bottom ash, fly ash and dust, slag and other residues.

A waste characterisation study for 2018 was conducted across six waste facilities in the City of Cape Town Metropolitan Municipality (see Figure 5). Plastic waste accounted for 14%. This is comparable to the 13% for sub-Saharan Africa reported in the UNEP Africa Waste Management Outlook report.

FIGURE 5: WASTE CHARACTERISATION FOR THE CITY OF CAPE TOWN LANDFILL WASTE IN 2018[55]



**Other refers to hazardous wastes, tetrapak and e-waste.

There is currently no standard methodology or categorisation for waste characterisation. An international standard is required to aid comparison.

BUT WHERE DOES UNCOLLECTED PLASTIC WASTE GO?

In 2018, 35% of households in South Africa did not receive weekly waste collection. However, this value should not be directly translated to the amount of waste that is not collected due to the disparities in regional and socio-economic per capita waste generation values.[56] These households either have collection less than once per week (1,7%), have communal waste dumps (3,5%), have their own waste dumps (27,7%), dump rubbish anywhere (2,0%) or use other means of disposal (0,5%).[57]

Households in urban areas are most likely to have weekly collection services provided by municipalities, while 81,6% of households in rural areas rely on their own waste dumps.[58] However, households in high-density informal settlements in urban and peri-urban areas often do not receive waste collection services at all and the littering and dumping of waste in these areas into open fields, streets and rivers are highly visible. It is unclear whether these households have been taken into consideration in the household surveys by Statistics South Africa.

There are many reasons for inconsistent waste collection services, including the legacy of apartheid town and urban planning and the resultant poor service provision in some areas. Other factors that play a role are rural–urban migration, rapid rates of urbanisation, a lack of funds and capacity in municipalities and the inability of vehicles to access areas in informal settlements.

Therefore, uncollected plastic will most likely end up as litter or be illegally dumped along with other household rubbish. A total of 29% of household waste is not collected in South Africa.[59]

Illegal dumps

In 2017, Von Blottnitz, Chitaka and Rodseth[61] estimated that of the 1 190 000 tonnes of plastic entering formal and informal waste management systems, 70% is disposed of in open dumps and non-compliant landfills with a high risk of leakage into the natural environment. Litter amounts to approximately 11 000 tonnes. Contrary to popular

54 DEA, 2018.
55 GreenCape, 2019.
56 Rodseth et al., 2020.
57 StatsSA, 2019.
58 StatsSA, 2019.
59 Rodseth et al., 2020.
60 1,06 g per 20 g crisps packet (The Moss Group, 2019).
61 Von Blottnitz et al., 2018.

belief, less than 1% of plastic reaching end of life enters the environment in the form of litter, whereas leakage rates from non-compliant landfills and open dumps are estimated at 30% and 80% respectively.[62] This amounts to approximately 275 000 tonnes of plastic leaking into the environment per annum or 18% of plastic at end of life.

There is a deeply entrenched narrative that plastic pollution is a litter problem that will be solved through anti-littering campaigns addressed at consumers. This narrative is flawed as it frames the plastic pollution and broader waste management problem in terms of its symptoms, not its root causes. It further endorses the belief that plastic and other valuable waste streams have no value and thus should simply be disposed of – but in a controlled way.

While litter is a problem that needs solving so that we can care for nature and live in a clean environment that we are proud of, the root cause of the plastic pollution challenge starts with production and consumption. It requires accountability across the full plastics value chain, from producers all the way through to consumers.

Uncontrolled burning affects human health

Uncontrolled burning of plastic and other forms of municipal solid waste is done in open-air conditions with no control of gas emissions. Plastics may be burnt for heat generation, separation of plastics from scrap metals (in the case of copper wires) or as an alternative means of disposal when formal collection services are not available. The extent to which uncontrolled burning occurs in South Africa is not well quantified; however, it is common and poses several environmental and human health risks.

Due to the variety of plastic types and additives, various toxic gases are emitted when mixed plastics are burnt. These include dioxins, furans, polychlorinated biphenyls (PCBs) and halogenated compounds, to name a few.[64] These gases are known to cause varying degrees of air pollution as well as human health issues in the respiratory, nervous, endocrine and circulatory systems of exposed individuals. Dioxins in particular pose an additional threat of cancer.[65]

COLLECTION AND INFORMAL WASTE RECLAIMERS

Plastic waste that is collected through formal municipal waste services will most likely go directly to landfill, which is the primary waste management solution in South Africa. However, before the waste is collected by the municipal waste collection service (if such a service is being provided), informal waste pickers or reclaimers do the rounds early in the day to collect recyclable materials directly from the kerbside wheelie bins. They also collect from landfills. Most of the approximately 46% of plastic that was collected for recycling in 2018[66] probably came from informal waste reclaimers. They sort the recyclable material and sell it to buy-back centres (see Section 4) or directly to recyclers. This system is referred to as "separation outside source" – the "source" primarily being households.

In light of the COVID-19 pandemic, waste workers – including informal reclaimers, waste collectors and sorters – as well as recyclers were put at risk given that the virus can be transmitted via waste materials from households with infected individuals. It is crucial that households are educated and supported to properly manage their waste for safe disposal, in addition to stockpiling recyclables while recycling operations are limited. It is therefore of increased importance that waste workers in both formal and informal sectors are provided with the necessary personal protective equipment while handling household waste.

Street reclaimers often have to travel long distances and earn an average of R50 per day.[68] There have been cases of exploitation of these reclaimers, who are vulnerable due to their harsh working conditions and the fluctuating prices of recyclable materials.

215 k

INFORMAL RECLAIMERS

IN SOUTH AFRICA COLLECT, SORT AND SELL RECYCLABLE MATERIALS, INCLUDING PLASTIC, TO EARN A LIVELIHOOD[67]

62 Russo et al., 2020.
63 DST, 2014.
64 Verma, 2016.
65 Verma, 2016.
66 Plastics SA, 2019a.
67 Godfrey & Oelofse, 2017.
68 Blaauw et al., 2015; DEA, 2018.

In order to prevent the neglect and mistreatment of the informal waste sector, South African researchers together with the Department of Environment, Forestry and Fisheries (DEFF) have formulated a set of guidelines for municipalities to integrate reclaimers into South Africa's waste system. These guidelines will come into effect in the coming years and will hopefully tackle issues of occupational health risks as well as compensation for their services.

During the COVID-19 Level 5 lockdown regulations in South Africa in 2020, municipal waste collection services were deemed to be an essential service and were allowed to continue operations. However, the informal sector was not allowed to operate, including waste reclaimers and buy-back centres, whose livelihoods suffered during this period. This was illustrated through the dismissal of the urgent application by Lawyers for Human Rights on behalf of informal waste reclaimers demanding recognition as essential service workers.[69]

However, this changed once Level 4 regulations came into effect. The informal waste sector was then allowed to operate. Additional initiatives[70] were conducted to further support their work in the form of engaging with households to handle their waste safely, and providing access to and education on personal protective equipment to waste reclaimers while collecting and sorting waste.

Furthermore, because the already unstable recycling system became more vulnerable due to the low oil prices and operations were limited during the COVID-19 lockdown, waste reclaimers and buy-back centres struggled to find markets for their collected recyclables. They were thus forced to stockpile until sales could occur.

Informal waste reclaimers play an important role in bridging municipal services in the waste value chain. Despite in some cases not having legal access to waste, they provide a free service to households and municipalities that improves waste collection in South Africa. However, due to the growing formal sector, and the preference of municipalities and businesses to rather contract with formal service providers, the informal waste sector may be neglected, which will have a significant impact on livelihoods in this sector.

CASE STUDY 3: KERBSIDE COLLECTION OF RECYCLABLES

The City of Cape Town Metropolitan Municipality has a programme where recyclables are collected by a formal contractor (WastePlan) at 170 000 households. A "Willingness to Pay" survey was carried out throughout the Metro during 2015. Of the 8 000 initial respondents, 64% indicated that they would be interested in a kerbside recycling collection service such as Think Twice, and over 80% of them would be willing to pay a small fee for such a service.

Despite some challenges, including initial low participation and delays in the tendering process, WastePlan now collects recyclable waste from about 83 000 households across the Cape Peninsula, diverting 1 143 tonnes of waste from landfill every month.[71]

The City of Johannesburg has implemented a mandatory s@s (separation-at-source) programme since July 2018 in some areas of the city. This also requires residents to recycle their garden waste. However, this programme has experienced a few setbacks due to the City not including the informal waste pickers in the consultation process before project implementation.

71 wasteplan.co.za/residential-collection

"Everyone talks recycling but no one is prepared to pay for it. It takes a lot more effort to produce quality recycled material than to produce it from oil. Therefore it should come at a premium and not at a discount to virgin material if you require the same quality as virgin."

– Private-Public investment specialist

69 Krige, 2020.

70 undp.org/content/dam/south_africa/docs/Reports/The_UN/South_Africa_Emergency_Appeal_2020_28_Apr_2020_Final.pdf; knowledgehub.org.za/elibrary/COVID-19-national-public-hygiene-strategy-and-implementation-plan

STAGE 4: TREATMENT

In South Africa, the majority of plastic waste still ends up in landfills – a result of a dominant linear economy of "take-make-waste".

SOUTH AFRICA IS STILL STUCK IN THE AGE OF LANDFILL

As mentioned before, landfill is the primary waste management solution in South Africa. The plastic waste that is collected through formal municipal waste services will most likely go directly to landfill. However, most of these landfills do not meet compliance standards. This could mean that the waste is not contained properly and can be transported off-site again through wind and rainfall, a common occurrence in South Africa. It was estimated that close to 40% of plastic waste – 457 000 tonnes – ended up in non-compliant landfills in 2017.[72]

Compliant landfill management includes the use of the necessary infrastructure and activities, including:

- Engineered lining necessary to prevent leachate leaking into groundwater
- Daily covering with sand to prevent uncontrolled transport of waste via wind and rain
- Fencing and maintaining a safe perimeter around the site
- Recording incoming waste volumes

Poor landfill management leads to the uncontrolled salvaging of waste, open burning, uncontrolled leachate and methane emissions, illegal dumping and the overfilling of sites that have already reached full capacity.

BOX 7: THE MISMANAGED STATE OF LANDFILLS

Of South Africa's major municipalities, only eThekwini Metropolitan Municipality in KwaZulu-Natal and the City of Ekurhuleni Metropolitan Municipality in Gauteng have significant landfill airspace left.[73] There is an urgent need to divert plastic and other end-of-life materials away from landfill sites, most particularly those in the major metropolitan municipalities such as the City of Johannesburg and the City of Cape Town, not only to prolong the lifespan of these sites but also to shift away from a linear economic model of "take-make-waste".

There are 826 landfills in South Africa, which are managed by municipalities; 69 of them are unlicensed and thus operating illegally.[74] However, the majority of landfills are also suspected to operate outside of licensing conditions and are therefore non-compliant. Non-compliance is often due to a lack of municipal funding and capacity.

In 2017, 73 out of the 156 landfill sites in the Western Cape were closed or earmarked for closure.[75] The City of Cape Town now only has two operating landfill sites for 3,8 million people.

73 DEA, 2018.
74 DEA, 2016.
75 DEA, 2018.

To continue burying our waste in landfills is clearly unsustainable in the long run. Overall waste generation levels need to decline and materials we use need to remain in the economy. Diversion from landfill of all these materials post-use, such as plastics, is urgently needed.

72 Von Blottnitz et al., 2018. The ratio of recyclate (352 000 tonnes) to total plastic consumption (2 056 000 tonnes).

DO WE RECYCLE AS MUCH PLASTIC IN SOUTH AFRICA AS WE SAY WE DO?

46%

OF PLASTIC SCRAP IS COLLECTED FOR RECYCLING

The recycling industry is largely supported by the informal sector, which collects an estimated 80–90% (by weight) of the total paper and packaging scrap collected in South Africa.[76] However, due to the economic drivers of the recycling industry, only scrap with monetary value is collected and consequently recycled. Low-value scrap that is technically recyclable is not recycled in practice: if there are no buyers for the material, the material is simply not collected.

The current plastic waste and recycling data has come under some scrutiny since 2018, with other studies presenting different results. Plastic recycling data is only recorded by large, formal plastic recyclers and a few, not all, waste-sorting facilities. Municipalities do not currently report on volumes or characterisation of individual waste streams; however, there are ongoing waste characterisation studies at various landfills in South Africa. The reason for discrepancies between studies could be that different methodologies are used to determine the recycling rate.

68%

OF THE COLLECTED MATERIAL WAS ACTUALLY CONVERTED TO RECYCLATE IN 2018

Input recycling rate

Plastics South Africa reports the input recycling rate for 2018 as 46,3% for all plastics.[77] This is the ratio of plastics collected for recycling against the total plastic entering the waste stream. The input recycling rate is calculated as follows: [78]

$$\textbf{Input recycling rate}^{[79]} = \frac{\text{Total tonnage collected for recycling}}{\text{Total plastic waste}} \times 100$$

Total plastic waste

Total plastic waste (1 122 000 tonnes)[80] includes virgin and recycled material converted into plastic packaging and products in South Africa. This amount excludes an estimated 40% of plastics in durable applications manufactured in South Africa during 2018 for industries like building, mining and agriculture (unlikely to be recycled after use of 20–30 years) as well as total imports and exports. All these variables affect the accuracy of the current recycling rate.

Furthermore, of the 519 000 tonnes[81] (46,3%) of plastics collected for recycling, only 352 000 tonnes (67,8%) of the collected material is actually converted to recyclate (recycled material). The rest goes to landfill or other waste disposal methods (energy recovery and reuse or repurpose applications) or are exported.[82] Total plastic waste is calculated as follows:[83]

Total plastic waste = Locally converted plastic (virgin + recyclate) – 40%[84] durables still in use

76 Godfrey et al., 2016.
77 Plastics SA, 2019a.
78 Plastics SA, 2019a; Pretorius, 2020.
79 Aligned with the EU recycling rate calculation methodology, as well as Paper, Glass and Metal packaging.
80 The figure of 1 122 000 tonnes reported by Plastics SA excludes the 408 000 tonnes of imported plastic products and packaging as well as the exported 228 000 tonnes. We estimate that the value of 1 302 000 tonnes is more in line with the plastic waste generation in 2018. Refer to the infographic on page 20.
81 The value of 519 000 tonnes includes 152 000 tonnes of sorting and processing waste (the red bar under 'Treatment' in the diagram on page 20), 4 000 tonnes reuse and recovery, 11 000 tonnes exported recyclate and 352 000 tonnes recyclate used in local markets (all in the blue bar under 'Secondary markets' in the diagram on page 20).
82 Plastics SA, 2019a.
83 Plastics SA, 2019a; Pretorius, 2020.
84 As reported in the Plastics SA National Recycling Survey 2018, Figure 55, page 61 (Plastics SA, 2019a).

Output recycling rate

Another methodology involves using the output recycling rate (a ratio of recyclate against virgin material converted). For South Africa, this was 22,8% in 2018. The output recycling rate is calculated as follows:[85]

$$\text{Output recycling rate} = \frac{\text{Total tonnage recyclate}}{\text{Total virgin tonnage manufactured in South Africa}} \times 100$$

Average recycled content

A methodology suggested by Von Blottnitz, Chitaka & Rodseth[86] is to calculate an average recycled content for plastics products. For South Africa, the average recycled content was 17% for 2018.[87] Reporting on the quantity of plastic that is effectively recycled into other plastic products (17%) would indicate what percentage of the material is actually flowing back into the economy. The average recycled content is calculated as follows:[88]

$$\text{Average recycled content} = \frac{\text{Total tonnage recyclate}}{\text{Total plastic consumption (total virgin tonnage manufactured in South Africa + imported products and packaging)}} \times 100$$

Moving forward, a more robust and transparent methodology is needed to determine the recycling rate to establish a clear baseline from which to measure progress and ensure accountability. Reporting should include the data gaps identified to account for all plastics traded internationally and leakage into nature, among other things. Data is particularly required for the volumes of indirect plastic packaging imports and exports, as well as both the sources and volumes of plastic litter and informal dumping.[89]

There are currently no International Organization for Standardization (ISO) standards for calculating a national material recycling rate (such as one for plastics) or a product recycling rate (for particular products). It is recommended that a trusted organisation advocates for an internationally recognised standard through ISO, to be adopted by national plastics industry bodies (such as Plastics SA). This will provide international agreement and guidance on calculating national material or product recycling rates while also allowing for country comparisons and benchmarking. The Ellen MacArthur Foundation is one such organisation that is currently developing an international standard that could be taken up by the ISO.

An agreement on how to calculate and report on the plastic recycling rate is also necessary globally and in South Africa.

17%

OF PLASTIC MATERIAL FLOWING BACK INTO THE ECONOMY

~ 40%

OF PLASTIC MATERIAL STILL IN USE

>40%

OF PLASTIC IS NOT RECYCLED EVERY YEAR

85 Plastics SA, 2019a; Pretorius, 2020.
86 Von Blottnitz et al., 2018.
87 Using material flows as described in Plastics SA, 2019a, including imports found in UN Comtrade database.
88 Von Blottnitz et al., 2018.
89 Rodseth et al., 2020.

Tailings, or residue material that is non-recyclable, are separated from other household recyclables at the material recovery facility in Kraaifontein, and subsequently sent to landfill.

© Fiona Piller / WWF

7 BARRIERS TO RECYCLING IN SOUTH AFRICA

Recycling is a key element of circulating plastic material in the economy. However, while all plastics are technically recyclable, not all plastics are currently recycled in practice in South Africa. Seven considerations determine whether an item gets recycled.

1 Is it economically feasible to collect and transport the items (by informal waste reclaimers or waste management companies)?

Informal waste reclaimers will only collect plastic items (and other recyclables) if these items have a monetary value that makes it worth their time, energy and effort. Before the unprecedented drop in the global oil price and the arrival of COVID-19, which has driven down the price paid for plastic scrap substantially, informal waste reclaimers generally received R2/kg of plastic scrap.[90] They would therefore rather collect 20–25 2-litre PET cool drink bottles than 160 LDPE bread bags or 1 640 100-gram polystyrene yogurt tubs for that same R2/kg.[91]

2 Are the infrastructure and systems available to recycle certain plastic types?

Certain plastic types are not recycled in certain regions of South Africa because the infrastructure is not available. But some plastic items are not recycled at all due to the lack of capacity and recycling systems for dealing with those items. There is currently no capacity to recycle PET thermoform trays (clear sandwich clamshells and salad tubs) anywhere in South Africa, even though PET bottles have a 63% recycling rate.[92] However, new technologies are currently under exploration.

3 Is there an end-use market for the recyclate?

For the plastic scrap to have value, there needs to be a stable end-market for the recyclate. If a market is not in place, the reclaimed plastic items are likely to end up in the waste stream destined for disposal to landfill or open dumps.

Even if an item can be recycled in South Africa, the value and likelihood of the recyclate being sold depends on the demand for the recyclate. A supplier (such as the buy-back centre) taking PET beverage bottles to a recycler will receive R3,50/kg. The share of the cost declines depending on the number of middlemen in the chain, with a reclaimer being paid less than R1/kg. An additional factor that determines the price paid for post-consumer PET beverage bottles is when recyclers have an oversupply over the end-of-year holiday period and do not buy bottles for recycling. This is not an isolated occurrence and can happen with any material type if the end-use market is limited or failing.

90 Pretorius, 2020.
91 The Moss Group, 2019.
92 PETCO, 2018.

4 Is the price of the recyclate competitive with virgin materials?

Globally and in South Africa, the demand for recyclate diminishes when the crude oil price, and therefore the price of virgin raw material, drops. Manufacturing items from virgin plastic is then cheaper than using the recyclate. Even in South Africa, where a high proportion of plastic is produced from coal by Sasol, the coal price competes with the crude oil price.

According to a McKinsey report, when oil is below $65/barrel, the economics of mechanical recycling become more challenging.[93] At the end of March 2020, the oil price reached a low of $20/barrel,[94] causing significant challenges for the plastic recycling sector globally, in and among other economic challenges.[95]

Unfortunately, the South African recycling industry is facing challenging times with the closure of large recycling facilities in 2019, including Transpaco's polyolefin recycling plant and Mpact's PET bottle-to-bottle recycling facility, both in Gauteng. The Mpact plant closed down in November due to the unprofitability of operations. This was attributed to the non-competitive prices of recyclate compared to virgin material,[96] as well as other operational issues.

5 Are sufficient volumes available to operate at the necessary economies of scale?

The capital investment for plastic recycling equipment at the scale necessary to achieve a good return on investment is often too high to justify the fluctuations of the volumes of material collected for recycling and in the price for recyclate. The large degree of uncertainty makes it an unattractive business model for investors and new entrants.

6 Are consumers able to correctly identify a product that can be recycled, and do they have access to recycling separation and drop-off sites?

Consumers play a particularly important role in recycling. But the reality is that they are often confused about, or do not know which items can be recycled.

This information is now being communicated through product labelling, also known as on-pack recycling labelling (OPRL). However, the on-pack recycling labelling for plastic and other packaging is not standardised in South Africa and varies drastically across retailers and brands (see page 12 and page 70). Retailers and brand owners provide inconsistent and sometimes misleading information to the consumer. There is often variation on the definition of recyclability and a lack of information on whether recyclable items actually get recycled in practice across regions in South Africa.

The majority of consumers, especially in rural areas and informal settlements, also do not have direct access to recycling collection through s@s (separation-at-source) programmes or recycling drop-off centres, which further adds to the challenge of recycling.

7 Is the material contaminated by residues such as oil, is it a combination of materials that cannot be separated, or does it contain additives that render the product unrecyclable?

Even if contaminated items are collected for recycling, they will often not get recycled. Some recyclers do not have appropriate washing facilities, or they do not want to risk contaminating their recycling process. This is true for crisps packets and PET bottles used for edible oils, which both contain oil residue that is difficult and expensive to effectively wash or remove.

Mixed or multilayer materials that are not easily separated will not get recycled due to the technical difficulties or because it will be too expensive to attempt separation. This is true for all multilayer plastic materials in South Africa such as pet-food bags, barrier shrink film for meat and dairy products, and refill bags for certain detergents and hand and dishwashing soaps.

Certain additives added during the manufacturing stage may also render the material unable to be recycled. Calcium carbonate fillers might be added to such a level that plastic carrier bags cannot be recycled, for example.

0%

PET THERMOFORM TRAYS ARE RECYCLED

63%

RATE FOR PET BOTTLE RECYCLING

93 Hundertmark et al., 2018.
94 markets.businessinsider.com/commodities/oil-price?type=wti
95 Linked to the COVID-19 pandemic, as well as rising price of operational costs such as labour, electricity and others.
96 Arnoldi, 2019.

OTHER FORMS OF TREATMENT

Apart from mechanical recycling, plastic scrap can also be treated in other ways to prevent used plastic from leaking into the environment.

Waste-to-energy facilities

Waste-to-energy operations include those that use plastic scrap directly as a fuel or produces a combustible fuel such as methane or other gases. Incineration is one such process if the heat energy is captured for use. There are currently no commercial, or large-scale, waste-to-energy facilities in South Africa.[97] However, it is estimated that in 2019, approximately 1 000 tonnes of plastic were processed in this way in informal and trial or small-scale operations.

Chemical recycling

Chemical recycling of plastic uses pyrolysis or gasification technology to convert plastic scrap back into the primary polymers intended for reprocessing. Chemical recycling of polyolefins is being trialled at a facility in the Eastern Cape and a few non-commercial pyrolysis plants are being trialled for diesel production.[98] These technologies are still novel in the plastic recycling sector globally, and are still being established.

As South Africa transitions away from fossil-fuel-based energy and petroleum production into a low-carbon economy, adapting the existing local refining infrastructure for chemical recycling of plastics should be investigated.

97 Plastics SA, 2019a.
98 Plastics SA, 2019a.

Workers at the material recovery facility in Kraaifontein near Cape Town sorting household recyclables into separate bags as the items move along a conveyor belt.

BOX 8: SHORT-TERM SOLUTIONS FOR UNRECYCLED PLASTICS

While all plastics may be technically recyclable, not all of them are recycled in South Africa due to the reasons mentioned above. To find a use for items that cannot be recycled, some solutions, including ecobricks, plastic bricks and plastic roads, have been or are currently being tested in the South African market.

Projects of this nature are often started with the best of intentions, but soon run into organisational or logistical problems. Unless all possible scenarios are considered to ensure the longevity of the project, they remain short-sighted solutions tackling the symptoms (e.g. unrecyclable plastic) of a much larger systemic problem.

Ecobricks

Ecobricks are made from dry, non-recycled plastics (such as crisps packets) that are stuffed into 2-litre cool drink bottles. These non-load-bearing "bricks" are used for filler material and insulation in various indoor and outdoor buildings and constructions. Ecobricks have seen a huge uptake from South African consumers as a sink (destination) for all their non-recycled plastics.

However, due to the sheer number of ecobricks that projects were receiving, the lack of quality control over what was put into the bricks and the extent to which they had been filled, ecobrick projects have stopped collection.

Once projects stop collecting ecobricks, the ecobricks will simply end up in landfills, with the unintended consequence that high-value clear PET 2-litre bottles are removed from the recycling stream. If ecobrick projects continue, lower-valued or brown- and green-coloured bottles can be used instead.

Furthermore, there are multiple concerns about the suitability of ecobricks as building material, particularly the flammability risks and non-uniform weights and insulation properties.

Ultimately, ecobricks are not a sustainable long-term solution to the problem of unrecycled plastics as they do not address the systemic problem of the production of plastic packaging and products that cannot be circulated back into the economy through reuse or recycling.

Plastic bricks

Lightweight concrete blocks are currently being made from post-consumer expanded polystyrene mixed with concrete, and used as low-cost building and construction material. Plastic bricks can be used for loadbearing walls, filler material and concrete frames. They can be cemented and plastered similar to conventional bricks and provide improved noise absorption.[99]

These bricks are different from ecobricks in that they are manufactured according to strict building standards for flammability and strength. However, concerns have been raised about microplastic leakage and whether the bricks can be reused after current structures are demolished.

Plastic roads

South Africa's first plastic road was opened in December 2019 in Jeffrey's Bay in the Eastern Cape, and another is being constructed in KwaZulu-Natal. The 1 km stretch of road used 1,5 tonnes of waste plastic, replacing a portion of the required bitumen.

However, mostly HDPE milk bottles[100] are being used in the construction, which are currently recycled in South Africa into packaging and agriculture products. Another concern is whether these roads will add to the leakage of microplastics as the road wears.

99 Nkgadima, 2019.
100 Reynolds, 2019.

STAGE 5: SECONDARY MARKETS

The end-use market demand for recycled material is still one of the limiting factors for growth of the plastic recycling sector in South Africa. This is largely linked to the competitive price of virgin plastic.

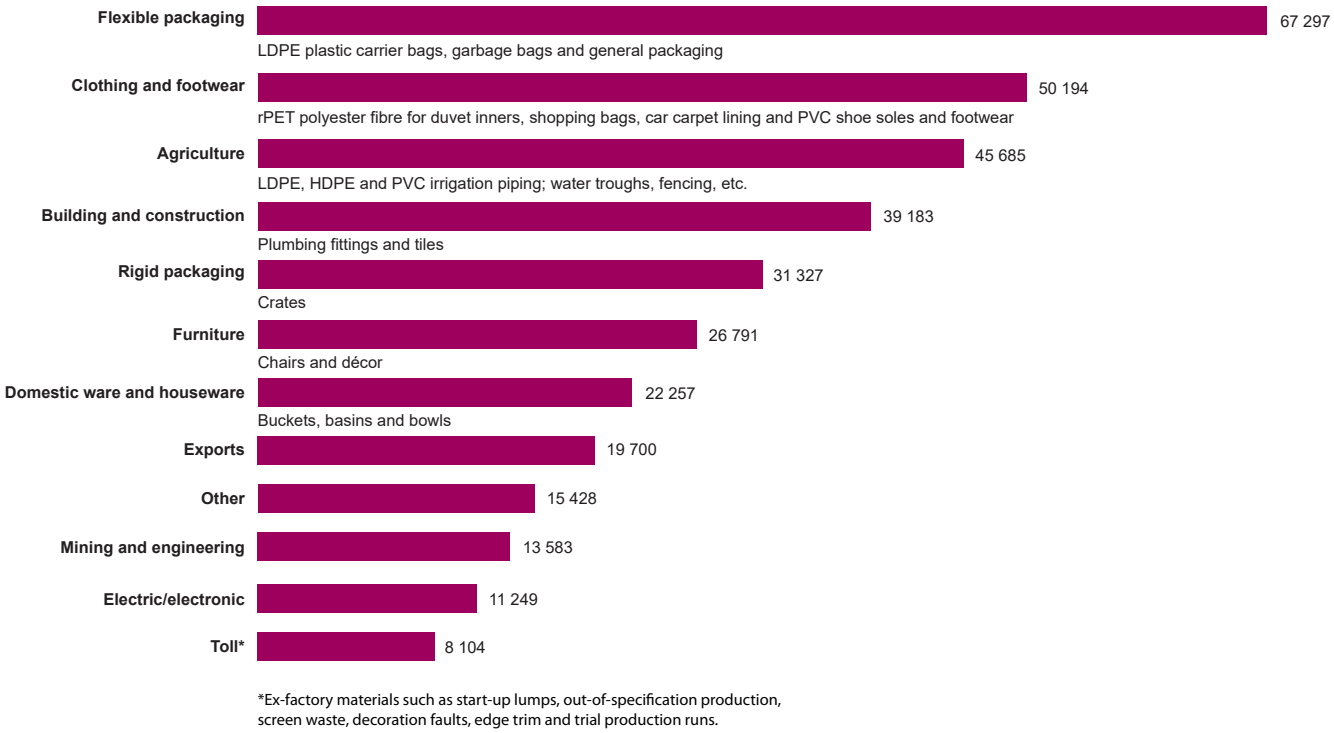
DEMAND FOR PLASTIC RECYCLATE

Plastic recyclers approach plastic converters or manufacturers to sell their recyclate for feedstock that will be made into products for various end-use markets. The price of recyclate is largely dependent on the operational costs of recycling. There is no real demand for recyclate from converters when the price of virgin material is lower than that of recyclate. Furthermore, the demand for recyclate also ultimately comes from retailers and brand-owners – the customers of plastic product and packaging converters – who make decisions based on price, branding and marketing considerations.

Sustainability considerations for product and packaging design have only recently started to become part of these decisions, and sometimes take lower priority. This is partly because sustainability departments in retail and brand-owner organisations work in isolation and are not fully integrated with the rest of the organisation.

The end-use markets and common applications for recycled plastic (approximately 350 000 tonnes) in South Africa in 2018 are illustrated in Figure 6. These volumes include all plastic types.

FIGURE 6: END-USE MARKETS AND COMMON APPLICATIONS FOR RECYCLED PLASTICS IN SOUTH AFRICA (2018)[101] (TONNES)



*Ex-factory materials such as start-up lumps, out-of-specification production, screen waste, decoration faults, edge trim and trial production runs.

101 Plastics SA, 2019a.

Quality of recyclate

One of the factors affecting demand for end-use recyclate is the quality of the recyclate compared to virgin material. This includes material properties such as strength and viscosity, potential contaminants such as additives, as well as aesthetic properties such as colour and clarity.

The prioritisation of these quality indicators depends on the product market. Material properties are prioritised for irrigation pipes and tubing in the agricultural sector. Food-grade applications have strict specifications and standards when it comes to food safety and human health. Recyclers are required to use the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) assessment, which tests for the presence of any hazardous chemicals.

Aesthetics are prioritised when it comes to branding and marketing of products in the fast-moving consumer goods sector, especially in food applications. Recycled content can affect the colour and clarity of plastic. While this is important from a brand perspective, aesthetics should not take priority when it comes to including recycled content in products. Research into the consumer acceptance of products with recycled content should be further investigated.

THE DESIGN AND PROCUREMENT OF SUSTAINABLE PLASTIC PACKAGING SHOULD BE A PRIORITY ACROSS ALL RELEVANT DEPARTMENTS IN THE RETAILER AND BRAND-OWNER ORGANISATION

Sustainability should not take the form of a specific departmental mandate, but should be integrated into the mandates of all departments throughout the organisation.

Plastic bottles are compressed into bales for ease of transport for recycling.

IN SUMMARY

Tackling the plastic pollution challenge requires a life cycle approach – failures occurring at each stage of the plastics life cycle all contribute to plastic pollution. Focusing on waste management alone is not enough to address this systemic problem.

1. **Virgin plastic:** South Africa consumes both locally produced and imported fossil-fuel-based plastic raw material, which is often sold cheaper than recycled material. The price of oil is a huge factor contributing to the instability of the recycling system in South Africa, and globally.
2. **Changing lifestyles demand more packaging:** The increasing trend of on-the-go eating habits linked to our faster-paced lifestyles has led to increased use of plastic in packaging, particularly in food applications.
3. **Plastic packaging is the largest sector:** Plastic packaging is beneficial to the fast-moving consumer goods sector but has significant negative impacts on the environment when leakage occurs.
4. **Limited data availability:** There is limited monitoring and reporting of comprehensive data for the plastic material flows in South Africa. Gaps include data on indirect plastic imports and exports,waste generation and leakage.
5. **Weak municipal waste management systems:** There are numerous waste management challenges in South Africa, including the lack of infrastructure, leakage into nature and insufficient capacity at municipalities, which need to be addressed. However, interventions to address plastic pollution are needed throughout the plastics value chain and should not solely focus on waste management.
6. **High levels of leakage:** South Africa has relatively high levels of post-consumer plastic that is not disposed of properly due to inadequate capacity to deal with it. In a global study, South Africa was identified as the 11th worst country in terms of unmanaged plastics waste.[102] However, recent local research has found that these results have been overestimated. Even so, this does not detract from the growing waste crisis and subsequent increasing plastic leakage into the environment.
7. **Recycling is not the only solution:** South Africa has a well-developed plastic recycling sector, but recycling is not the only solution to achieve a circular plastics economy. The evidence of continuing and increasing plastic pollution suggests that improvements in recycling is only one solution. Others include elimination of unnecessary and problematic plastic items, product design for reuse, and new product delivery models such as own-container dispensing schemes.

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102 Jambeck et al., 2015.

A worker separates different materials at a recycling sorting centre at the V&A Waterfront, Cape Town, wearing personal protective equipment including gloves, a mask and an apron.

SECTION 3

PLASTICS, NATURE AND PEOPLE

The planet's air, soil, freshwater and oceans are contaminated with macro-, micro- and nanoplastics. Some of the positive qualities of plastic, such as its durability, are what cause long-term problems when the plastic lands up in the environment (where it can last up to 500 years).

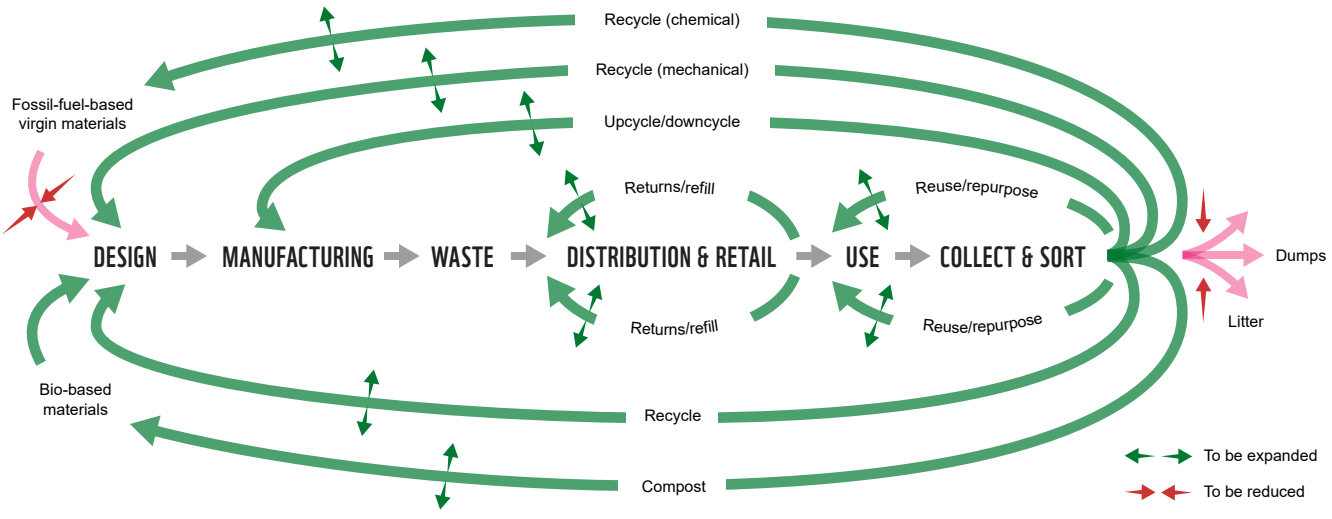
THE "TAKE-MAKE-WASTE" ECONOMIC MODEL IS NOT SUSTAINABLE

Plastic leakage into nature is a symptom of our current "take-make-waste" linear economy. This business-as-usual scenario is driven by profit, fuelled by fossil-fuel extraction which contributes to climate change, sustained by our convenience-seeking lifestyles and characterised by environmental degradation.

Our pursuit of perpetual economic growth has created a global economic culture of consumerism and resulted in unimaginable amounts of waste and pollution. This is becoming more and more visible in African cities with a growing population, a rapid rate of urbanisation and a growing middle class, which anticipate a greater consumer market for goods, including plastic goods, and thus an increase in the generation of plastic waste.[103] These changing consumption patterns influence waste composition and volumes, even outside the cities in small towns and rural areas where there is little to no waste management infrastructure.

To continue on this linear economic development pathway is inconceivable. It will only lead us further along the path towards more waste and more pollution. The time is right to move towards a circular economy where plastic goods are returned, reused, repaired and recycled to limit plastic leakage into the environment.

MOVING FROM A LINEAR TO A CIRCULAR ECONOMY



103 UNEP, 2018a.

SOURCES, FLOWS AND IMPACTS OF PLASTICS IN THE ENVIRONMENT

Plastic is prevalent in many environments, from the crisps packets in the gutter and the mountains of plastic garbage in our landfills and illegal dumpsites, to the unsightly mounds of washed-up plastic along our coastlines.

80%

OF OCEAN PLASTIC COMES FROM LAND-BASED SOURCES

The amount of unmanaged plastic at end of life entering the environment, particularly the ocean, has reached crisis level. Beach clean-up data as well as open-water sampling in certain regions clearly point to packaging and other disposable plastic items as the main contributors to plastic pollution. Its durability means that plastic accumulates in the environment, where it can persist for hundreds of years.

Plastic pollution is commonly framed from a marine litter lens because the ocean is one of the largest sinks (or destinations) of plastic at end of life. This plastic is transported from land via rivers, stormwater drains or wastewater discharge, or dumped directly into the ocean. Today, at least 8 million tonnes of plastic find its way into the oceans every year, equivalent to one garbage truck of plastic dumped into the ocean every minute.[104]

Nearly every component of the marine environment is affected by plastic debris. Once there, it is acted on chemically, physically and biologically. Exactly where a particular piece of plastic will end up is determined partly by its material properties and partly by the movement of oceanic and atmospheric currents.

SOURCES OF PLASTIC POLLUTION FROM LAND AND SEA

It is widely reported that 80% of marine plastic litter (or ocean plastic) comes from land-based sources,[105] while the rest comes directly from sea-based activities. However, it is a challenge to accurately quantify the plastic leakage from both land- and sea-based sources. This is largely due to the lack of comprehensive global, regional and national monitoring data. Nevertheless, several global assessments have been done to estimate plastic leakage into the environment by using top-down methodologies[106] and broad assumptions to provide an overview of the global status quo.

Globally and in South Africa, the bulk of land-based sources of plastic leakage is unmanaged solid waste, which includes plastic waste found as litter, in open dumps and in non-compliant landfills (see Box 7). This includes various types of post-consumer plastic such as plastic packaging, sanitary wear and nappies, domestic ware and furniture, and shoes.

Land-based sources of microplastics include microfibres from textile washing, and microbeads in cosmetics and personal-care products (face washes and toothpastes). Other less-reported or less-quantified land-based sources of microplastics

104 The Ellen MacArthur Foundation et al., 2016.
105 Jambeck et al., 2015.
106 These studies are theoretical and are based on modelling the portion of plastics produced that leaks into the environment. They are not calibrated by empirical evidence, i.e. by what is found to be actually present in the environment.

leakage include tyre abrasion, city dust and road-marking abrasion. With increased use of cars in the major cities in South Africa, tyre wear is predicted to be a major source of microplastic leakage into the environment.

Plastic leakages from sea-based sources include abandoned, lost or otherwise discarded fishing nets, also known as ghost gear, which is the largest sea-based source of plastic pollution.

BOX 9: FLOATING PLASTICS IS JUST THE TIP OF A MUCH LARGER PLASTIC ICEBERG

There have been several reports and images in the media of an accumulation zone of plastics and other marine litter, named the Great Pacific Garbage Patch, in the North Pacific Subtropical Gyre.[107] These are mainly plastics that float.

Plastics such as low- and high-density polyethylene (LDPE and HDPE) and polypropylene (PP), which make up about 60% of total plastics production in South Africa, float in water. Denser plastics, such as PET and PVC, sink, either being suspended in the water column or settling on the seafloor. However, a PET bottle filled with air and closed with a bottle cap will also float, as we often see in rivers.

Micro-organism growth on plastic surfaces, known as biofouling, may also cause floating plastics to sink over time. A 3-month-old LDPE bag was found near the seafloor just off the coast of South Africa with pelagic goose barnacles present on its surface, proving that biofouling causes the rapid sinking of floating plastics.[108]

Although shorelines have the highest concentration of visible plastic in the ocean, shoreline plastics are estimated to only account for around 5% of the total mass of plastic in the ocean. The seafloor is postulated to be the ultimate sink, or end location, for the majority of plastics entering the oceans.

A study that was done during 235 dermesal trawls – a fishing method to catch fish along, or just above the seafloor – off the South African coast reported that 17% of the trawls contained litter. Most of the litter was plastic items (88%), of which 22% by count was fishing-related items, the rest was packaging. This indicates that most of the sources were from the closest urban centre, Cape Town.[109] It should be noted that this is only macroplastic litter; the seafloor may hold millions of microplastics.

So, the plastic we see floating on the surface of the water, and on our beaches, is only a fraction of what actually exists in the marine environment.

107 Lebreton et al., 2018.
108 Ryan, 2018.
109 Ryan et al., 2019a.

1 440

GARBAGE TRUCKS OF PLASTIC ARE DUMPED INTO THE OCEAN EVERY 24 HOURS

While there is some understanding of plastic litter on the seafloor based on dermesal trawl surveys and multiple beach litter surveys, there is still a need to understand the fluxes of plastics in the sea/midwater column, as well as transport through oceanic currents.

OCEAN CURRENTS, RIVERS AND DRAINS - KEY PATHWAYS FOR PLASTIC WASTE

While some of the litter in the streets, rivers and open fields is captured by informal waste reclaimers or waste collectors as part of the Expanded Public Works Programme (EPWP), the bulk of it is not. Unmanaged post-consumer plastic, along with many other waste types, is often discharged into rivers and other freshwater environments (lakes and wetlands). River discharge may happen through transport via

PLASTIC POLLUTION TRANSPORTED BY RIVERS AND OCEAN CURRENTS IS A TRANSBOUNDARY ISSUE REQUIRING INTERNATIONAL MEASURES AND COOPERATION

>6 M

MICROFIBRES RELEASED IN A 5 kg WASH OF POLYESTER TEXTILES

stormwater drainage systems, wind transport or direct dumping, in some cases.

South Africa has 10 major river systems flowing through multiple towns and cities, often crossing provincial boundaries (the Orange, Limpopo, Vaal, Thukela (Tugela), Olifants, Gamtoos, Great Kei, Komati, Great Fish and Molopo rivers). Plastic from one community is transported to another together with all the negative impacts that come with it. South Africa also shares six river basins (Incomati, Limpopo, Maputo, Orange-Senqu, Thukela and Umbeluzi) with six neighbouring states (Botswana, Lesotho, Mozambique, Namibia, eSwatini and Zimbabwe). The transport of plastic pollution via river systems thus becomes a transboundary issue needing international measures and cooperation.

Plastic pollution in the marine environment is also transported via ocean currents. Particle tracer models[110] can visually illustrate the movement of floating plastic debris in coastal waters from anywhere in the world. Floating plastic debris off the West Coast of South Africa, for example, is transported and eventually gets entrained in the South Atlantic Gyre.

Microplastics such as microfibres and microbeads enter sewage systems and are captured to varying degrees in wastewater treatment plants, depending on the infrastructure available, before being discharged into the oceans. However, most wastewater treatment plants are not designed to filter out materials as small as these microfibres.

It is estimated that over six million microfibres are released in a typical wash of 5 kg of polyester textiles. This depends on factors such as loading, temperature and, most importantly, the quality of the fabric in the first place. This value can decrease by 35% if a fabric softener or conditioner is used,[111] but the detrimental impacts fabric softeners have on water treatment plants need to be considered in this instance. Some (not all) microfibres are caught in lint filters of washing machines, which are meant to be cleaned out regularly by the user (who throws the lint ball into the bin destined for landfill).

Installing lint filters in washing machines is a low-effort intervention that washing machine manufacturers can implement. It requires little effort from the end-user other than cleaning out the filter regularly. But do all washing machine brands sold in South Africa have filter systems?

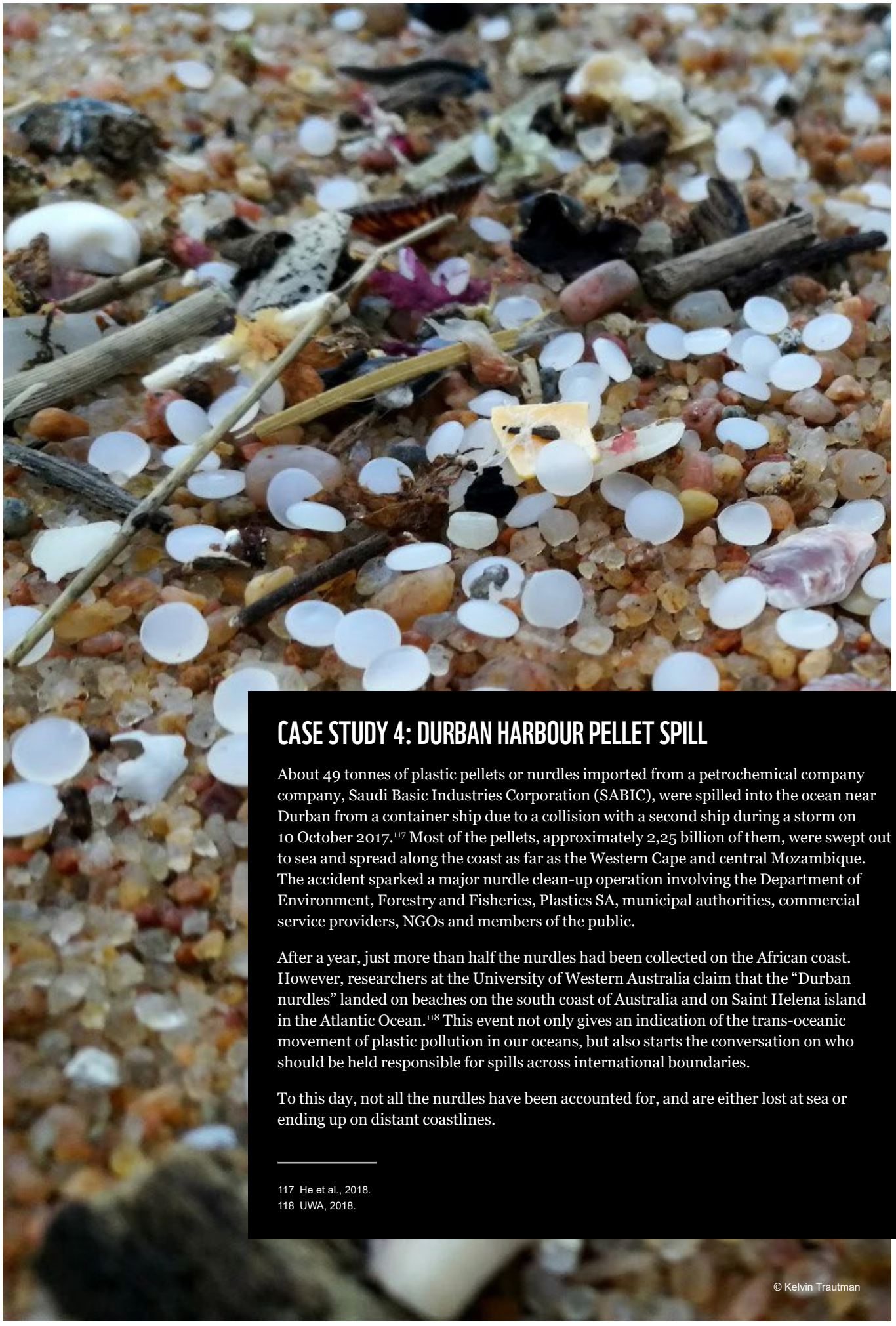
Furthermore, this intervention is an end-of-pipe solution, and efforts should be focused upstream at the yarn- and fabric-manufacturing stage.[112] Research on and the implementation of interventions to prevent microfibre production from textiles at the design and manufacturing stages should be investigated.[113]

Microplastics have also been detected in both bottled and tap drinking water. In 2018 the Water Research Commission discovered microplastics in 83% of tap water samples from Gauteng and borehole water samples from North West province.[114] One of the recommendations of the study was the banning of products with microbeads, which the South African government is considering through an amendment to the Foodstuffs, Cosmetics and Disinfectants Act 54 of 1972.[115]

Research on microplastics in soil ecosystems is at an earlier stage. Microplastics are found in sludge, wastewater irrigation and rain, and can leach into the ground from mulching film. Existing evidence shows that microplastics can influence soil biota at different trophic levels and threaten human health through the food chain.[116]

Lentil-sized plastic pellets or nurdles are a source of primary micro- or mesoplastics that are leaked into the environment if mismanaged during processing and transport, particularly during the shipping of nurdles to be processed elsewhere. When the nurdles land in the ocean, they are mistaken for food by marine animals and sea birds because they look like tiny eggs.

110 Van Sebille et al., 2012; plasticadrift.org
111 De Falco et al., 2018.
112 oceancleanwash.org/solutions/solutions-for-companies
113 Mermaids Ocean Clean Wash, 2019.
114 Bouwman et al., 2018a.
115 DEA, 2019.
116 He et al., 2018.



CASE STUDY 4: DURBAN HARBOUR PELLET SPILL

About 49 tonnes of plastic pellets or nurdles imported from a petrochemical company company, Saudi Basic Industries Corporation (SABIC), were spilled into the ocean near Durban from a container ship due to a collision with a second ship during a storm on 10 October 2017.[117] Most of the pellets, approximately 2,25 billion of them, were swept out to sea and spread along the coast as far as the Western Cape and central Mozambique. The accident sparked a major nurdle clean-up operation involving the Department of Environment, Forestry and Fisheries, Plastics SA, municipal authorities, commercial service providers, NGOs and members of the public.

After a year, just more than half the nurdles had been collected on the African coast. However, researchers at the University of Western Australia claim that the "Durban nurdles" landed on beaches on the south coast of Australia and on Saint Helena island in the Atlantic Ocean.[118] This event not only gives an indication of the trans-oceanic movement of plastic pollution in our oceans, but also starts the conversation on who should be held responsible for spills across international boundaries.

To this day, not all the nurdles have been accounted for, and are either lost at sea or ending up on distant coastlines.

117 He et al., 2018.
118 UWA, 2018.

BETWEEN 1994 AND 2012 BEACH LITTER IN CAPE TOWN INCREASED BY

300%

PLASTIC ACCUMULATING ON BEACHES

Plastic waste accumulates on beaches through direct littering or transport via waterways. The "Dirty Dozen" list (see Box 10) captures the most commonly found beach litter items. In addition, there are a few anomalies including toiletries, nappies, cigarette butts and polystyrene pieces.

Litter

Litter is growing faster than the human population. The number of litter items washing up on Cape Town's beaches increased by 300% from 1994 to 2012.[119] Over the same period, the City of Cape Town's human population grew by 50%. Given that most litter comes from local, land-based sources, it means Capetonians are now producing more litter per person than 20 years ago. Excessive non-recyclable and problem (single-use) packaging consumption is driving most of this trend.[120]

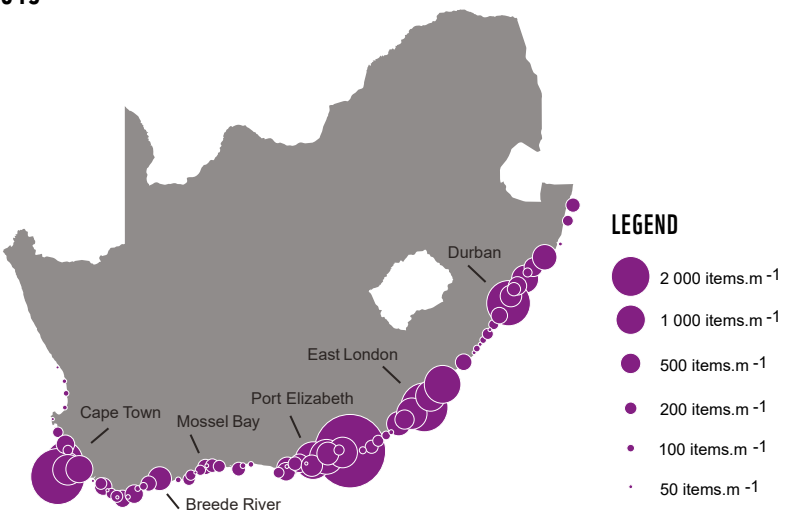
Beach litter collection and sorting studies have been widely used as a way to intercept litter before it enters the oceans, to increase awareness, and to track and monitor the amount and types of plastic litter entering the marine ecosystem.

77%

OF PLASTIC LITTER ON BEACHES IS PLASTIC PACKAGING

Beach litter studies along the coastline of South Africa by University of Cape Town researcher Dr Peter Ryan, shows that macro- and mesoplastic litter found on sandy beaches are concentrated around four urban-industrial centres, namely Cape Town, Port Elizabeth, East London and Durban (see Figure 7). However, as Figure 7 shows, there is a surprising amount of plastic outside the main centres, along a coastline mostly dotted with small towns and villages. Some beaches (namely, Woody Cape near Alexandria and Olifantsbos near Cape Point) with peak litter loads also have a large proportion of legacy litter and do not reflect current litter inputs. The data also revealed that most of the plastic litter was from local, land-based sources.[121]

FIGURE 7: CONCENTRATION OF PLASTIC PIECES FOUND ON 82 BEACHES ALONG SOUTH AFRICA'S COASTLINE IN 2015[122]



Most litter items found on beaches in South Africa are plastics (94%), most of which is plastic packaging (77%).[123] In a 2017 study of beach litter collected from six sites around Cape Town, University of Cape Town researchers found that plastic litter accounted for 94,5–98,9% by count, and 57–98,9% by weight of the total collected beach litter. The majority of the top 10 identifiable items was associated with on-the-go food packaging items, including polystyrene packaging, snack packets and straws.[124]

119 Ryan, 2018.
120 Ryan, 2018.
121 Ryan et al., 2018; Ryan, 2019b.
122 Ryan et al., 2018.
123 Ryan & Moloney, 2016.
124 Chitaka & Von Blottnitz, 2019.

Plastic straws picked up during a clean-up event on Ganger Bay beach, Mouille Point, Cape Town.

BOX 10: THE DIRTY DOZEN

The Dirty Dozen is a monitoring methodology that is based on the most commonly found items on beaches in South Africa. The list will need to be updated from time to time as trends change. It includes items such as sweet wrappers, cool drink bottles and lids, straws, crisps packets and fishing line. Figure 8 illustrates the cumulative number of items collected on South African beaches over a two-year period by the Beach Co-op NGO and volunteers. This methodology was developed by University of Cape Town researcher, Dr Peter Ryan.

FIGURE 8: TOTAL NUMBER OF DIRTY DOZEN ITEMS COLLECTED FROM 100+ BEACH CLEAN-UPS AROUND SOUTH AFRICA (2017-2018)[125]

125 The Beach Co-op, 2019.

Cigarette butts and polystyrene pieces

The Dirty Dozen list (see Box 10) – a list of the top 12 most commonly found beach litter items – excludes cigarette butts and polystyrene pieces. This is due to the fact that these items are prevalent in such large quantities that they are difficult to accurately count, and often skew the data if they are included.

Toiletries

Earbuds, wet wipes and female sanitary wear all contain plastics to a certain degree. These items are found on beaches, yet do not arrive the same way as on-the-go snack and takeaway packaging and cigarette butts, which are littered on beaches or transported from the street via stormwater drains. Cosmetic and toiletry items are often flushed down the toilet and thus land on beaches via wastewater discharge into the ocean.

Brands advertise 100% cotton- or paper-based products as "flushable". This creates a habit in the consumer to dispose of certain items by flushing. They often do not realise that items from another brand contain plastic or other materials, even though the items may look similar.

Regardless of whether products are made from cotton-based materials or other alternatives to plastic, sanitary and cosmetic products such as wet wipes, earbuds and other toiletries should not be flushed along with toilet paper, as they result in water pollution and blockages in the water reticulation and wastewater systems. Retailers and brand owners need to provide consumers with accurate and responsible disposal instructions based on best practice. Consumers must then dispose of these products safely and responsibly.

Nappies

Another contributor to plastic on beaches is used nappies. Globally and in South Africa, these items are disposed of in rivers and then wash down to the sea.[126] This direct littering behaviour is overwhelmingly attributed to a lack of formal waste management and informal dumping of waste in or near rivers in certain communities.

The problem is taking on alarming proportions because more and more people living in areas with insufficient to no appropriate waste management systems in place are using disposable nappies.

126 Falanga, 2016.

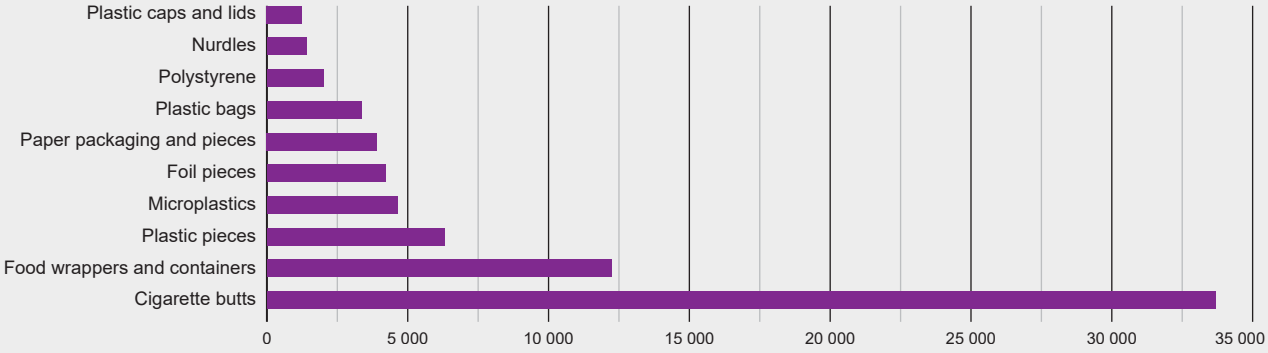
CASE STUDY 5: PLASTIC DEBRIS IN STORMWATER DRAINS

The Overstrand Municipality in partnership with Marine Dynamics shark tour company and the Dyer Island Conservation Trust has started "Project Storm". The aim of this project is to tackle marine pollution via stormwater drainage systems in the Gansbaai region, which is part of the Cape Whale Coast in the Western Cape. This project has two parts. The first is an anti-littering and awareness-raising initiative through a paint stencil at various stormwater drain inlets in the Gansbaai town area. This concept was borrowed from Knysna Municipality.

The second part of the project involved data collection and capturing of the number and types of debris caught in several stormwater drain outlet nets. The project started in June 2019. After 17 collections, a total of more than 74 000 pieces of debris were counted, amounting to 142 kg.

Cigarette butts accounted for the most number of items (46%) by count, followed by food wrappers and containers (16%), which includes plastic bottles, cans, plastic straws, stirrers, crisps packets and sweet wrappers. Plastic bags contributed the most by weight (27 kg or 20% of the total weight), followed by food wrappers and containers (12%) and cigarette butts (10%).

FIGURE 9: NUMBER AND TYPE OF DEBRIS IN STORMWATER DRAIN OUTLETS, OVERSTRAND MUNICIPALITY (2019)



Food wrappers and containers (which include plastic water and cool drink bottles, crisps packets and sweet wrappers), as well as plastic caps and lids are also on the Dirty Dozen list (see Box 10). Unfortunately, it is difficult to compare this data to the Dirty Dozen, given the different methodologies and categories for data analysis.

A common methodology should be used when collecting this type of data so that litter from different sites can be compared, for example beach litter to stormwater drain debris.

A municipal worker paints a stencil at a stormwater drain outlet in Gansbaai, Western Cape.

Plastic and other debris in a stormwater drain net as part of Project Storm conducted by the Dyer Island Conservation Trust, Overstrand Municipality.

GLOBAL GHG EMMISIONS FROM PLASTIC

2015

3,8%

2050

15%

CLIMATE IMPACTS

The plastic sector is a direct and indirect contributor to the climate crisis throughout the value chain, from fossil-fuel extraction, transport, refining and manufacturing to the management of plastic waste.

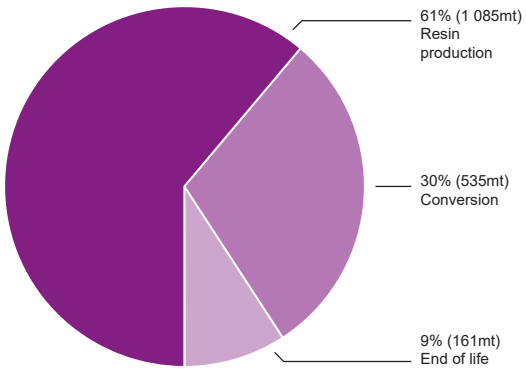
Global plastics life cycle greenhouse gas (GHG) emissions for conventional fossil-fuel-based plastics (see Figure 10) were calculated to be 1,7 Gigatonne (Gt) of CO2 equivalent (CO2-eq) in 2015, which is comparable to Russia's total emissions in the same year (1,67 Gt). Russia is the fifth largest greenhouse gas emitter in the world. This equates to 3,8% of global emissions for 2015.

This percentage is projected to increase nearly fourfold over the coming decades. With the petrochemical and plastic industries planning a massive expansion in production, emissions from plastics will reach 15% of the global carbon budget by 2050.[127]

Current levels of greenhouse gas emissions in the plastics life cycle are a threat to achieving the global climate targets under the Paris Agreement.[128] Global estimates for emissions from the three main stages in the plastics life cycle are as follows:

- Production: 61%
- Conversion: 30%
- End-of-life management: 9%[129]

FIGURE 10: GLOBAL LIFE CYCLE GREENHOUSE GAS EMISSIONS OF PLASTIC (2015)[130]



Greenhouse gas emissions from virgin plastic production in South Africa

In South Africa, there is no data available for greenhouse gas emissions from plastic conversion and the end-of-life management of plastics, although these stages will undoubtedly contribute to additional greenhouse gas emissions. Emissions data is available for part of[131] the domestic plastic production by one of South Africa's primary plastic raw-material producers, Safripol (KAP Industrial Holdings). In 2019 Safripol produced 491 993 tonnes[132] of polymer. The greenhouse gas emissions per tonne was 0,52 tonnes CO2-eq/ tonne and their total greenhouse gas emissions 254 021 tonnes CO2-eq. Thus Safripol's emissions from polymers made up 25% of their total greenhouse gas emissions, which could hold significant carbon tax implications for the group.

127 The Ellen MacArthur Foundation et al., 2016.
128 CIEL, 2019.
129 Zheng & Suh, 2019.
130 Zheng & Suh, 2019.
131 Sasol's GHG emissions data specifically for local polymer production was not available; polymers were reported under the category of base chemicals which include solvents, fertilisers and explosives in conjunction with polymers. Furthermore, their reporting combines South African and North American operations.
132 KAP Industrial, 2019a.

IMPACTS ON ANIMALS AND PEOPLE

The ecological impacts of plastic pollution include direct impacts on plant and animal life as well as indirect impacts through accumulation in food chains.

A 2016 United Nations report documented that over 800 animal species were affected by marine debris via ingestion or entanglement[133] – a figure 69% higher than in a 1977 review. Another study reports that at least 700 marine species were affected by marine litter between the 1960s and 2014. This is an underestimate as not all impacts have been reported in literature, with limited reports from Africa and Asia.[134] However, there is no evidence of impacts at a population level for any of the species reported to date.[135]

The impacts of both macro- and microplastics on terrestrial and marine environments contribute to biodiversity losses on land and in the oceans.[136]

ANIMAL ENTANGLEMENT IN FISHING GEAR, PLASTIC BAGS AND ROPE

The most visible impact of plastic pollution on animal species in marine environments is entanglement. Over 4 000 cases of animals affected by plastic in marine environments globally were identified in the Ocean Conservancy's 25th anniversary International Coastal Cleanup Report.[137] The majority of cases were reported to be caused by fishing gear, followed by plastic bags and rope.

A study conducted in KwaZulu-Natal recorded the number of sharks that had become entangled or had ingested some form of plastic litter over a 23-year period (1978–2000). The study reported that 53 sharks of eight different species were found entangled with polypropylene (PP) strapping around their bodies.[138]

There have also been reports of Cape fur seals entangled in string, monofilament line, fishing net, rope, plastic straps, rubber O-rings and wire in several seal colonies along the Cape.[139] A more recent study was conducted on the number of entanglement cases of Cape fur seals over the period 2000–2018, in the V&A Waterfront harbour in Cape Town.[140] The study reported a total of 927 entanglement cases, 85% of which were caused by plastic box-strapping, fishing line and raffia cord. All these items are related to fishing activities. Other debris included nylon cord, longline trace, rope, plastic bags and various items of clothing.

ANIMALS INGESTING PLASTIC

Plastics are sometimes mistaken for food and are ingested by animals; this may lead to suffering and eventual death because the respiratory and digestive organs become blocked.[141] In the marine environment, the most commonly reported example is that of sea turtles and dolphins mistaking plastic bags for jellyfish, one of their food sources. Sixty sharks in a KwaZulu-Natal study were reported to have ingested plastic, mostly plastic packets and sheets.[142] However, there is still limited information on commercially exploited marine species that have ingested plastics.

>800

ANIMAL SPECIES HAD BEEN AFFECTED BY INGESTING OR BECOMING ENTANGLED IN MARINE DEBRIS BY 2016

133 Secretariat of the Convention on Biological Diversity, 2016.
134 Gall & Thompson, 2015.
135 Ryan, 2019c.
136 UNEP, 2018b.
137 Ocean Conservancy, 2011.
138 Cliff et al., 2002.
139 Shaughnessy, 1980.
140 Basson, 2018.
141 UNEP, 2018b.
142 Cliff et al., 2002.

A Cape fur seal, *Arctocephalus pusillus*, with a constricting strip of plastic stuck around its neck, South Africa.

© Martin Harvey / WWF

Cases of land animals, such as goats and cows, ingesting plastic have also been reported.[143] Community members from a township in KwaZulu-Natal have also reported their cattle dying due to plastic ingestion. This was confirmed by the local veterinarian.

The negative health effects of ingestion include, but are not limited to:[144]

- Blockage of or injury to the digestive tract
- Decreased feeding and growth as a result of false satiation
- Transfer of toxic compounds from plastic particles such as hazardous plastic additives, which may cause liver toxicity and endocrine disruption
- Suspected transfer of nanoplastics to organs

Macroplastics are also known to form a physical barrier to certain natural processes. For example, plastic reportedly causes obstructions in the journey of tiny sea turtle hatchlings (only 5 cm long) when making their way along the beach to the ocean.[145] Macroplastics also reduce the exchange of oxygen and delivery of sediments to the seafloor, with impacts such as reduced abundance and productivity of benthic marine life.[146]

© Andrew Milson / WWF

A dorado, *Coryphaena hippurus*, caught off the Agulhas Bank with pieces of plastic found in its gut – a bottle cap, a button, a bottle neck, a piece of nylon/polyester cord, a piece of flexible plastic and other unidentifiable items.

143 Plastic Soup Foundation, 2018; UNEP, 2018b.
144 Naidoo et al., 2019.
145 Aguilera et al., 2018.
146 Green et al., 2015.

BOX 11: NEW SPECIES NAMED AFTER PLASTICS

Previously, microplastics were found in sea ice in the Arctic and at the bottom of the Mariana Trench.[147] A recent study confirmed microplastics and fibres present in the hindgut of amphipods in all nine deep-sea trenches of the study.[148]

New research has uncovered the presence of plastic, PET microfibres in particular, in the hindgut of a newly discovered species of deep-sea amphipod. This species lives in the Pacific Ocean's Mariana Trench between Japan and the Philippines, about 6 900 metres deep in the ocean. The researchers officially named the species *Eurythenes plasticus* in reference to the plastic it had ingested.[149]

147 Chiba et al., 2018.
148 Jamieson et al., 2019.
149 Weston et al., 2020.

© Weston et al.

The newly discovered species, *Eurythenes plasticus*, which was named after plastics found in its hindgut.

Just as there is a Dirty Dozen list of the most commonly found plastic items on beaches in South Africa, so there should also be a list of the most commonly found plastic items causing cases of entanglement and ingestion in terrestrial, marine and freshwater systems in South Africa. This is known as "hotspotting" and can be done in terms of common geographic locations, material or product. Hotspotting provides the evidence base to engage and address industry sectors, activities, geographic locations, or materials or products upstream to prevent impact down the line.

An analysis of entanglement of Cape fur seals,[150] for example, shows that the items causing the entanglement comes from fishing activities in the region. This indicates the sector that needs to be held accountable to take action to prevent further impact.

A HEALTH HAZARD FOR PEOPLE

Plastic can have an adverse effect on human health in various ways. There can be direct exposure to plastic particles themselves via ingestion and bioaccumulation in the food chain, or through the associated toxic chemicals and gases released from plastic particles and products.[151]

Microplastics in the food chain

It is a fact that humans are ingesting microplastics from the food chain through bioaccumulation in many commercial marine species, and other commodities such as tap and bottled water,[152] honey and salt samples (including one South African brand).[153] Although there is no definitive answer yet about how the ingestion of microplastics may affect human health, the fact remains that we are ingesting them.

Published and controversial research[154] estimates that we ingest a credit card's worth – 5 grams – of microplastics every week. Some researchers believe that this is an overprediction by up to a factor of a thousand. Research is currently being conducted on this topic. Even though the prevailing view is that plastics simply pass through our digestive system, there is new evidence that plastic particles may be accumulating in human organs and tissues.[155]

150 Basson, 2018.
151 CIEL, 2019.
152 Bouwman et al., 2018b.
153 Karami et al., 2017.
154 Senathirajah et al., 2020
155 sciencedaily.com/releases/2020/08/200817104325.htm

Embedded toxins

The presence of toxins and persistent organic pollutants (POPs) in certain plastic products, such as children's toys, have been found in samples from 26 countries.[156] These highly toxic pollutants come from flame retardants in electronic equipment, which is recycled to make the plastic toys. While there is uncertainty about the release of the pollutants from these toys, there is still considerable exposure risk with negative health impacts.

Bisphenol A (BPA), a synthetic organic compound, has also been banned in baby products and food packaging in South Africa since 2011.

BPA mimics the structure and function of the oestrogen hormone in the body and can influence bodily functions including cell repair and reproduction, among other things. BPA was usually added to polycarbonate plastics (PC, MIC 5) (see page 14) for the manufacture of water and baby bottles and food storage containers, before being banned.

Contaminated solid waste

Another aspect of the impact of plastics on human health is from the exposure to dirty or contaminated solid waste while collecting plastic for recycling. Informal waste reclaimers, including women, the elderly and illegal immigrants, are the most vulnerable to this kind of exposure. They are key actors in the waste value chain, but because they operate informally and earn very little, they cannot afford personal protective equipment (PPE).

Besides being recognised as key actors in the waste value chain, informal waste reclaimers should be supported by municipalities with the correct PPE to safely handle waste on the streets and on landfills. This is especially important during the COVID-19 pandemic.

Open dumping of solid waste, a large proportion of which is plastic scrap, on land and in waterways can become a breeding ground for disease through pest infestation (mice, flies and maggots) and spread vector-borne diseases (like cholera or dengue fever) to nearby communities.

Harmful gases

As mentioned on page 33, open-air and uncontrolled burning of solid waste causes respiratory problems.[157] Due to the variety of plastic types and additives, various toxic gases are emitted upon burning of mixed plastics, including dioxins, furans, polychlorinated biphenyls (PCBs) and halogenated compounds, to name a few.[158] These gases are known to cause varying degrees of air pollution as well as human health issues in the respiratory, circulatory and nervous system and the hormone production and heart of exposed individuals. Dioxins in particular pose an additional threat of cancer.[159]

Inhalation and skin contact of certain chemicals and gases are also a human health risk during the production and manufacturing stages of the plastics life cycle.[160] These gases include benzene, styrene and other organic compounds, causing cancer, skin and eye irritation and respiratory problems, among others.

"Uncertainties and knowledge gaps undermine the full evaluation of health impacts, limit the ability of consumers, communities, and regulators to make informed choices, and heighten both acute and long-term health risks at all stages of the plastic lifecycle."

– Center for International Environmental Law, 2019

156 DiGangi et al., 2017.
157 UNEP, 2018a.
158 Verma et al., 2016.
159 Verma et al., 2016.
160 CIEL, 2019.

An equipment operator preparing plastic products for granulation at a plastics recycling facility in Cape Town.

© WWF

IMPACTS ON THE ECONOMY

Plastic pollution has a direct and indirect economic impact in industries such as fishing, shipping and tourism. It affects ecosystems and ecosystem services, which in turn has knock-on economic impacts.

R4 M

TO CLEAN UP AFTER THE STORMS IN DURBAN IN 2019

UNEP has estimated the economic losses incurred by fisheries, tourism and biodiversity as a result of the impact of marine plastics (excluding microplastics) at $8–13 billion per year.[161]

South Africa has more than 3 000 km of coastline and a tourism sector worth R125 million, contributing 2,9% to South Africa's GDP. Research shows that litter density of more than 10 large items per metre of beach would deter 40% of foreign tourists and 60% of local tourists from returning to Cape Town.[162] This could have a considerable impact on the industry.

Over 12 million people are engaged in the fisheries sector in Africa.[163] In South Africa, there are approximately 29 000 subsistence fishers.[164] The impact of marine plastic pollution could pose a significant problem to livelihoods through a potential decrease in fish stocks as well as the quality of the catch due to plastic ingestion. Small-scale fishers in South Africa have found plastic items in the stomachs of some of their catch.

The cost of cleaning up plastics accumulating in the environment adds significantly to the expenses of local authorities. The Department of Environment, Forestry and Fisheries reports that the costs of cleaning up litter and illegal dumping ranges between 1% and 26% of municipal operating expenditure for waste management.[165] The value itself will vary according to the size and budget of the municipality concerned.

In Durban Harbour, the cost of clean-ups following heavy rainfall events in October 2017 amounted to R1,25 million. In April and May 2019, costs of R4,35 million were incurred over seven clean-up events after severe storms. In November 2019 further storms occurred, which once again washed plastic up on beaches from rivers and stormwater drains. Additional costs (or economic losses) are associated with damages to shipping vessels due to blocked engines, port downtime during the clean-up of the port, and resultant disruption of service for the shipping and maritime sectors.

The damage to cities, towns and villages from flooding due to plastic and other solid waste blocking stormwater drains has also been substantial. Coupled with this is the resultant spread (and cost) of waterborne diseases.

The total economic value that is lost through damaged ecosystem services due to plastic pollution in South Africa is not widely quantified and reported. More evidence is needed to create the economic case to determine the true cost of plastic pollution and encourage immediate action. Additionally, the responsibility for these costs needs to be established and the responsible party held accountable through the appropriate policy responses. Further research and reporting in this regard is needed.

"The cost of inaction is greater than the systemic transition required to a circular plastics economy."

– Luc-Olivier Marquet, CEO of Unilever South Africa

161 UNEP, 2014.
162 Ballance et al., 2000.
163 Arabi & Nahman, 2019.
164 South African Government, 2014.
165 DEA, 2018.

PLASTICS, NATURE AND PEOPLE

IN SUMMARY

The impacts of plastic pollution reach all natural environments, affect ecosystems and the economy and are felt by all parts of society. Understanding and quantifying these impacts are necessary for driving evidence-based action.

1. **Land-based sources:** Plastic is prevalent in terrestrial, freshwater and marine environments. Most plastic in the ocean comes from land-based sources and gets transported through waterways and via atmospheric and ocean currents.
2. **Biodiversity and ecosystems:** Ingestion of and entanglement in plastic leads to the injury and death of terrestrial, freshwater and marine animals.
3. **Greenhouse gas emissions:** The majority of plastics are produced from fossil fuels with significant climate-change impacts at every stage of the value chain, from production to disposal. Projected expansion in plastic production to meet the exponential increase in consumption will significantly increase the plastics sector's contribution to global greenhouse gas emissions from 4% in 2015 to 15% by 2050.
4. **Human health:** Plastic can have a negative impact on human health through direct exposure to plastic particles themselves via ingestion and bioaccumulation in the food chain, or through the associated toxic chemicals and gases released from plastic particles and products.
5. **Socio-economic impacts:** The socio-economic impacts of plastic pollution are not well understood and quantified, yet threaten livelihoods and key industries, including fisheries and tourism. Acknowledging and agreeing on the true cost of plastic pollution and accountability throughout the plastics value chain is key to addressing the challenge.

SECTION 4

ACTORS AND ACTIONS

While we have known about the problem for decades, plastic pollution and its environmental impacts are currently receiving unprecedented attention. There is now an increasing awareness among governments, industry and consumers that the way in which we currently produce, consume and use plastic is simply not sustainable.

A cashier in one of Shoprite's retail outlets wearing a face shield and mask during the COVID-19 lockdown period.

© Shoprite

THE PLASTICS VALUE CHAIN

Addressing the plastic pollution problem in South Africa requires actions and collaborations across the entire plastics value chain. This requires an understanding of the roles that each actor plays, the relationships and interactions between them, and the initiatives that already exist among them.

THE SOUTH AFRICAN PLASTICS VALUE CHAIN

DIRECT STAKEHOLDERS

POLYMER PRODUCERS & IMPORTERS	PLASTIC CONVERTERS	RETAILERS, BRAND OWNERS & HOSPITALITY	CONSUMERS	WASTE COLLECTORS, CONTRACTORS, RECYCLERS & TREATMENT FACILITIES
Petrochemical companies (producers & importers)	Conventional plastic converters (local & international)	Large-scale retailers	Shelf-facing consumers	Formal and informal waste collectors and buy-back centres
Bio-based plastic polymer producers & importers	Bio-based plastics converters	Multinational & local brand owners		Material recovery facilities
	Biodegradable plastic converters	Small-scale retailers		Recyclers
		Online retailers		Municipalities
		Hospitality & food services		

INDIRECT STAKEHOLDERS

RESEARCH INSTITUTIONS	GOVERNMENT DEPARTMENTS	CIVIL SOCIETY ORGANISATIONS	INDUSTRY BODIES
PRODUCER RESPONSIBILITY ORGANISATIONS (PROs)	INFORMAL SECTOR REPRESENTATIVES	LABOUR UNIONS	

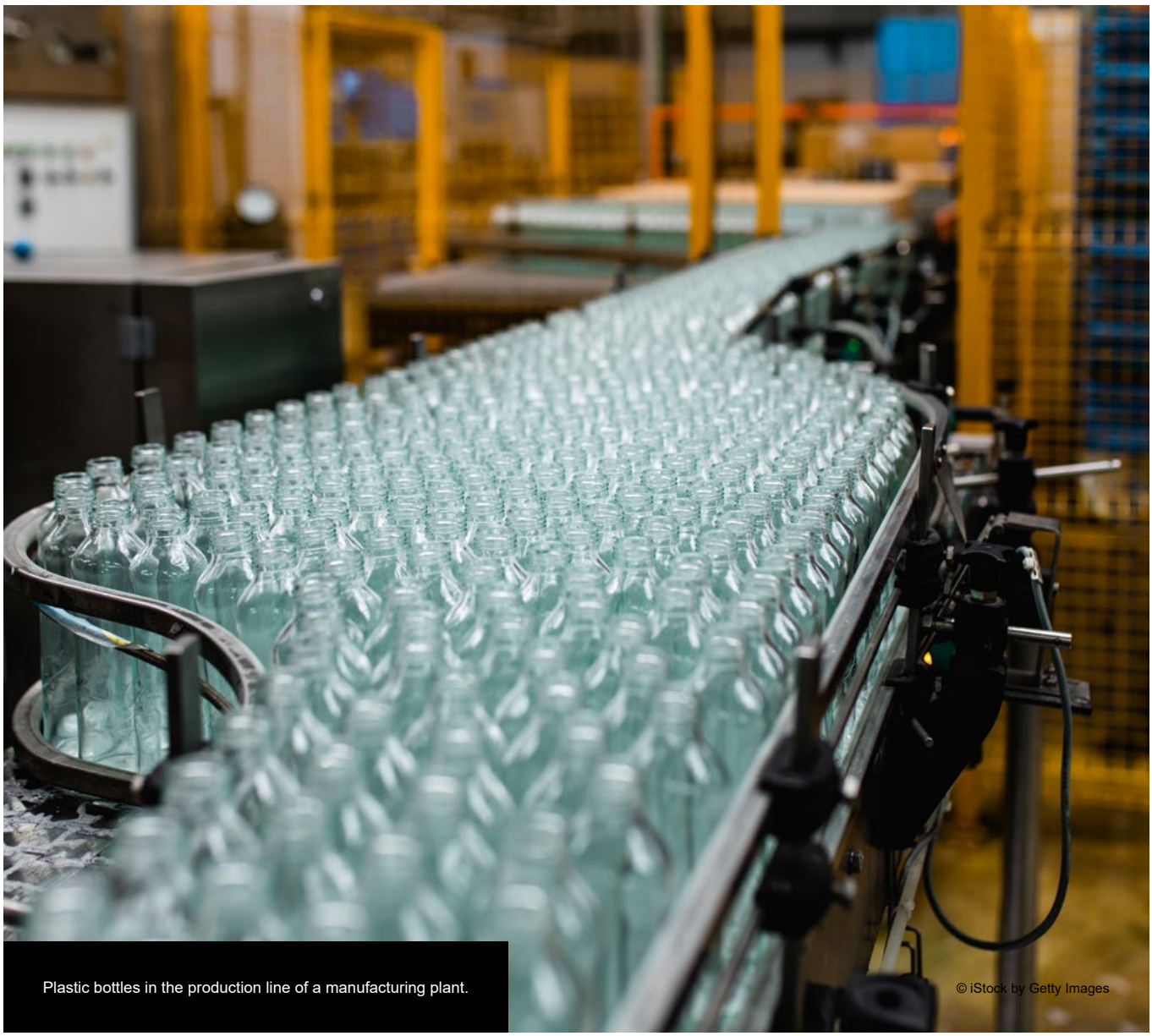
POLICIES, REGULATIONS AND INITIATIVES TO COMBAT POLLUTION FROM THE PLASTICS VALUE CHAIN

International partnerships and frameworks	Global agreement on plastic pollution	National policies and regulations	Global initiatives and voluntary agreements

The South African plastics value chain involves many stakeholders. It starts with a few producers, brand owners and retailers, and then widens out like a funnel to millions of consumers. The value chain is vast and involves many direct and indirect actors, from the government, industry, NGOs, research institutions and the waste sector to consumers. This makes it particularly complex.

The South African plastics sector is well developed throughout the plastics value chain, from raw-material (polymer) production through to plastic recycling. South Africa is fortunate to have a complete plastics value chain where the raw material is produced, manufactured and sold locally, in contrast to most African countries that primarily import finished products. Furthermore, certain types of post-consumer plastics can be recycled, sold and reprocessed locally, whereas other parts of the world (largely developed countries) choose to export their post-consumer plastics to developing countries for recycling, as it is easier than investing in recycling infrastructure and end-use markets.[166]

Plastic packaging makes up more than half of the plastics sector in South Africa, and is responsible for the largest volumes of leakage into nature. While the plastics value chain includes all plastic products, the discussion that follows puts particular emphasis on packaging.



Plastic bottles in the production line of a manufacturing plant.

166 Marss et al., 2019

DIRECT STAKEHOLDERS

Direct stakeholders include polymer producers and importers; plastic converters; retailers, brand owners, informal retailers and hospitality services; consumers; and waste collectors, contractors, recyclers and treatment centres.

POLYMER PRODUCERS AND IMPORTERS

Sasol and Safripol (KAP Industrial Holdings) are the primary domestic producers of plastic polymers in South Africa. Sasol uses coal and imported oil[167] to produce ethylene monomers as building blocks for its plastic polymer products, including LDPE, LLDPE, PP and PVC (see page 11). Total production amounted to 1,3 million tonnes in 2019,[168] some of which was exported. Sasol's polymer production facilities are in Secunda in Mpumlanga and Sasolburg in the Free State (for oil-based petrochemicals).

Safripol produces PET, HDPE and PP, with production outputs of 0,48 million tonnes for 2019.[169] Safripol receives ethylene from Sasol to produce HDPE, and propylene from SAPREF to produce polypropylene. The HDPE and PP production facilities are based in Sasolburg near the raw-material supply. Safripol imports terephthalate acid for PET production, with facilities in Durban.

Plastic polymer importers include Dow Chemicals, Brenttag and Plastomark, among others.

Bio-based plastic feedstocks are imported into South Africa and converted into products locally. A few bioplastic manufacturers include Bonnie Bio Bags, Prime Plus Packaging and The Really Great Material Company, to name a few.

PLASTIC CONVERTERS (MANUFACTURERS)

Plastics manufacturing in South Africa contributed approximately 2,7% to GDP in 2018 and makes a significant contribution to the manufacturing sector.[170]

There are 1 800 plastic product and packaging manufacturers, more commonly known as plastic converters, employing approximately 60 000 people.[171] Most plastic converters are based in Gauteng, followed by the Eastern Cape, Western Cape and KwaZulu-Natal. These plants are often small to medium-sized enterprises, with each plant employing 130 people on average. Black Africans make up 66% of the workforce, with jobs such as plant and machine operators and assemblers.[172]

Some of the larger plastic converters include Berry Astrapak, Mpact, Nampak, PailPac and Polyoak.

RETAILERS, BRAND OWNERS, INFORMAL RETAILERS AND HOSPITALITY SERVICES

Retailers and brand owners

Retailers and brand owners are the main consumers of plastic packaging for fast-moving consumer goods. Changing the behaviour of this stakeholder group could have a ripple effect across the entire value chain, especially on downstream reuse and recycling activities.

Retailers include small, large and online retailers.

There is a mix of local and multinational brand owners in South Africa. Simba, National Brands Limited, Mondelēz International and Tiger Brands together produce over 90% of the snack category in number of units in South Africa.[173] It is important to note that some of these companies in South Africa are subsidiaries of large multinationals that have already committed to targets towards sustainable packaging. Simba, for example, is owned by PepsiCo, which has committed to 100% reusable, recyclable and compostable packaging by 2025 (in addition to a number of other packaging commitments).

167 oec.world/en/profile/country/zaf
168 Sasol, 2019.
169 KAP Industrial, 2019b.
170 DTI, n.d.
171 Tsotsi & Jenkins, 2019.
172 Tsotsi & Jenkins, 2019.
173 The Moss Group, 2019.

Commitments and targets set by retailers and brand owners should filter through to the subsidiaries of large companies in Africa through the initiation of the South African Plastics Pact (see Box 21) or other corporate pressures. There should not be dual brand-owner standards for developed and developing countries.

BOX 12: PACKAGING DESIGN AND BRANDING

The use of plastic packaging, especially for the food and beverage category, provides a storing container, prolongs the shelf-life of products and prevents food waste. Plastic packaging is also preferred to other materials such as glass or metal because it is lightweight and cheaper by comparison. Packaging can also consist of multiple components such as a bottle with a separate lid, or a tray and film, each made from different types of materials.

Brand owners and retailers are in control of the design of their packaging and order specific designs from plastic converters. Besides preserving and protecting the product from degrading before reaching the consumer, packaging design is also used for branding and marketing purposes. In addition, the packaging provides essential on-pack information for health and food products. Often branding is the sole purpose of packaging and labelling items, which may include the colouring of packaging material, adding logos, as well as labelling and other consumer-facing information.

Rigid plastic packaging production comes with a high initial capital outlay with moulds costing in the range of R100 000 to R20 million. A plastic converter will only invest in this cost if there is a sufficient off-take agreement to make it economically viable. This is why plastics are produced in such high volumes, and why converters are so resistant to changing additives and including recyclate: their machines are made to run within very narrow specification ranges.

All these packaging design and production decisions affect whether the plastic packaging can be recycled or not. Packaging SA has developed a Design for Recycling guideline, using a traffic-light system adopted from Recoup in the UK. The traffic-light system rates packaging material types on whether they are compatible with the current recycling collection and operations in South Africa – green for compatible, orange for conditional compatibility and red for not compatible. The guideline document and traffic-light system are primarily intended for use by packaging designers, sustainability managers, line converters, printers (packaging branding and labels) and students. The guide was initially prepared by Packaging SA, and is currently undergoing a wider stakeholder review process initiated by the Department of Environment, Forestry and Fisheries under Operation Phakisa, to achieve the objectives of increasing the recyclability of packaging and the recycled content in packaging.

The traffic-light system in the Packaging SA Design for Recycling Guideline is currently not based on recognised recyclability definitions such as ISO 14021:2017 and ISO 18603:2013. Many of the packaging formats in the guideline that are allocated to the green column (seen as being recycled in practice) are in reality not recycled at scale or collected nationally. This brings the credibility and transparency of the guideline into question.

Another concern is whether this guideline is limited to packaging design for recycling only, without considering other equally important circular interventions, including reuse and new product delivery systems. A new Circular Design Guide[174] was launched by The Ellen MacArthur Foundation and IDEO in 2020. Will South Africa take a few lessons from this to move towards a circular design for plastic packaging?

174 IDEO & The Ellen MacArthur Foundation, 2020.

ON-PACK RECYCLING LABELS INDICATE WHETHER THE PACKAGING CAN OR CANNOT BE RECYCLED

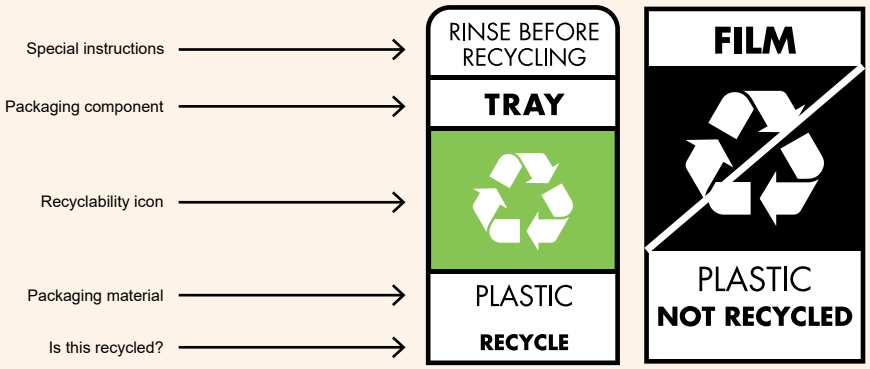
BOX 13: ON-PACK LABELLING STANDARDS

A group of leading retailers, convened by WWF, developed and started implementing standardised recycling instructions, known as on-pack recycling labels (OPRLs), which indicate whether the packaging can or cannot be recycled. The participating retail brands in this initiative were Clicks, Food Lovers Market, Pick n Pay, SPAR, Shoprite and Woolworths. As it is rolled out, other companies are also expected to come on board. The OPRL standards and guidelines now fall under the South African Plastics Pact (see Box 21) and work is ongoing.

Features of the new on-pack recycling labels

- Messaging that simply reads "Recycle" or "Not Recycled"
- To qualify as "Recycle", packaging must be collected and recycled in practice and at scale in at least one major metropolitan city in South Africa. This information will be reviewed regularly.
- The new information will appear on the packaging label whenever possible or in the pack design (in the case of flexible packaging).

FIGURE 11: EXAMPLE OF THE NEW, STANDARDISED BINARY ON-PACK RECYCLING LABEL[175]



175 Le Roux, 2019.

The packaging will still include the current resin or material identification code (MIC) (three chasing arrows with coded numbers and sometimes letters) (see page 11). These are intended for industry actors, such as waste pickers, recyclers and sorters. However, many consumers currently mistake these to mean that the packaging is recyclable (see Box 1), which is not the case. This further highlights the need for clear, standardised consumer-targeted labelling.

BOX 14: WHAT IS PREVENTING BRAND OWNERS AND RETAILERS FROM TAKING ACTION?

The challenges faced by brand owners and retailers in providing sustainable packaging design to consumers include:

- **Procurement of post-consumer recycled content in packaging:** There is currently limited demand for post-consumer recycled content in packaging and products from retailers and brand owners. Acknowledging that post-consumer recycled (PCR) content in food packaging is a constraint, there are many other packaging formats[176] that can easily have a high post-consumer recycled content, such as personal-care and detergent products. Other plastic products to consider for post-consumer recycled content (that have a longer life span) are shopping trolleys, hangers and crates, to name a few.
- **Lack of communication with converters and recyclers:** The design and procurement of packaging does not generally stipulate a minimum post-consumer recycled content. As discussed in the previous point, there are various packaging and product formats that can be a significant sink for post-consumer recycled content. Unless instructed by retailers and brand owners, converters will favour cheaper feedstock, which is currently virgin plastic, to maximise profit. In addition, recyclate affects production efficiencies compared to virgin plastic.
- **Education on packaging design within organisations:** When packaging technologists design packaging, they often fail to take into account the end of life of the packaging. In most cases the marketing and branding departments have the final say on packaging design. Preference is given to bright colours and new materials, which generally cannot be recycled or reused.
- **Money talks:** From a financial perspective, retailers and brand owners prefer cheaper pricing on products and packaging. Currently virgin plastic is substantially cheaper than recyclate, due to the low oil price and COVID-19, and offers greater operational efficiencies at converters.

176 Including secondary and tertiary packaging (see Glossary).

It is important for brand owners and retailers, as a collective, to look beyond the current pricing and consider long-term sustainability, as has been done before with plastic carrier bags. This should reflect and be integrated across packaging design, procurement, branding and marketing, and departmental processes at retailers and brand owners. Future regulation could also potentially be a risk to current procurement patterns.

Small-scale traders: Spaza shops, street hawkers, small grocers and bespoke traders

The small and micro informal retail sector consists of approximately 81 000 small, informal and independent retailers. These include spaza shops, street hawkers and small grocers.[177] Given the increasing unemployment rates, many people have shifted to working in the informal sector. It is estimated to be worth around R360 billion a year, accounting for 30–50% of the food and grocery sector.[178] These small and micro-businesses often purchase their goods from wholesalers in the formal market and sell these goods near public transport hubs such as train stations, taxi ranks and bus stops, accessing hundreds if not thousands of local commuters every day.

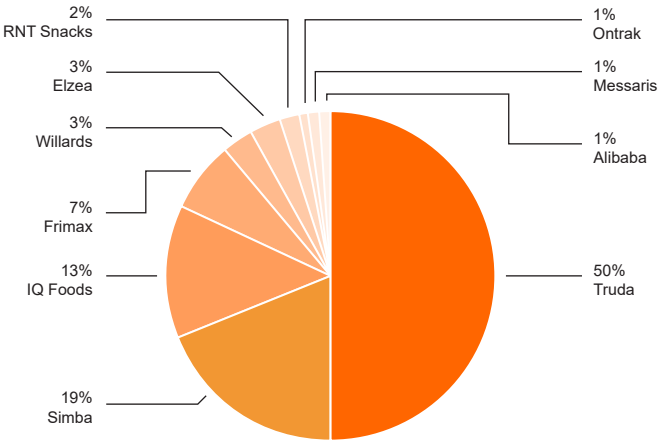
These businesses sell a wide range of products, mainly in the food and beverage category, from staple food items such as bread, milk and sugar, to on-the-go snack foods. Most of the snack products sold to informal markets are from South African brand owners such as Truda Foods, IQ Foods, Frimax Foods and Elzea Snacks.

177 Greenberg, 2016.
178 Centre of Excellence for Food Security, www.foodsecurity.ac.za/news/small-informal-vendors-are-big-business

Recent brand auditing on litter in various wetlands and on beaches[179] in South Africa (see Figure 12) showed that South African snack brands make up the majority of snack category items leaked into the environment. This higher leakage is linked to the absence of waste management services in informal communities, and the fact that snack packaging formats have no value after disposal as they are not recycled.

It is crucial that these brands are part of the conversation when it comes to sustainable packaging design and commit to targets as members of the South African Plastics Pact, as well as being part of extended producer responsibility.

FIGURE 12: SNACK FOOD LITTER BRAND AUDIT DATA FOR WETLANDS AND BEACHES[180]



At the expensive end of the market, there has also been an emergence of alternative small-scale retail options such as Nude Foods, Shop Zero and other plastic-free or zero-waste stores, and farmer's markets. These bespoke traders make use of bulk buying and in-store dispensing of goods into reusable containers such as glass jars, which are provided or brought in by consumers themselves.

CASE STUDY 6: REUSE AND REFILL

A reuse-and-refill model in South Africa is the Gcwalisa (meaning "fill" or "refill" in Zulu) dispensers, which allow customers to purchase food and homecare products in values from as little as R1. A pilot project using prototype dispensing machines was trialled in Johannesburg in 2019 and will hopefully be ready for the next phase of market testing in 2020. Spaza owners can quickly provide the amount requested by customers because of on-board computers with Internet of Things sensors measuring volume while dispensing. Goods are dispensed into reusable containers, allowing brands to deliver bulk into the informal channel and for shop owners to distribute in micro-sizes without having to use problem plastics.

There are shops across the country where consumers bring their reusable containers to fill with grocery items.[181] There are also online shops such as the Zero Waste Store that use eco-friendly, plastic-free packaging. However, these are niche, high-end stores that do not cater for the majority of the population. Even so, some bigger retailers are offering selected food items such as grains, nuts and sweets, among other things, at dispensing stations.

181 See lifelivedsimply.co/2019/04/23/zero-waste-shopping-in-south-africa for a list (October 2019 update at time of writing).

179 Dyer Island Conservation Trust, 2019.

180 Research by Dr Peter Ryan of the University of Cape Town, as reported by The Moss Group, 2019. Brand audit data for 400 items found in wetlands and 200 items found on beaches.

Hospitality and food services

The hospitality and food services industry includes a broad range of businesses ranging from fast-food chains, restaurants, coffee shops and hotels to catering services.

Hotels provide a host of toiletries and foodstuffs that are packaged in small quantities for their guests. These products are often replaced on a daily basis even if only half used. Recently, some hotel chains have started to use refillable dispensers for toiletries to avoid using so much problematic and unnecessary packaging.

Takeaway containers, including disposable coffee cups and cutlery, are a major problem in this sector. A few companies that are aware of the problem are switching to compostable or paper-based alternatives. Consumers tend to celebrate the actions of restaurant and fast-food chains, such as Spur, Wimpy and McDonald's, which are driving awareness and making small changes such as switching to paper straws and alternatives to plastic takeaway containers.[182] Along with retailers, these businesses have direct, first-hand interaction with consumers and have a great opportunity and responsibility to drive awareness and education about plastic pollution.

There is a great risk of "greenwashing", spreading misinformation to create a false impression of the product and implementing "solutions" with unintended negative consequences. Compostable straws, for example, still pose the risk of ending up in the environment with a similar impact as conventional plastic straws because there are no systems and infrastructure in existence to collect and compost the materials (see Section 1).

CONSUMERS

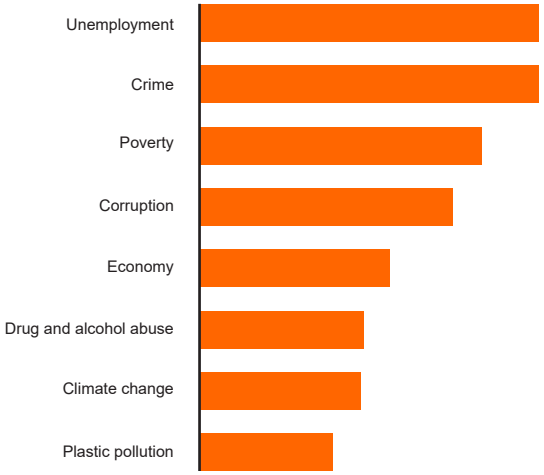
The trend to consume more convenience foods is increasing. However, some consumers are becoming increasingly aware of environmental damage and thus changing their buying habits, such as buying from zero-waste or plastic-free stores.

Recent market research[183] found that consumers are not looking to reduce consumption, but there is a greater focus on alternative materials and recycling.

South African consumers give a low ranking to the plastic pollution challenge compared to other socio-economic challenges, with unemployment rates and crime being the major concerns (see Figure 13). While this may read as socio-economic issues being prioritised over environmental issues for many South Africans, it also highlights the false dichotomy between environmental and socio-economic issues.

Consumers need to understand the link between socio-economic and environmental issues, and that solutions to tackle the one must have the other in mind.

FIGURE 13: CONSUMER RANKING OF SOCIO-ECONOMIC AND ENVIRONMENTAL ISSUES IN SOUTH AFRICA IN ORDER OF MOST IMPORTANT TO LEAST IMPORTANT[184]



"GREENWASHING" HAPPENS WHEN BUSINESSES FALSELY MARKET THEIR GOODS OR SERVICES AS PROVIDING ENVIRONMENTAL BENEFITS

182 Ocean Pledge, 2019.

183 Consumer research conducted via an online survey commissioned by WWF South Africa, conducted by Ocean Pledge and Ovatoyou in November 2019. The survey had 1 923 respondents of mixed age, gender, race and income levels; 79% of the sample was based in Gauteng, the Western Cape or KwaZulu-Natal.

184 Ocean Pledge, 2019.

Informal waste reclaimers bring their collected recyclable waste to the buy-back centre in Stellenbosch.

© Fiona Piller / WWF

BOX 15: WHAT ARE THE BARRIERS TO CONSUMERS TAKING ACTION?

South African consumers experience five major barriers to taking action against plastic pollution:

- **Education:** Not being sufficiently informed and falling victim to greenwashing
- **Cost:** Not being able to afford, or not being informed of the cost-saving potential of choosing reusable alternatives to disposable plastic packaging
- **Convenience:** Not wanting to change a habit or choose an alternative that requires effort or creates friction in their lives
- **Impact of individual actions:** Sceptical that individual actions can make a significant impact, or not creating the link between individual action and the issue
- **Being overwhelmed or experiencing feelings of guilt:** These feelings can create paralysis or inaction

There are currently very few to no alternatives to the problematic packaging of products on offer at retailers. Alternatives could include dispensing systems, with consumers bringing their own containers. However, these have not been adopted widely or at scale due to potential challenges such as user motivation to bring containers, brand protection and building up the required distribution network.

More than 60% of South Africans consumers claim to be concerned with whether an item can be recycled or not.[185] While most respondents believe recycling is important, many claim not to have the infrastructure or know-how to recycle, and face the daily confusion of whether something can or cannot be recycled in South Africa.

185 Ocean Pledge, 2019.

The widespread adoption of an on-pack recycling label standard would be a start to resolving consumer confusion and improving the collection of recyclable material.

WASTE COLLECTORS, RECYCLERS, TREATMENT CENTRES AND MUNICIPALITIES

Waste collectors and buy-back centres

Primary waste collection in South Africa occurs through a variety of channels, including informal waste reclaimers and waste management companies. Some of these companies are contracted by municipalities for waste collection and removal services, or do it privately through public–private partnerships or contracts. Waste management companies in South Africa include Averda, Enviroserv, WastePlan, Pikitup and DSW, among others.

When it comes to plastics, informal waste reclaimers usually only collect PET and HDPE bottles, as well as some LDPE and PP packaging. However, they prefer collecting heavier items (rigid packaging) and those with the greatest monetary value per tonne compared to smaller, more lightweight items, which are not worth their while to collect.

Reclaimers then sell these items along with other recyclables such as cardboard and glass to buy-back centres or directly to recyclers themselves. Buy-back centres act as middlemen in the collection network and aggregate higher volumes of materials, as recyclers prefer to buy in higher volumes than what the average individual reclaimers collect on a daily basis.

CASE STUDY 7: PACKA-CHING BY POLYCO

PACKA-CHING is an owner-operated mobile separation-at-source recycling service. It collects used recyclable packaging material from the public in low-income and informal areas – those areas that are often overlooked with regard to recycling education, recycling infrastructure and recycling services. The aim is to decrease the amount of recyclable packaging entering landfills and being discarded in the environment.

The first PACKA-CHING unit was launched in 2017 in Langa, Cape Town. Since then, PACKA-CHING has expanded its operations to four units. At present it services the areas of Langa and Phillipi in Cape Town, Western Cape; Thabazimbi in Limpopo; Buffalo City in the Eastern Cape; and Katlehong in Gauteng. PACKA-CHING aims to have a total of 25 units operating across South Africa within the next five years.

Through its recycling operations, PACKA-CHING helps not only to clean up the environment but also to uplift the communities in which it operates. By paying for recyclable packaging, PACKA-CHING incentivises behaviour change by shifting perceptions of recyclable waste. Each kilogram of recyclable material brought to a PACKA-CHING unit is weighed and paid for. PACKA-CHING shows people that used packaging has value and selling recyclables becomes recognised as an income-generating activity.[186]

186 Polyco, 2020.

Langa residents lining up to sell their recyclable materials at the mobile PACKA-CHING buy-back unit.

Tailings from the sorting process (front left) at a waste transfer facility at Kraaifontein MRF operated by WastePlan. All this material (tailings and other waste from household collection) will go to landfill.

© Andrea Weiss / WWF

58 k

JOBS IN RECYCLING COLLECTION

8 k

FORMAL JOBS IN RECYCLING PLANTS

Material recovery facilities

Material recovery facilities (MRFs) (wet and dry) form part of the s@s (separation-at-source) pilot programmes implemented by certain municipalities. For dry material recovery facilities, recyclables are collected from households and are further sorted into material categories such as cardboard, metal, glass and different types of plastics. These recyclables are then sold to recyclers for further processing.

A wet or "dirty" material recovery facility is where recyclable materials are picked out from general household waste where s@s does not occur. What is not currently recycled in South Africa is sent to landfills from these material recovery facilities. These tailings (non-recyclable plastics and other materials) cost the waste management companies, such as WastePlan, which operates a dry material facility in Cape Town, up to R150 000 per month in disposal fees at landfill.

Recyclers

Plastic recycling in South Africa is governed purely by economic drivers and free-market principles as opposed to environmental factors, as is the case in Europe.[187] Recyclers face challenges such as the price of recyclables, which fluctuate dramatically depending on supply and demand; the price of crude oil, which makes virgin plastic cheaper or more expensive; increasing operational costs (labour, electricity, transport); being regarded as a high insurance risk; and uncertainty of incoming feedstock volumes.

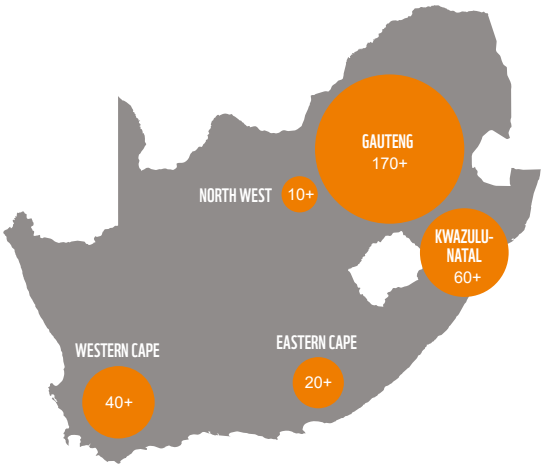
Capital costs to set up a facility to granulate, wash and pelletise incoming feedstocks are higher than for conventional plastic converters and is thus not seen as a favourable business opportunity. It is a self-regulating sector with very little regulatory enforcement (tax, waste licences), which leads to non-compliant companies competing with responsible recyclers. There are also no subsidies to hedge against price fluctuations[188] with limited support from the government, industry and consumers.

There are more than 300 plastic recyclers in South Africa (see Figure 14). Most of them are concentrated in Gauteng, followed by KwaZulu-Natal, the Western Cape, the Eastern Cape and North West province. In the Free State, Limpopo and Mpumalanga there are fewer than 10 in total, and none in the Northern Cape.

Most recyclers process LDPE (approximately 125), HDPE (85) and PP (85), which shows a low barrier to market entry. There are even fewer PS (12), PET (10) and PVC (5) recyclers. [189]

Recycling provides 7 892 formal jobs in recycling plants and approximately 58 500 jobs[190] throughout the collection network, which include waste reclaimers and small collection businesses.[191]

FIGURE 14: PLASTIC RECYCLERS IN SOUTH AFRICA



187 Plastics SA, 2018b.
188 Plastics SA, 2019a.
189 Pretorius, 2019b.
190 This estimate varies, as other research reports up to 215 000 informal waste reclaimers in South Africa (Godfrey & Oelofse, 2017).
191 Plastics SA, 2018b.

INDIRECT STAKEHOLDERS

Indirect stakeholders in the plastics packaging value chain include research institutions, government departments, civil society organisation, industry bodies and labour unions.

RESEARCH INSTITUTIONS

Various research institutions have conducted research independently or on behalf of the South African government. The Council for Scientific and Industrial Research (CSIR) is hosting the implementation of the Waste Research, Development and Innovation (RDI) Roadmap, which includes various projects such as a Life Cycle Sustainability Assessment of plastic carrier bags. Research in this space has only started picking up in the last five years and is becoming increasingly popular.

The **Waste RDI Roadmap** was initiated to provide strategic direction and manage and coordinate South Africa's investment in six clusters of Waste RDI activity. The vision of the Roadmap is to stimulate waste innovation (technological and non-technological) and human capital development through investment in science and technology. In so doing, it wants to maximise the diversion of waste from landfill towards value-adding opportunities. These opportunities include prevention of waste and the optimised extraction of value from reuse, recycling and recovery in order to create significant economic, social and environmental benefit.[192] As mentioned before, landfilling is still the primary form of waste management in South Africa and the implementation of the Waste RDI Roadmap is key to realising a circular plastics economy in the country.

In the 2018/19 year, R7 million was invested in Roadmap-managed research and development grants to research institutions. In the fifth year of implementation, the trends consistently demonstrate growth in research outputs and students further increasing capacity in the sector. Two targeted projects that received grant funding with a focus specifically on plastic was informing decisions on plastic carrier bags, taking into account environmental as well as social impacts, and the use of post-consumer plastic in road construction.[193]

> Bridging some of the data gaps mentioned in this report as well as establishing a centralised data repository is essential to guide actions to address plastic pollution. Actions based on accurate data and the best available science, appropriate to the local context, are more likely to succeed.

GOVERNMENT DEPARTMENTS

The Department of Environment, Forestry and Fisheries (DEFF) has a mandate to ensure that the environment and human health are protected by providing measures for the prevention of pollution and ecological degradation according to the National Environmental Management: Waste Act 59 of 2008 (Waste Act). The Waste Act and subsequent amendments entitle the Minister to enact regulations in respect of the design, composition or production of a product or packaging. This covers the composition of the packaging (volume and weight), reduction, reuse and recycling as well as the use of materials that are less harmful to the environment. In light of this, in 2017 plastic packaging was defined as a priority waste along with other streams such as e-waste and lighting. Since the dismissal of the Section 28 Notice in December 2019 by the Minister of Environment, Forestry and Fisheries (see page 85), plastic is now included in materials where extended producer responsibility will be applied in terms of section 18 of the Waste Act.

2017
PLASTIC PACKAGING IS DEFINED AS A
PRIORITY WASTE

192 DST, 2016.
193 Both studies were conducted by the CSIR.

The Department of Science and Innovation (DSI) (previously the Department of Science and Technology) is responsible for facilitating, training and providing resources for science, technology and innovation in support of South Africa's development. The *White Paper on Science, Technology and Innovation*,[194] approved by Cabinet in March 2019, acknowledges that environmental challenges such as climate change and biodiversity loss will increasingly shape policy and that the concept of a circular economy will dominate future growth discourse. This transition to circular material management, including plastic and others, is seen to address the UN Sustainable Development Goals (SDGs) and also place the country on a development pathway that avoids getting locked into resource-intensive industries and practices. Circularity of the economy is also seen as a crucial concept towards achieving a greener economy: it will address the reduction in greenhouse gas emissions, create new markets to assist in the transition to jobs of the future and keep South Africa's industry relevant to trading partners.

The Department of Trade, Industry and Competition (DTIC) (previously the Department of Trade and Industry) is responsible for commercial and industrial policy and has industry sector desks that focus on developing and implementing high-impact sector strategies and policies to create decent jobs and increase value-addition and competitiveness. These include the Industry Policy Action Plans (IPAPs), now to be replaced with Master Plans currently under development. Plastics falls under the Plastics, Pharmaceuticals, Chemicals and Cosmetics sector desk. The packaging market, which is the largest consumer of plastic, is perceived favourably as it created relatively good opportunities for value-addition in other high-value sectors of the South African economy.

The National Treasury has the mandate to coordinate macroeconomic policy and support the allocation and utilisation of financial resources to promote economic development and social progress. This is done through prioritising investment into infrastructure and industrial capital. Plastic has featured on the National Treasury's radar, specifically when it came to the plastic bag levy (see Box 16). National Treasury may also play a role in the consideration of additional environmental levies for plastic products, as well as possible management of or guidance on the financial element of a mandatory extended producer responsibility mechanism implemented for plastic packaging as initiated through the Department of Environment, Forestry and Fisheries.

CIVIL SOCIETY ORGANISATIONS

Various evironmental and social civil society organisations are involved in advocacy work on plastic pollution. Interventions are largely focused on clean-ups and raising awareness. Some examples include:

- **Citizen science:** Beach clean-ups and data collection of items commonly found on beaches, through citizen science
- **Ecobricking projects:** The use of non-recyclable plastics used to fill 2-litre PET bottles to use as building materials for schools, raised-bed gardens and seating (see Box 8)
- **Awareness-raising campaigns:** Plastic Free July, #RethinkTheBag, #StrawsSuck, etc.

Faith-based organisations

Faith-based organisations are committed to increasing awareness, understanding and action with regard to eco-justice, sustainable living and climate change. Faith-based organisations such as the Green Anglicans and the Southern African Faith Communities' Environment Institute (SAFCEI) are advocating for individuals and communities to turn the tide on the increasing levels of plastic pollution by refusing problem plastics and calling on the government to ban these items.

194 DST, 2019.

INDUSTRY BODIES

Industry bodies or associations represent various stakeholder groups in the plastics value chain (see Table 1).

TABLE 1: SOME OF THE INDUSTRY BODIES IN THE PLASTICS PRODUCTION AND CONSUMPTION SECTORS

INDUSTRY BODY	STAKEHOLDER GROUP IT REPRESENTS
Plastics SA	Virgin raw-material producers and plastic converters
Plastics Converters Association of SA (PCA)	Plastic converters
Packaging SA	Packaging producers including paper, glass, metal and plastic
Consumer Goods Council of SA (CGCSA)	Fast-moving consumer goods companies, including brand owners and retailers, are the largest consumers of plastic packaging and products
South African Plastics Recycling Organisation (SAPRO)	Plastic recyclers
Association of Rotational Moulders of South Africa (ARMSA)	Rotational moulding[195] plastic converters
South African Plastic Pipe Manufacturers Association (SAPPMA)	Plastic pipe manufacturers

Industry bodies speak on behalf of the groups whose interests they represent at government consultations. They support industry and the government with data, knowledge exchange and reporting needed for decision-making. Industry bodies may also conduct public-facing education and awareness programmes, and promote plastics as the material of choice.

Producer responsibility organisations

Producer responsibility organisations typically organise, coordinate and manage extended producer responsibility (EPR) schemes. Producer responsibility organisations in South Africa are organisations that voluntarily implement the producer responsibility scheme for specific material streams, including plastic packaging, paper, e-waste and lighting.

TABLE 2: PRODUCER RESPONSIBILITY ORGANISATIONS IN THE PLASTICS SECTOR

PRODUCER RESPONSIBILITY ORGANISATION	PLASTIC TYPE
The PET Recycling Company (PETCO)	PET beverage bottles
Polyolefin Responsibility Organisation NPC (Polyco)	Polyolefins: Low-density polyethylene (LDPE), linear low-density polyethylene (LLDPE), high-density polyethylene (HDPE) and polypropylene (PP)
Polystyrene Association (PSA) (also merged with Expanded Polystyrene Association of Southern Africa)	Expanded polystyrene (ESP) and high-impact polystyrene (HIPS)
Southern African Vinyls Association	PVC

195 A plastic moulding technique used to manufacture hollow products such as tanks, bins and children's toys.

Producer responsibility organisations collect, manage and disburse voluntary extended producer responsibility fees and ensure that material collection targets are reached on behalf of their members, the plastic producers and converters. The extended producer responsibility fees are typically used to support recyclers through short-term loans or grants. These fees are sometimes also used for education and awareness programmes, pilot projects and to support the informal waste sector.

Informal sector representatives

Although informal waste reclaimers are not formally organised, there are two representative bodies, namely the African Reclaimers Organisation, and the South African Waste Pickers Association (SAWPA). Both of these actors represent the interests of informal waste reclaimers in public forums, and in some instances work collaboratively.

Labour unions

There is no dedicated labour union for workers in the plastics sector. However, the interests of these workers have been represented across industrial workers' unions listed in Table 3.

TABLE 3: INDUSTRIAL WORKERS' UNIONS

WORKERS' UNION	INDUSTRIES THEY BARGAIN IN
National Union of Metalworkers of South Africa (NUMSA)	Engineering, tyre, motor and auto industries (plastics falls in the engineering sector)
United Association of South Africa (UASA)	Industrial sectors including manufacturing engineering (which includes plastics)
Metal and Electrical Workers Union of SA (MEWUSA)	Engineering and electrical industries including the plastics, rubber and related industries

Pick n Pay trials a packaging-free zone for certain food items in its Constantia store, Cape Town.

© Pick n Pay

NATIONAL POLICIES AND REGULATIONS

South Africa's policies and regulations governing plastic are largely centred around waste management legislation, which anchors the idea that plastic does not have value and is simply an environmental liability that needs to be properly managed.

THE SOUTH AFRICAN PLASTIC BAG LEVY[196]

ADDING CALCIUM CARBONATE FILLER MATERIAL TO PLASTIC ABOVE THE SPECIFIED MAXIMUM CONTENT ALLOWED MAKES IT UNRECYCLABLE

The South African public consumes approximately 8 billion plastic carrier bags every year.[197] In 2003, the then Minister of Environmental Affairs, Valli Moosa, introduced an environmental tax which was levied on plastic bags. The intention was to reduce consumption to mitigate the increasing prevalence of plastic bags in the environment and address the growing volumes of solid waste. The levy was introduced along with a ban on bags with a thickness below 24 µm. Due to the charge on bags at formal retailers, overall consumption initially declined, but before long the cost of the carrier bags was included in household budgets and consumption increased again.

The heavier gauge was intended to promote recycling through the establishment of a non-profit organisation, Buyisa-e-Bag. The mandate of Buyisa-e-Bag was to promote waste minimisation and awareness initiatives in the plastics industry, expand collector networks and create jobs, as well as kick-start rural collection. In 2003, 3 cents per bag was levied to subsidise Buyisa-e-Bag, which increased to 4 cents in 2010. Buyisa-e-Bag was closed in 2011 due to maladministration with financial losses estimated at R100 million. It was subsequently wound up and its functions absorbed into the then Department of Environmental Affairs.[198] In April 2018, the levy per bag increased by 50% to 12 cents to address the high levels of consumption, bringing in R241,3 million to the fiscus compared to R41,2 million in 2004. The levy was increased to 25 cents per bag in 2020.

Spaza shops and street hawkers provide plastic carrier bags that are not approved by the National Regulator for Compulsory Specifications (NRCS). These bags often have a thickness below 24 µm, the limit specified by the NRCS, and are most likely imported as local producers are required to conform to NRCS requirements. These informal businesses also do not pay the mandatory plastic bag levy and, unlike major retailers, often provide the bags free of charge to their customers.

With the current focus on plastic pollution and ad hoc actions taken by retailers, there have been calls from Plastics SA to ring-fence the levy in order to invest in measures that support the recycling industry. According to the Department of Environment, Forestry and Fisheries, the funds are used for the Compulsory Specification for Plastic Bags (VC8087) through the NRCS. Funds can also be accessed for recycling activities through the submission of an approved business plan to the National Treasury. It is unclear whether any successful projects using these funds have ever been implemented.

An additional obstacle to recycling came in the form of converters adding calcium carbonate to the bags to cut costs while still meeting the minimum weight requirement, which renders the bags unrecyclable. This was addressed by the updated NRCS plastic bag specification on the maximum calcium carbonate content allowed along with pressure from retailers to have a high level of recycled content in carrier bags.

196 Commonly known as a levy but actually an environmental tax collected by the South African Revenue Service (SARS).
197 Dikgang et al., 2010.
198 DEA, 2011a.

In the last two years, this has led to a lower calcium carbonate content and higher post-consumer recycled content in the bags, which means these bags can be recycled, provided that they are not contaminated and that they are indeed collected for recycling.

With the new maximum filler content specified, all carrier bags at formal retailers can now be recycled in practice. However, post-consumer recycled plastic content can vary from 100% at some retailers – which one sees printed on the bags – to none. There are still various obstacles that need to be overcome in the value chain. Retailers need to take a position to only use high levels of post-consumer recycled content in their bags along with open and credible communication to and from their suppliers. The largest constraint for the recycling industry in South Africa is the lack of end-market demand, therefore retailers have a significant role to play in increasing the levels of post-consumer recycled content in their carrier bags. We celebrate the retailers who use 100% post-consumer recycled content in their bags in support of a circular plastics economy in South Africa (see also Case study 1 on page 27).

BOX 16: IS THE PLASTIC BAG LEVY PROMOTING THE CIRCULAR TRANSITION?

The increased use of recycled content in plastic bags is a major step forward in transitioning to a circular plastics economy in South Africa, but this trend is under tremendous threat. The main reason is the current extremely low oil price brought about by the COVID-19 crisis and the geopolitical situation between oil-producing countries in the Middle East and Russia. This makes the manufacturing of plastic bags from virgin plastic a much cheaper option than bags made from recycled material. In addition, the levy per bag has increased to 25c from 1 April 2020, with a subsequent increase in price at formal retailers.

With these recent developments, the levy in its current form is problematic for a number of reasons:

- It has generally been unsuccessful in reducing the consumption of plastic bags.
- An increase in the levy may not result in any significant behavioural change on the part of consumers, depending on the new retail price per bag charged by formal retailers.
- The blanket approach of taxing virgin and recycled content the same actually disincentivises the use of recycled content, which is at present more expensive than virgin plastic.

In the face of the pressing need for an overall reduction in the consumption of plastic carrier bags, the levy and other measures can indeed contribute towards that end. However, it could also be used as a mechanism to "level the playing field" between circular plastic (recycled materials) and virgin plastic.

A better approach would be to adjust the plastic bag levy to incentivise the use of recycled content. And to change current consumer behaviour patterns, additional measures could be considered, such as stocking the plastic bags inside the store instead of at the till-point, and incentivising consumers to bring a reusable bag by offering discounts.

This would prevent making the mistake of perceiving a plastic bag levy as a significant win in the fight against plastic pollution. Instead, it can be seen as one intervention in what needs to be a suite of interventions right across the plastics value chain.

EVOLUTION OF THE SOUTH AFRICAN WASTE LEGISLATION LANDSCAPE

In 2008, the **National Environmental Management: Waste Act 59 of 2008** was promulgated, leading on from the National Waste Management Strategy and the *White Paper on Integrated Pollution and Waste Management*.[199] The Waste Act is guided by the waste hierarchy and aligns with circular economy principles to adopt an integrated solution. The ultimate aim is to design waste out of the system and, if waste is generated, to ensure that it is reused, recycled or recovered before safe disposal.

Following 2008 there was a period categorised as a "flood of regulation" in an effort to minimise the environmental and human health impacts associated with poor waste management while, at the same time, striving to drive waste up the hierarchy.[200] **The National Environmental Management: Waste Amendment Act 26 of 2014** was seen to rectify the shortcomings of the Waste Act.

Despite amendments to the Waste Act, however, many obstacles still exist that make waste diversion difficult, such as the definition of waste, which triggers various compliance requirements for service providers wanting to enter the waste reuse, recycling and recovery sector.

The **National Waste Management Strategy** (NWMS) is drawn up by the Department of Environment, Forestry and Fisheries to achieve the objectives of the Waste Act. The last NWMS was published in 2011. The draft third NWMS[201] was released for public comment in 2019 together with a State of Waste Report,[202] which updates the National Waste Information Baseline Report of 2012.

The development of an **Integrated Waste Management Plan** (IWMP) is a requirement for all levels of government responsible for waste management according to the Waste Act.

Plastic is not currently a focus area in the IWMPs and the diversion of waste is constrained due to available capacity, competence and cost.

199 DEA, 2011b.
200 Godfrey & Oelofse, 2017.
201 DEA, 2019b.
202 DEA, 2018.

BOX 17: POLICY AND LEGISLATION – A BARRIER TO COMBATING THE WASTE PROBLEM

The current South African legislative framework for waste recognises and defines waste as an environmental liability. It is interesting to note that by-products are not considered waste in terms of the Waste Act, and "any portion of waste, once re-used, recycled and recovered, ceases to be waste".[203]

Waste is described in the Waste Act as "protection-based" and something that "needs controlling" via regulation, norms and standards. Thus any effort for reuse, recycling or recovery of waste triggers extensive legislative requirements, creating a huge barrier to entry into this space.[204] Another element to this over-regulated environment is that municipalities technically own waste and become gate-keepers of waste.

Furthermore, the Municipal Finance Management Act 56 of 2003 requires that all service providers must be contracted for a three-year tender period. Waste management companies contracted by municipalities would not be able to pay back their infrastructure costs over this period, which prohibits meaningful long-term waste management contracts.

203 Also see the definitions of "waste" in the National Environmental Management: Integrated Coastal Management Act 24 of 2008 and the National Water Act 36 of 1998.
204 Oelofse & Godfrey, 2008; Godfrey & Oelofse, 2017.

The National Environmental Management: Waste Act 59 of 2008 **Section 28 Notice** was published on 6 December 2017. This meant that packaging was declared a priority waste by the government and the plastics industry needed to submit an **Industry Waste Management Plan** (IndWMP) to the government by September 2018. All producers were also required to register with the government by 6 February 2018.

The IndWMPs for Paper and Packaging were submitted by Packaging SA as a Federation of Plans for each packaging material stream. The pricing strategy for the IndWMPs according to section 13 of the Waste Act called for all extended producer responsibility fees to be collected through the fiscus and then disbursed through the Waste Bureau. However, the submitted IndWMPs for Paper and Packaging stated that the collection of funds was to remain with the industry and that the producer responsibility organisations would disburse funds as necessary.

A response from the Department of Environment, Forestry and Fisheries was not forthcoming and in December 2019 the Section 28 Notice was withdrawn and all IndWMPs were dismissed by the Minister. None of the submitted plans complied with the criteria in the Section 28 Notice, specifically with reference to the pricing strategy. The new approach to be undertaken is extended producer responsibility as contemplated under section 18 of the Waste Act. It is expected that the Extended Producer Responsibility Regulations for Paper and Packaging will be published in October 2020 for implementation in early 2021.

BOX 18: EXTENDED PRODUCER RESPONSIBILITY – AN ENABLER IN COMBATING THE WASTE PROBLEM

Extended producer responsibility (EPR) is a governance and financial mechanism to shift the responsibility for the end-of-life management of products and materials to producers. There are two main intentions behind the establishment of these kinds of systems:[205]

1. To share the physical, organisational and financial responsibility for waste management, including collection, sorting and recycling, between producers and the government, thus reducing the burden on municipalities. This creates more resourceful and effective schemes that would increase the end-of-life collection, reuse, environmentally sound treatment and recycling of collected products.
2. To provide incentives for producers to ensure that plastic packaging is designed to be easily collected and recycled or reused.

Producers (obliged companies) pay extended producer responsibility fees per tonne of material consumed to the producer responsibility organisations. These funds are used to support collection and recycling operations while also offering support for various projects.

As a result, the establishment of extended producer responsibility can contribute to:

- Artificially raising the value of plastic packaging and products, resulting in a higher probability of collection
- Introducing efficient collection schemes for specific waste streams, including plastic packaging
- Shifting the responsibility for post-consumer management of packaging to the producers who place the plastic packaging on the market.

205 Watkins et al., 2017.

Extended producer responsibility schemes have positive effects up and down the value chain, making them an ideal tool to push the economy towards circularity. To close the loop towards plastic circularity, it is necessary to reduce the disposal of end-of-life plastics in landfills or the environment and the use of virgin feedstocks by replacing them with recycled materials.

6 ITEMS DOWN AND OUT?

1. STRAWS

2. STIRRERS

3. COTTON BUDS

4. PLASTIC PLATES, BOWLS, CUPS AND CUTLERY

5. EXPANDED POLYSTYRENE USED IN FOOD PACKAGING

6. PLASTIC MICROBEADS IN COSMETICS

South Africa faces numerous challenges regarding waste management, even though sophisticated legislation is in place. Constitutionally, the safe disposal of end-of-life products once they appear in the municipal waste stream, including paper and packaging, is a core function of local government.[206] However, a lack of enforcement and competing interests have led to ineffective implementation. Weak governance and a lack of funding, appropriate infrastructure (e.g. engineered landfills, weighbridges) and technical capacity are a reality at local government level, especially in peri-urban and rural areas. This is demonstrated in the compliance results from public waste management facilities.[207] In 2017, 75 municipal waste sites were audited and only 22% had compliance levels of 70% and above, while six sites had no data.

In addition, the much-needed transition to waste prevention and diversion to reuse, recycling and recovery is more expensive relative to disposal to land, with the consequence that this (disposal to landfill and dumping) remains the dominant waste disposal technology in South Africa. This current state of affairs has up until now constrained the growth of the recycling sector to only those waste streams that are economically viable, e.g. ferrous metals, PET and paper.[208] However, according to the **2018 State of Waste Report**,[209] progress has been made since 2011. In 2011, 90% of waste was landfilled whereas, according to the 2018 report, up to 40% of waste has since been diverted to recycling and other uses.

The lack of data on waste and material flows has also hampered effective strategy and policy development. The establishment of the **South African Waste Information System** (SAWIS) is included in the Waste Act. SAWIS's objectives are to provide data to effectively manage waste; develop an Integrated Waste Management Plan, and provide information to the government and the public.

The inaccurate reporting on SAWIS is a drawback as the national government needs to rely on estimated figures from the Waste Baseline Report (2017) instead of actual figures for planning and other purposes.

BOX 19: OPERATION PHAKISA – CHEMICALS AND WASTE ECONOMY

The Department of Planning, Monitoring and Evaluation hosts the implementation of Operation Phakisa. This includes the Chemicals and Waste Phakisa, which is coordinated by the Department of Environment, Forestry and Fisheries.

The Chemicals and Waste Phakisa provides detailed plans for both local and national interventions about waste management that align with the goals of the National Waste Management Strategy. It aims to enhance South Africa's chemicals and waste economy through increasing the commercialisation of the circular economy, especially waste. It also wants to foster inclusive growth and, through this, reduce the negative environmental and health impact of waste. The outcomes of the Chemicals and Waste Phakisa align with the Department of Science and Innovation's 10-year Waste Research, Development and Innovation (RDI) Roadmap. The goal is to grow the waste sector from 0,62% of GDP to 1–1,5% of GDP in the next five years via a number of levers, including accelerating the waste recycling economy and growing the waste-to-energy economy.

A work stream for Product Design and Waste Minimisation has been set up, looking at themes that include food waste, packaging waste and refuse-derived fuel. Through the packaging

→

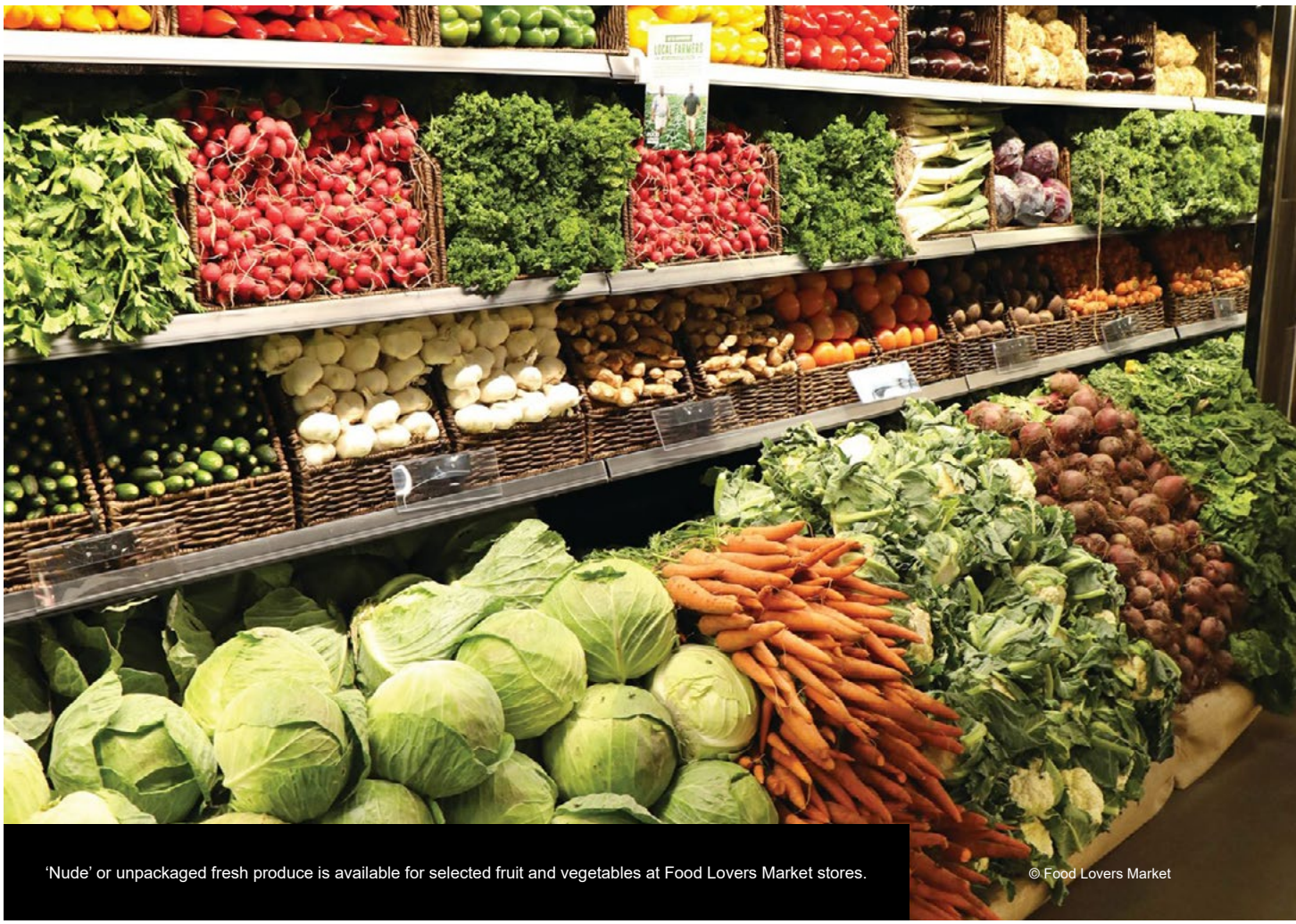
206 Section 9 of the Waste Act 59 of 2008.
207 DEA, 2018.
208 Godfrey et al., 2016.
209 DEA, 2018.

waste theme, the aim is to create 2 400 jobs, divert 146 000 tonnes of packaging waste from landfill and contribute an extra R36 million to overall GDP.

The aim within the packaging waste theme is to increase recycling through rethinking design and formalising the extended producer responsibility mechanisms. This will be done by:

- Rethinking packaging design to ensure that it is recyclable and contains a minimum recycled content
- Developing national packaging design guidelines and a grading system (see Box 12)
- Implementing a successful extended producer responsibility mechanism through a Section 18 Notice, which will be promulgated in 2020 (see Box 18)

Adopting the waste hierarchy approach and supporting circular economy principles are measures to address high unemployment, which is the case in South Africa. Creating an enabling environment to establish a secondary resource economy in South Africa is forecast to generate approximately 70 000 direct jobs, with a subsequent multiplier effect of two to three times for the number of indirect and induced jobs.



'Nude' or unpackaged fresh produce is available for selected fruit and vegetables at Food Lovers Market stores.

© Food Lovers Market

SOUTH AFRICA'S INVOLVEMENT IN GLOBAL INITIATIVES AND VOLUNTARY AGREEMENTS

Numerous global and regional initiatives and voluntary agreements have been established with different approaches to solve the plastic pollution challenge.

INTERNATIONAL STRATEGIES, PARTNERSHIPS AND FRAMEWORKS

Since 1972, South Africa has ratified several international treaties, forged partnerships and subscribed to legal frameworks to combat plastic pollution in its terrestrial and marine environment. This is giving South Africa a firm footing to voice its concerns in global forums, on the one hand, and gaining access to the latest environmental considerations regarding the combating of plastic pollution, on the other. Various initiatives and platforms exist and this list is not exhaustive.

2019 —

The **Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal**, which South Africa is party to, at its 14th Conference of the Parties, adopted a decision to incorporate certain categories of plastic under its scope. This includes giving parties the right to prohibit the import of plastic at end of life as well as requiring parties to obtain prior written informed consent for the export of plastic of this nature. To be traded, waste plastic has to be clean and must consist of single or clearly defined plastic polymer types that can be recycled. Mixed bales of rubbish are not acceptable.

This decision obtained great media coverage and was seen as a statement from the 187 countries to address the plastic pollution problem. Since then, the world has seen developing countries, specifically the Philippines and Indonesia, sending back shipments of plastic scrap and waste to countries of origin, including the USA, the UK and Australia.

South Africa became a signatory in May 1994. The Basel amendments will take effect from 1 January 2021.

2017 —

The G20 Action Plan on Marine Litter was agreed upon by the G20 countries (akin to the G7 Action Plan of 2015). The action plan includes a commitment to “take action to prevent and reduce marine litter of all kinds, including from single-use plastics and micro-plastics”.

South Africa is one of the G20 countries.

As global governance frameworks, however, these action plans have some inherent limitations, the most evident being that they include only a limited number of states. Another notable drawback is that they are not legally binding, and do not have compliance mechanisms, funding systems or effective implementation support architectures.

2015

The 2030 Agenda for Sustainable Development was adopted by all UN member states. A blueprint for achieving this agenda took the form of the **17 Sustainable Development Goals** (SDGs).

The SDGs that specifically relate to combating plastic pollution are:

- SDG 6: Clean water and sanitation
- SDG 8: Decent work and economic growth
- SDG 9: Industry, innovation and infrastructure
- SDG 11: Sustainable cities and communities
- SDG12: Responsible consumption and production
- SDG 13: Climate action
- SDG 14: Life below water
- SDG 15: Life on land
- SDG 17: Partnerships for the goals

2014

Several **UN Environment Assembly** (UNEA) resolutions have been made on marine litter and microplastics from the first UNEA meeting in 2014. These resolutions called for strengthening the UN Environment Programme's (UNEP) role in taking action on marine litter and microplastics in UNEA-1; establishing the Ad Hoc Open-Ended Expert Group on Marine Litter and Microplastics in UNEA-3; and addressing single-use plastics in UNEA-4. Resolutions also call for greater collaboration and coordination of efforts to address plastic pollution.


South Africa is part of the member states participating in the UNEA discussions.

2011

The **Honolulu Strategy: Global Framework for Prevention and Management of Marine Debris** is a voluntary approach to connect marine litter programmes and foster collaboration among them by sharing lessons learned and best practices. It is the recommended framework to be used for UNEP's GPA (see 1995 below).


South Africa is part of two Regional Seas Programme Conventions, namely the Abidjan and Nairobi conventions, which places it in a unique position to coordinate initiatives through both platforms. The Abidjan Convention is currently undergoing a regional assessment on marine litter to inform a Regional Action Plan to address marine litter in member countries. The Nairobi Convention completed a marine litter assessment in 2008 and is currently implementing its Regional Action Plan.

1995

The Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA) was set up in 1995 and is hosted by UNEP. The Global Programme of Action aims to foster collaboration and coordination among states to prevent marine pollution from land-based sources and encourage action at the national, regional and international level. The programme operates primarily through the Regional Seas Programme.

The success of the GPA is debatable: for more than two decades after its establishment the results have not been particularly convincing. Part of the reason for this could be that it lacks a functioning compliance mechanism. It also does not provide sufficient funding for the implementation of the objectives in developing countries.

1982 — Part XII (Articles 192–237) of the 1982 **UN Convention on the Law of the Seas** (UNCLOS) aims to protect and preserve the marine environment from land- and sea-based sources of marine pollution. UNCLOS is a comprehensive convention that covers virtually all matters relating to the management and use of the ocean.

South Africa ratified UNCLOS on 23 December 1997.

1978 — The **International Convention for the Prevention of Pollution from Ships** (MARPOL) aims to prevent marine pollution from operational or accidental causes by ships.

South Africa accepted participation in MARPOL in February 1985.

1972 — **Convention on the Prevention of Marine Pollution by Dumping Wastes and Other Matter** (the London Convention) and the 1996 Protocol to the London Convention (the London Protocol) aim to control pollution of the sea by dumping and to encourage regional agreements supplementary to the Convention.

South Africa is a party to the London Convention.

AFRICAN PARTNERSHIPS

2020 — President Cyril Ramaphosa is the chairperson of the **African Union** (AU) in 2020, presenting another opportunity for leadership in the case where the AU has also called on African cities to commit to recycling at least 50% of the urban waste they generate by 2023 and to grow urban waste recycling industries.[210]

2019 — In 2019 the African First Ladies took the lead on the plastics front by hosting two high-level side events. The first was on Banning Plastics towards a Pollution-free Africa Campaign, which resulted in the **Addis Ababa Communique** to advocate the banning of plastics. The second was on Plastic Pollution Solutions for Development in Africa to initiate the implementation of the Communique.

2016 — The **East African Legislative Assembly** passed a Bill in 2016 to ban the manufacture, sale, import and use of certain plastic bags across its six member states, with a combined population of approximately 186 million people.[211] A total of 127 countries have put into force some type of legislation to ban the use, manufacture, free distribution and import of plastic bags as at July 2018. African countries have been seen to be leaders in this regard, with 37 countries regulating plastic bags in some way.

BOX 20: TOWARDS A NEW GLOBAL LEGALLY BINDING AGREEMENT ON PLASTIC POLLUTION

Acknowledging the current gaps in the existing strategies, policies and frameworks, WWF recognises and supports the need for an effective global response to plastic pollution through the implementation of a new international legally binding agreement. Such a treaty would make the issue of plastic pollution a joint global undertaking, setting clear responsibilities for states and ensuring accountability for the growing production, consumption and leakage of plastics into the environment.

The **African Ministerial Conference on the Environment** (AMCEN) held in Durban in November 2019, saw 54 member states endorse a declaration calling for global action on plastic pollution. Among the options to be further explored was a suggestion for a new global agreement to combat plastic pollution. African governments have now joined the Caribbean Community (CARICOM), the Association of Southeast Asian Nations (ASEAN), the Pacific Island Countries and the Nordic states in their call for strong global action on plastic pollution.

The South African Minister of the Environment, Barbara Creecy, holds the AMCEN presidency for 2020/21, which is an opportunity for South Africa to take the lead on a number of topics, including addressing the plastic pollution challenge.

210 UNEP, 2018a.
211 East African Legislative Assembly, 2016.

THE NEW PLASTICS ECONOMY AND THE SOUTH AFRICAN PLASTICS PACT

The New Plastics Economy is an ambitious global initiative to build momentum towards a plastics system that works. It applies the principles of the circular economy and brings together key stakeholders to rethink and redesign the future of plastics, starting with packaging. The New Plastics Economy Global Commitment is a shared vision agreed upon by businesses, governments and organisations to address plastic pollution at source. It is led by The Ellen MacArthur Foundation together with UNEP to drive engagement with governments and other key players.[212]

The New Plastics Economy also hosts a global Plastics Pact Network, which is a platform for multiple national implementation initiatives. Each national initiative will be aligned with the common vision outlined in the Global Commitment, but will set national targets and develop a roadmap to suit the local context. The South African Plastics Pact was launched by WWF South Africa in partnership with the South African Plastics Recycling Organisation (SAPRO) and the UK's Water and Resources Action Programme (WRAP) in January 2020. It is the first national Plastics Pact in Africa and joins the global Plastics Pact Network.

BOX 21: THE SOUTH AFRICAN PLASTICS PACT – A FIRST IN AFRICA

The SA Plastics Pact

The South African Plastics Pact was launched in January 2020 and joined The Ellen MacArthur Foundation's Plastics Pact global network, aligned with the New Plastics Economy vision. The first of its kind in Africa, the South African Plastics Pact joins France, the UK, the Netherlands, Chile, Australia and the Pacific and the European Union to exchange knowledge and collaborate to accelerate the transition to a circular economy for plastic.

The South African Plastics Pact is managed and implemented by GreenCape, with the founding members committed to a series of ambitious targets for 2025 to prevent plastics from becoming waste or pollution.

At the date of publication, the South African Plastics Pact members are Berry Astrapack, the Clicks Group, Clover, Coca-Cola Africa, Danone, Distell, HomeChoice, Myplas, Pick n Pay, Polyoak, Palletplast, RCL Foods, SPAR, Spur Holdings, The Foschini Group, Tigerbrands, Tuffy, Unilever and Woolworths. Supporting member organisations include the African Circular Economy Network, African Reclaimers Organisation, the City of Cape Town, the Department of Environment, Forestry and Fisheries, Fruit South Africa, the Institute of Waste Management of Southern Africa, the Polyolefin Responsibility Organisation, the Polystyrene Association of South Africa, the PET Recycling Company, South African Bottled Water Association, SAPRO and the Southern African Vinyls Association.

By 2025, all members commit to:

- Eliminate problematic or unnecessary plastic packaging through redesign, innovation or alternative (reuse) delivery models
- 100% of plastic packaging to be reusable, recyclable or compostable*
- 70% of plastic packaging effectively recycled
- 30% average post-consumer recycled content across all plastic packaging

*In the case of compostables, this is applicable only in closed-loop and controlled systems with sufficient infrastructure available or fit-for-purpose applications.

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212 The Ellen MacArthur Foundation, 2019a.

In order to achieve these 2025 targets for a circular economy for plastic in South Africa, various activities are required:

- Some plastic items are problematic or unnecessary and need to be designed out.
- Reuse models can reduce the need for single-use packaging, while at the same time holding the potential for significant user and business benefits.
- All plastics need to be designed to be reusable, recyclable or compostable in practice and at scale, with a concerted effort on both the design and the after-use side.

By delivering on these targets, the South African Plastics Pact will help to boost job creation in the South African plastic collection and recycling sector, and help to create new opportunities in product design and reuse business models.

Following the launch, GreenCape, with the support of WWF South Africa and WRAP, has developed the South African Plastics Pact roadmap for 2025 towards collective action in the local market, with annual public progress reporting.

ALLIANCE TO END PLASTIC WASTE

Another global initiative is the Alliance to End Plastic Waste (AEPW), which was founded by various global petrochemical companies. The alliance aims to raise funds in order to invest in developing and scaling up solutions to manage plastic at end of life, through education, innovation, clean-ups and investment in infrastructure in Southeast Asia. The fundraising and investment target is $1,5 billion, to be provided by the member organisations over the next five years.[213] Sasol is currently the only African-owned company which is a member of the Alliance.

AFRICAN MARINE WASTE NETWORK

The African Marine Waste Network is a project under the Sustainable Seas Trust. It aims to prevent marine litter at source by providing a platform for collaboration and knowledge sharing through its network of government bodies, industry and civil society. Its current projects include developing and testing marine litter monitoring guidelines in collaboration with UNEP, developing educational materials for schools, promoting enterprise development and providing research expertise in ghost gear and microplastics.

CLiP

The Commonwealth Litter Programme (CLiP) aims to support four developing countries (the Solomon Islands, Vanuatu, South Africa and Belize) in preventing plastic litter from entering the marine environment. CLiP is led by the UK through the Centre for Environment Fisheries and Aquaculture Science (Cefas) and is funded by the UK Department for Environment, Food and Rural Affairs (Defra).

THE AFRICAN CIRCULAR ECONOMY ALLIANCE

The African Circular Economy Alliance is a project hosted under the Platform for Accelerating the Circular Economy by the World Resources Institute. It aims to share best practices, undertake collaborative projects and advocate for the circular economy between countries at a ministerial level. The alliance was founded by Rwanda, South Africa and Nigeria in 2016, and joined by Niger, Senegal, Malawi and the Democratic Republic of the Congo in 2018.

213 AEPW, 2019.

ACTORS AND ACTIONS

IN SUMMARY

All actors in the plastics value chain have a role to play in tackling the plastic pollution challenge. While there are several policies and actions at play, little can be achieved without collaboration and the alignment of these actions.

1. **An expanding value chain:** South Africa has an established plastics value chain which contributes positively to GDP. Due to the increased demand for plastics locally, further expansion in production is being explored without considering end-of-life implications.
2. **Poorly aligned policy:** Government departments such as the Department of Environment, Forestry and Fisheries, the Department of Science an Innovation and the Department of Trade, Industry and Competition, all have interests in plastics, but the policy strategies of these departments are poorly aligned.
3. **Implementation challenges:** There have been ongoing changes to the National Environmental Management: Waste Act 59 of 2008 to align with the waste hierarchy and support a circular economy. However, challenges in implementation are due to a lack of capacity, funding and infrastructure.
4. **Research to change perceptions:** There has been increasing research on waste and material management in South Africa. The Department of Science and Innovation is funding projects and research to build capacity in the waste sector and change the perception towards waste as a secondary resource with considerable business opportunities and potential for job creation. Research institutions and pilot projects can showcase innovation in the value chain with new product delivery models and circular systems. Scaling up of these solutions are needed.
5. **A lack of holistic action:** In South Africa, regionally and globally, a number of strategies, policies and legislation aimed at addressing plastic pollution have been developed. Bans on plastic carrier bags have been the most common form of regulation in African countries. International policy and strategies do not address the plastic pollution crisis holistically. Increasingly, there are calls for a new intergovernmental legally binding agreement to address this.
6. **Extended producer responsibility:** Industry has been managing voluntary extended producer responsibility (EPR) since the early 2000s; however, there has been several delays in the implementation of mandatory extended producer responsibility in South Africa and the development of binding targets for waste diversion from landfill.
7. **New trends:** Voluntary agreements and multisector collaborative platforms are a trend that emerged during 2019 with the development and launch of initiatives such as the South African Plastics Pact in January 2020.
8. **Civil society organisations:** More than ever before, civil society organisations and initiatives are getting more attention and are creating awareness of the plastic pollution problem among ordinary citizens.

SECTION 5

ACTIONS FOR A CIRCULAR PLASTICS FUTURE

A business-as-usual approach to plastic production and consumption is not compatible with a sustainable environment and society. The good news is that viable solutions already exist to right the system, rapidly and at the required scale.

Fresh fruit and vegetables in a reusable net bag as an alternative to a plastic carrier bag.

DRIVING CHANGE TOWARDS A CIRCULAR PLASTICS ECONOMY

WWF focuses on four practical areas to drive systemic and collaborative change towards a circular plastics economy that eliminates waste and pollution: examining the trade-offs and making the hard decisions, accountability based on accurate and trusted data, unlocking investment, and supporting the local industry.

TOWARDS A CIRCULAR PLASTICS ECONOMY IN SOUTH AFRICA

1 Trade-offs and decision-making

- Align to a common vision
- Strengthen plastics policy and regulation
- Support a legally binding international agreement
- Protect basic services and human dignity

2 Ensure accountability

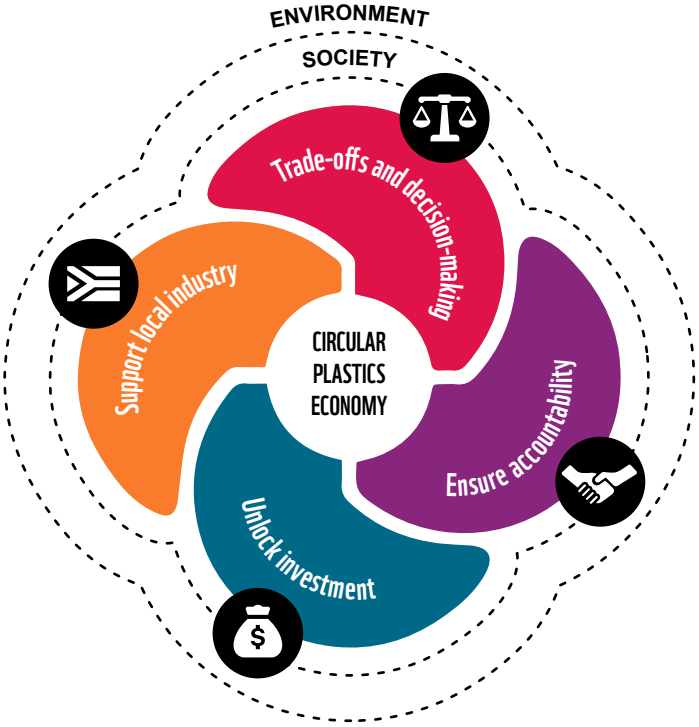
- Develop evidence-sharing systems
- Commit to time-bound national targets
- Transparently report on progress

3 Unlock investment

- Implement an industry strategy
- Support the South African Plastics Pact
- Capacitate packaging technologists
- Fund new technology and business models
- Scale up product delivery innovation

4 Support local industry

- Increase recycled content in plastic packaging
- Educate and mobilise for separation-at-source
- Develop mechanisms for levelling the playing field

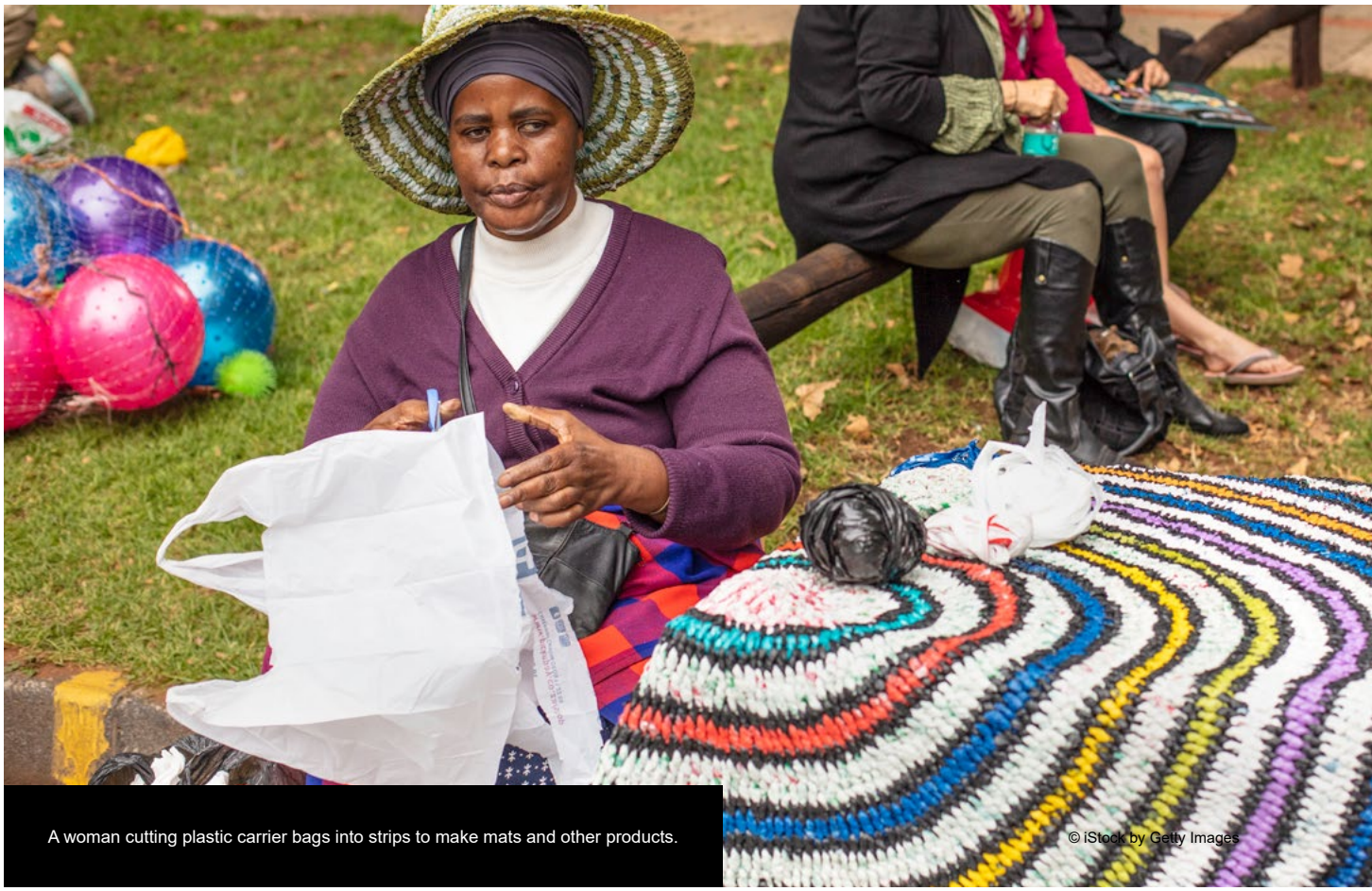


"A transition to a circular economy shifts the focus to reusing, repairing, refurbishing, re-purposing and recycling and up-cycling. It requires industry to redesign complete supply chains for resource efficiency and circularity. We need to create markets responding to shifts in consumption patterns, away from traditional ownership towards using, reusing, sharing and more circularity."

– Mr Kgauta Mokoena, Chief Director: Chemicals and Waste Policy, Monitoring and Evaluation, 2018 African Circular Economy Alliance event in Rwanda

In the content that follows, the four practical areas are discussed in more detail along with the barriers and necessary actions to overcome them. The focus is on plastic packaging and items used in consumer goods in South Africa. These actions, some already identified and initiated by various stakeholders, are the necessary starting points for building a more circular and sustainable plastics system.

Sectors that produce and use plastic products that are prone to leakage and cause significant environmental damage have been identified in the text. These include marine-based sectors (discarded fishing gear and waste dumped at sea) and sectors responsible for the manufacture of sanitary wear, nappies and cigarettes (cigarette butts). The scope of this report does not include actions for these sectors. There is a paucity of data on marine-based sources of pollution in South African waters, and WWF South Africa has not yet engaged with the tobacco industry in the country. However, various global interventions have been published for these industries and WWF South Africa is planning engagements with the relevant sectors in South Africa to find solutions.



A woman cutting plastic carrier bags into strips to make mats and other products.

EXAMINING THE TRADE-OFFS AND MAKING THE HARD DECISIONS

The government and industry must implement and drive action in order to deliver the required solutions to take forward – nationally, regionally and globally. However, this requires that they together examine the trade-offs of these actions and make the hard decisions upfront.

The plastics industry and various sectors that consume plastics (fishing, tobacco, retailers, tourism and hospitality) find themselves in an uncomfortable position at present. On the one hand there is a rising consumer outcry on the environmental impact of plastic; on the other hand, an unabated demand for the product due to its versatility and affordability. The economic, social and environmental trade-offs between plastic and alternative materials and systems, as well as virgin and recycled materials, need to be accurately quantified to realise lasting benefits. A clean environment is a socio-economic asset but it is imperative that, during this process, any impact on jobs or livelihoods is compensated for.

We should change our mindset away from the concept of waste management to sustainable and circular resource management.

Examining the trade-offs and making these hard decisions require an integrated solution and extensive funding to address plastic and other waste streams (secondary resources). A circular plastics economy must be established, where plastic is valued and never becomes waste, and jobs are sustainable. In other words, we should change our mindset away from the concept of waste management to sustainable and circular resource management.

The collaboration between private industry and government (national, provincial and local) via the mandatory extended producer responsibility scheme and the integration of informal waste reclaimers at municipal and community level will be a crucial factor for future success. In addition, the proposed transition to a circular plastics economy calls for behaviour change at a sectoral level, which includes enhancing institutional capacity.

ALIGNING TO A COMMON VISION

The plastics life cycle is complex and no single organisation or stakeholder can tackle the plastic pollution problem on their own. When stakeholders in the plastics value chain do not see the same solutions to this problem, it leads to a stalemate within the sector. Cross-sectoral, multi-stakeholder collaboration is required and, most importantly, the setting of a common agenda for collective action is a critical step. Given the many ongoing activities and interventions in the plastics landscape, it is important that efforts are not duplicated.

This common vision should be founded on circularity and sustainability principles with a holistic systems thinking approach. It needs to be reflected in and aligned with the relevant policies and regulations across government departments and levels, through investments in the necessary technology and infrastructure, as well as in initiatives led by the government, industry and civil society organisations.

STRENGTHENING PLASTICS POLICY AND REGULATION

Various policy instruments that incentivise sustainable plastics production, consumption and disposal are urgently needed. These instruments should include regulation, certification and standards on plastics packaging including biodegradable and compostable plastics.

A mandatory extended producer responsibility (EPR) scheme is a critical policy instrument to hold industry and the government accountable. The aim should be to ensure that the responsibility for plastic products put on the market extend beyond sales to the collection and processing of plastic packaging and products at end of life. The EPR scheme will need to have a long-term and ambitious vision, including landfill diversion, collection and recycling targets for plastics, and should align with separation-at-source targets for other waste streams. It will need to be reinforced by additional local government reforms to provide easier access for recyclers

and other secondary markets to plastic materials after disposal. The informal waste sector should be recognised and integrated in the mandatory EPR scheme.

An incentive for sustainable and circular design of plastic packaging should be included in the design of the EPR scheme through modulated EPR fees.[214] Modulating fees is an instrument that puts the circular plastics economy into practice and should be seriously considered. However, the complexities of designing a mechanism for fees adjusted to reward producers according to products designed for local conditions will take time. In addition to EPR fee modulation, various information-based policy instruments can further promote the sustainable and circular design of plastic packaging and products. These include guidelines on packaging design for circularity, eco-labelling, on-pack recycling labels (OPRLs) and inclusion of recycled content and product standards and certification. In particular, standards, certification and regulation for biodegradable and compostable plastics are urgently needed.

The unprecedented low price of virgin plastic, a consequence of the low oil price due to COVID-19 and other geopolitical pressures, has decidedly reduced the price competitiveness of recycled plastic compared to that of virgin plastic in 2020. This has a significant negative impact on the demand for recycled plastic, leading to closures of recycling facilities, the value of plastic scrap nearing zero and the loss of valuable jobs and livelihoods in the informal and formal waste sector. In order to "level the playing field", it is recommended that economic or regulatory instruments be used, namely taxes or regulation on a minimum recycled content in applicable products and packaging.[215] In order to incentivise and enable a market for circular plastics, tax exemptions on products with recycled content (such as plastic carrier bags) and subsidies to assist the waste and recycling sector need to be implemented.

Overall, the narrative needs to shift away from viewing plastic as "waste" and rather seeing it as a "secondary resource" in a circular plastics economy. It is essential that this shift in perspective (and terminology) is reflected in national policy to create more business opportunities and circular material flow.[216]

ALIGNING WITH AND SUPPORTING A LEGALLY BINDING INTERNATIONAL AGREEMENT

The steady pollution of the global commons requires an international response at multiple levels of governance. To address the systemic challenges across the plastics life cycle and the impact of plastic pollution across borders, WWF supports the call for a new international legally binding agreement on plastic pollution (see Box 20). African Ministers declared their support for a global response at the African Ministerial Conference on the Environment (AMCEN), held in Durban in November 2019.

As the chair of AMCEN and the African Union (AU) for 2020, South Africa can provide strong leadership through these institutions to initiate measures to support African countries to collectively deal with plastic production, consumption imports and end-of-life management. The recycling industry and producer responsibility organisations can work together with the government to share knowledge and benefit from collaboration with other African countries. This support includes:

- Open trade of plastic at end of life between South Africa and African countries with no recycling infrastructure to recycle and reprocess plastic for use in the African economy, in line with measures outlined in the amendment of the Basel Convention in May 2019 to control the transboundary movement of plastic waste
- Knowledge sharing and enabling investment in infrastructure in African countries
- Facilitating regional collaboration under the aegis of AMCEN and the AU to develop a regional plastics policy to address unchecked imports and the unsustainable production and consumption of plastic, to ensure that African countries do not become the dumping ground of plastics waste from developed countries

PLASTICS SHOULD BE SEEN AS A SECONDARY RESOURCE, NOT AS WASTE

214 EPR fees are set up (modulated) to reward producers (bonus) for designing products that mitigate their impact on the environment (products that can be recycled) or disincentivise (malus) for placing less circular or environmentally friendly products.

215 As has been proposed in the EU Green Deal and the proposed UK Plastic Packaging tax (UK Government, 2020).

216 Germany is now referring to landfills as "asset stockpiles", further enforcing the view that the government's definitions concerning plastic after first use must change from defining it as a material with liability to a valuable resource.

THE PROVISION OF BASIC SERVICES AND ACCESS TO A CLEAN AND POLLUTION-FREE ENVIRONMENT ARE CONSTITUTIONAL RIGHTS

PROTECTING BASIC SERVICES AND HUMAN DIGNITY

The current poor performance of municipal solid-waste management departments needs to be addressed along with plans to improve waste collection coverage and rates. This should be done through collaborating with informal waste reclaimers and integrating them into the waste management sector at municipal and community levels. Steps must be taken to ensure that they are able to carry out their services in a dignified manner and are compensated accordingly.

The diversion of plastics and other valuable materials from landfill is crucial, as is the responsible disposal of the remaining materials in engineered landfills to minimise the leakage of waste into the environment. This will go a long way in reducing illegal dumping, non-compliant landfills and open burning.

South African municipal waste collectors using personal protective equipment while collecting waste during the COVID-19 lockdown period.

ENSURING ACCOUNTABILITY

Once the hard decisions have been made by the government and industry, progress towards a circular economy for plastics needs to be monitored and publicly reported to ensure accountability. This requires bold leadership, accurate data collection and transparency.

A trusted, centralised and accurate data repository is required to close the current data gaps in plastic pollution research and the quantification of socio-economic and environmental impacts. It is crucial to establish a baseline of the current plastics landscape in South Africa in order to understand where interventions are needed, and to measure progress towards targets to reach the desired state. Monitoring of and transparent reporting on progress made towards these targets will support ongoing interventions and assist in identifying new areas of focus for industry and the government once the targets have been met. Adequate monitoring and reporting will also drive accountability in a wider context by reflecting the compliance of organisations with the regular monitoring and reporting requirements of the UN Sustainable Development Goals.

DEVELOPING SYSTEMS FOR SHARING LOCAL EVIDENCE

Collaboration between the government, industry, research institutions and civil society is needed to reach agreement on a centralised and accurate data repository for baseline data to map plastic material flows. This should include data on production, direct imports (plastic resins, finished and semi-finished goods, scrap and packaging), indirect imports (products containing plastic or packaged in plastic), leakage, collection, diversion from landfill and recycling. Agreed-upon monitoring and reporting methodologies also need to be included.

While data exists on direct plastic imports using SARS tariff code 39, there is a significant data gap on imported indirect plastic products that do not fall under code 39. This data is required to determine what proportion of the waste stream is made up of indirect plastic imports to ensure equitable responsibility for this plastic at end of life. Leakage and material flow data should be used to identify and prioritise various hotspots according to geographical area or for product and packaging formats, and plastic types. This data should also be used to develop product standards and terminology for different plastic materials (bio-based, biodegradable, compostable, conventional plastics) and additives in order to improve transparency on material composition and of product claims.

Research into alternative materials and delivery models needs to ensure that the unintended environmental and socio-economic impacts are taken into account by using Life Cycle Assessment or other credible methods. For example, a recent Life Cycle Sustainability Assessment study conducted by the CSIR on plastic carrier bags should be used by brand owners and retailers to make informed decisions about the future procurement of carrier bags.

COMMITTING TO AMBITIOUS, TIME-BOUND NATIONAL TARGETS

It is recommended that the relevant stakeholders in the plastics value chain commit to targets for collection, diversion from landfill, recycling and leakage prevention for plastics, through regulation and voluntary agreements. Ambitious targets to ensure the increasing circularity of plastic packaging have already been set by members of the South African Plastics Pact (see Box 21). National ambitions should be further supported by regulation that provides the framework for the development, implementation, monitoring and evaluation of extended producer responsibility (EPR) schemes (see Box 18) by producers, importers and brand owners. The EPR framework should have targets for collection, landfill diversion, recycling and post-consumer recycled content to ensure that products are designed to be recycled and reused.

REPORTING ON PROGRESS IN A TRANSPARENT WAY

Progress made towards these time-bound targets to achieve a circular economy for plastics will be measured from the established baseline and strengthen the importance of the data repository. It should be independently audited and publicly reported to ensure accountability. This data will be used to monitor plastic material flows and leakage volumes into the environment to determine the success of regulation, voluntary agreements and other supporting interventions.

UNLOCKING INVESTMENT

Increasing the value of end-of-life plastics and scaling up novel product delivery systems will ensure that the plastic material remains within the economy and subsequently create much-needed opportunities in a labour-intensive sector.

Investment for interventions across the plastics lifecycle will fast-track the transition from the current linear economic model of "take-make-waste" to a circular plastics economy. One of the biggest barriers is the plethora of plastic materials and formats with varying degrees of circularity (reusability, recyclability and recycled content), along with the insufficient collection and diversion of end-of-life plastic material. Increasing the value of plastics through the mandatory extended producer responsibility scheme will act as an incentive to collect post-consumer plastics, unlock much-needed investment in infrastructure and create multiple business opportunities and jobs in the sector.

IMPLEMENTING AN INDUSTRY STRATEGY FOR PLASTICS

The current fragmentation in the plastics industry should be addressed through the development of an overarching industry strategy. This will support the need for a common vision, address the socio-economic and environmental sustainability of the industry and strengthen and consolidate other initiatives within the government and industry. The strategy will be a valuable and much-needed input into the plastic sector Master Plan (replacing the Industrial Policy Action Plans[217]) which is currently under development under the aegis of the Department of Trade, Industry and Competition.

The Master Plan, with a clear vision and strategy from industry, is well placed to identify key areas for investment. Investment in technology (chemical and mechanical recycling infrastructure, equipment for converters) and other system interventions (collection, product design) will ensure that plastic remains in the economy. This could partly address the current trade deficit due to the shortage of locally available ethylene.

SUPPORTING THE SOUTH AFRICAN PLASTICS PACT

Businesses and organisations across the plastics packaging value chain are encouraged to collaborate. All direct stakeholders in the plastics packaging value chain are well placed to become a member of the South African Plastics Pact (see Box 21), while indirect stakeholders are best placed to become supporting members. As members, businesses and organisations will set the example by demanding more recycled content in packaging and ensuring that all plastic packaging is recycled in practice or is reusable. This will in turn drive up the value of the material and create new business and investment opportunities. Considering the short- and medium-term impacts of the COVID-19 pandemic coupled with the unprecedented low oil price, this collaboration is crucial.

INSPIRING PACKAGING TECHNOLOGISTS TO DESIGN FOR CIRCULARITY

Raising the awareness of and educating packaging technologists are important to achieve, first, packaging that is recycled in practice and second, circular packaging design. Rationalising[218] materials and formats will reduce the current inefficiencies in recycling and drive economies of scale, which will ultimately reduce plastic leakage into the environment. Buy-in from marketing and branding divisions in organisations and plastic packaging industry bodies will ensure that

217 The Industrial Policy Action Plans (IPAPs) provide an economic analysis of prevailing global and domestic economic conditions relevant to industrial policy and time-bound action plans and programmes across a range of sectors and list the key constraints to an optimal industrial strategy. See gov.za/sites/default/files/gcis_document/201805/industrial-policy-action-plan.pdf

218 Rationalising means consolidating and reducing the number of polymer types, formats, colours and additives in plastic packaging in order to create a standard that is easily identified, collected and recycled or reused.

packaging decisions support targets, such as ensuring that 100% of plastic packaging is reusable or recyclable and has post-consumer recycled content.

Norms and standards for packaging design for circularity are needed. These norms and standards must go beyond the current Design for Recycling, to include reduction of virgin material input, reuse of materials, as well as the new on-pack recycling label (OPRL) scheme (see Box 13). At present, there is a significant gap in harmonised standards and guidance on plastic packaging. The result is a diverse range of materials, formats and labelling, which is an obstacle in achieving cost-effective plastic collection and reprocessing. It is, therefore, imperative that the Packaging Guideline that is under development through the Chemicals and Waste Phakisa (see Box 19) adheres to international standards and definitions of recycling (recycled in practice and not technically recyclable) such as the International Organization for Standardization (ISO) and The Ellen MacArthur Foundation.

FUNDING NEW TECHNOLOGY, BUSINESS MODELS AND INFRASTRUCTURE

Extended producer responsibility fees and finance obtained from public–private partnerships must be directed towards infrastructure and technology development, as well as capacity building to minimise and divert plastic waste at municipal level. The growing demand for circular plastic products should lead to the required rationalisation of plastic packaging materials and formats to support recycling and alternative reuse models (see Figure 15), and ensure that products contain recycled content. This in turn should lead to the scaling up of current mechanical recycling capacity and chemical recycling opportunities. The plastics sector Master Plan currently under development is one of the mechanisms to realise this.

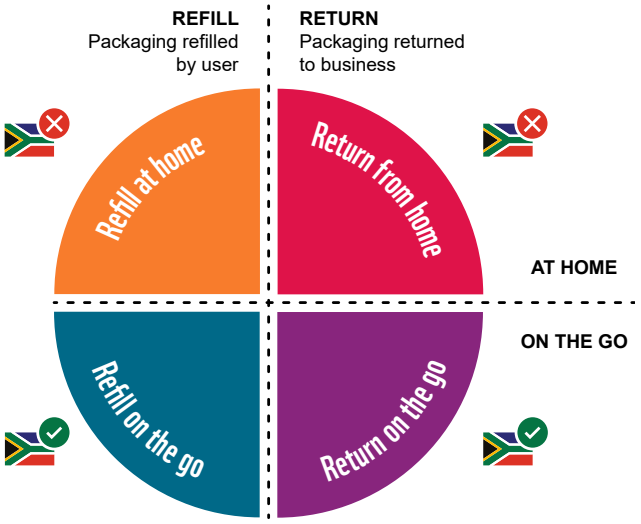
SCALING UP PRODUCT DELIVERY INNOVATIONS

There are numerous successful case studies of reuse and refill delivery models globally, using reverse logistics[219] of products and packaging, among others (see Case study 6). Retailers could follow these examples to explore and innovate, and attract private finance and support. These systems would then become more affordable and accessible to more consumers, open up new business opportunities and reduce waste generation and plastic leakage into nature.

The scaling up of existing reuse models, as a promising business model, is being explored by The Ellen MacArthur Foundation New Plastics Economy initiative in the 2019 *Reuse: Rethinking Packaging report*.[220] The South African Plastics Pact is also planning a project towards the end of 2020 to stimulate innovation in reuse and facilitate the uptake of reuse models in the South African market.

FIGURE 15: THE FOUR REUSE MODELS[221]

1. **Return from home**
   Packaging is picked up from home by a pickup service (e.g. by a logistics company)
2. **Return on the go**
   Users return the packaging at a store or drop-off point (e.g. in a deposit-return machine or mailbox)
3. **Refill on the go**
   Users refill their reusable containers away from home (e.g. at an in-store dispensing system)
4. **Refill at home**
   Users refill their resuable containers at home (e.g. with refills delivered through a subscription service)



219 All activity associated with a product or service after the point of sale.
220 The Ellen MacArthur Foundation, 2019b.
221 The Ellen MacArthur Foundation, 2019b.

SUPPORTING LOCAL INDUSTRY

Putting in place the necessary regulations and incentives will enable the local industry to transition to circularity and expand markets beyond South Africa. Collaboration and mobilisation in all sectors in the plastics value chain will lead to this change.

THERE ARE ALREADY OPPORTUNITIES TO SHARE CIRCULAR PLASTICS PRINCIPLES AND BEST PRACTICE INTO AFRICA

The recycling industry is driven purely by economic principles with no external subsidies or incentives and little enforcement of regulation (taxes, waste licences). Other sectors, such as resin producers and converters, also face challenges to transition to circularity, such as technology limitations and lock-in.[222] To support circularity and increase employment opportunities in the sector locally will entail the following:

- Various policy mechanisms and green public procurement, industry commitment and subsequent enforcement
- Developing product standards for plastic products and packaging (bioplastics, recycled content, recyclability), for imports and local manufacturing
- Encouraging retailers and brand owners to support locally manufactured products using locally produced feedstocks (post-consumer resin or virgin) where possible
- Ensuring that employment opportunities in the sector are dignified

These actions, among others, will maximise business and job opportunities and position the industry to expand markets, not only in South Africa but also into Africa. There are already opportunities to share circular plastics principles and best practice into Africa, such as recycling infrastructure, reuse models and setting up EPR schemes and producer responsibility organisations. The market for circular plastic products and packaging in Africa is an opportunity that the local industry is well placed to take up.

INCREASING THE USE OF RECYCLED CONTENT IN PLASTIC PACKAGING

Targets set in regulation via extended producer responsibility, policy and economic instruments, as well as voluntary agreements such as the South African Plastics Pact, will identify the streams that can be targeted for increased post-consumer recycled content and create the much-needed demand. This should be supported by the development of national standards to include recycled content in products and packaging. Given that end-markets for recycled plastic have dried up, salvaging the sector requires urgent interventions from industry and the government in the short and medium term.

A barrier to including post-consumer recycled content is the technology and equipment used by converters. The current plastic manufacturing business model is one of high throughput coupled with high capital costs for specialised machinery able to process only a narrow range of resins. This makes it challenging and leads to reduced efficiency when incorporating recycled materials into the feedstock. By rationalising materials and narrowing the range of plastic products and packaging formats with varying physical properties will ensure more acceptable throughput when using recyclate feedstocks. Although introducing recycled content is a constraint in food contact applications of packaging, many opportunities exist in other applications and especially in secondary and tertiary packaging.

222 When organisations have made a large capital investment, usually in infrastructure, they are “forced” to make use of this infrastructure and associated processes for the life of the infrastructure. This could be for more than 20 years, which is usually the return-on-investment period.

EDUCATING, MOBILISING AND SEPARATING AT SOURCE

Education and awareness campaigns need to be set up for brand owners, retailers and shelf-facing consumers. These campaigns must be based on reliable information on reusable and refillable models for the delivery of products, the inclusion of recycled content in packaging and the recyclability of packaging. Brand owners and retailers should explore alternative delivery models and packaging materials and provide information to consumers to drive more sustainable consumption and product stewardship. A good example of consumer empowerment is when six of the major retailers in South Africa collectively adopted a standard on-pack recycling label which, for the first time, gave consumers clear instructions on what to do with the packaging after use (see Box 13). This has multiple benefits in the value chain through increased and improved separation-at-source (s@s) so that more plastic material can be recovered after use.

Separation-at-source is the best way to ensure that the plastics stream for recycling remains uncontaminated. Economic incentives could be used to maximise recovery of plastics and other packaging, such as deposit-return schemes in stores, or easily accessible material collection facilities and systems. In Germany, for example, customers can unwrap their goods in the store and immediately return the packaging to the retailer. Again, this must be coupled with widespread education.

Retailers and brand owners could explore various business-to-business (B2B) packaging and product delivery models that apply reuse principles. Various B2B reuse models are available in The Ellen MacArthur Foundation *Reuse: Rethinking Packaging* report.[223]

More research is needed on current consumer behaviour and how to shift that behaviour to more sustainable plastic packaging choices, taking into account the local context. Research into the effectiveness of current consumer education around s@s and littering is required to develop more impactful outreach programmes that bring about real change. This should be combined with research on gaps in the provision of the necessary waste management infrastructure and recycling systems.

LEVELLING THE PLAYING FIELD BETWEEN LOCAL PRODUCTION OF CIRCULAR AND NON-CIRCULAR PRODUCTS AND PACKAGING

To ensure that circular plastic products and packaging are produced in and imported into South Africa, product standards and specifications are needed to inform the development and implementation of targeted and appropriate policy and economic instruments.

Growing the local sector that produces circular products and packaging (instead of increasing imports) will expand the membership of current producer responsibility organisations and simplify the implementation and effectiveness of extended producer responsibility. Extended producer responsibility should also apply to imported packaging and packaged goods[224] to ensure that the end-of-life management of all packaging coming into the country is funded.

To further support circularity locally, brand owners and retailers need to identify product ranges where locally manufactured products can replace existing imports and where manufacturers can enter into off-take agreements for locally produced products.

The growth of the local industry involved in the production of circular products and packaging will open up economic and knowledge-sharing opportunities beyond the borders of South Africa, ultimately supporting the global movement towards a circular plastics economy.

THE GROWTH OF THE LOCAL INDUSTRY INVOLVED IN THE PRODUCTION OF CIRCULAR PRODUCTS AND PACKAGING WILL OPEN UP ECONOMIC AND KNOWLEDGE-SHARING OPPORTUNITIES

223 The Ellen MacArthur Foundation, 2019b.

224 Ideally, South Africa should then ensure that any plastic packaging and packaged goods intended for export are in fact going to a country where they can be responsibly managed, or returned to South Africa for recycling.

BARRIERS AND OPPORTUNITIES FOR SECTORS AND STAKEHOLDERS

A shift to a circular plastics economy will require a departure from stakeholders working in silos and protecting the current linear "take-make-waste" material flow model. A systems view and deep collaboration across all direct and indirect stakeholders and sectors are required to tackle the environmental and socio-economic externalities of plastic pollution and waste.

The themes and subthemes discussed in this report are distilled into barriers to circularity and opportunities for each sector in the plastics value chain. Some of the barriers inherent in some sectors are unique to the direct (Table 4) and indirect (Table 5) stakeholders in those sectors, whereas some of the opportunities and actions overlap and apply to all sectors (see Box 22).

BOX 22: OVERLAPPING AND CROSS-CUTTING OPPORTUNITIES AND ACTIONS FOR ALL STAKEHOLDERS

The overlapping and cross-cutting actions needed to transition to circularity through systems thinking and deep collaboration can be summarised as follows:

- Ensure support and buy-in across the plastics packaging value chain for a mandatory extended producer responsibility scheme. This will ensure that funds are available to invest in new technologies and infrastructure, increase the value of packaging after use and hold the industry accountable for plastic packaging and products at end of life.
- Work closely with the government and support the development and implementation of policy instruments and other regulation-based approaches or economic instruments to enable the transition to a circular plastics economy. This is relevant for all plastic products beyond packaging that have been identified as problematic, such as discarded fishing gear, sanitary wear, nappies and cigarette butts.
- Collaborate with other sectors in the plastics packaging value chain and commit to ambitious, time-bound targets to tackle plastic pollution. The South African Plastics Pact is a multi-stakeholder platform and industry-led voluntary agreement with a focus on plastic packaging that enables cross-value-chain collaboration and commitment to ambitious, time-bound targets, as well as transparent public reporting of progress towards those targets.
- Work with researchers, NGOs and other civil society organisations to develop a unified consumer education and awareness programme on plastics and sustainable consumption.
- Have a central and trusted repository of data and information (including plastics material flow, hotspots, Life Cycle Sustainability Assessment studies and standard monitoring and reporting methods) on which to base policy and organisational decisions in future.

A panel discussion by member representatives of the South African Plastics Pact at the launch event in January 2020, Cape Town.

TABLE 4: TOWARDS A CIRCULAR PLASTICS ECONOMY: BARRIERS AND OPPORTUNITIES FOR DIRECT STAKEHOLDERS

STAKEHOLDER	BARRIERS TO CIRCULARITY	OPPORTUNITIES
Plastic polymer producers	• Current linear business model where existing material in the system is not used as feedstock	• Explore circular business models including chemical recycling of plastics and other technologies to scale up the transition to circularity
	• Lower price of virgin plastic compared to recycled material	• Support the end-market for plastic at end of life through organisational commitments and by supporting various policy approaches
	• Technology and process lock-in (e.g. coal or gas to liquid) and replacement cost for new technologies and processes	• Lead the change through investing in novel or modifying existing technologies and research (e.g. chemical recycling)
Plastic converters	• Current machinery can only process a narrow range of plastic types with specific material properties. There is a high capital investment in this specialised equipment and it is more efficient to use virgin plastic resins. The price of virgin plastic fluctuates with the oil price and it is sometimes more cost effective to use virgin instead of recycled plastic, also considering plant efficiency	• Standardise plastic polymer chemistry, grades, formats and additives to simplify collections, sorting and remanufacturing • Support the end-market for recycled plastic through organisational commitments and by supporting various policy approaches
	• With the increasing number of plastic packaging and product formats and plastic materials (e.g. multilayers) along with contamination with other waste streams, the quality of recyclate is not guaranteed and can therefore not be remanufactured into packaging applications	• Become a member of the South African Plastics Pact to find solutions with other stakeholders in the value chain (researchers, brand owners and retailers) to activate innovation and investment to transition to reusable and recyclable materials and product and packaging formats, and alternative product delivery models

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STAKEHOLDER	BARRIERS TO CIRCULARITY	OPPORTUNITIES
Retailers	• Sustainability principles are not always integrated throughout the business	• Ensure that sustainability strategies are integrated throughout business activities and across departments
	• Strategy and targets on sustainable packaging are not followed in procurement and other departments due to price (currently the virgin price is lower than recycled plastic) or other factors	• Commit to targets on recyclability and reusability of packaging along with minimum recycled content
	• Lack of expertise regarding sustainable packaging design, alternative materials and delivery models • End of life of products and packaging not considered during the design phase	• Use local Life Cycle Sustainability Assessment (LCSA) studies to inform procurement decisions and collaborate with packaging suppliers (converters), product suppliers (home brands and others), waste management companies and recyclers through platforms such as the South African Plastics Pact to design and produce recyclable and reusable packaging with increased recycled content
	• Suppliers are not aligned with internal sustainable product and packaging design	• Increased demand for this more circular packaging will flow upstream to brand owners, converters and resin producers • Ensure that suppliers are participating in the extended producer resonsibility (EPR) scheme
	• If packaging is part of the price of the product, consumers perceive packaging as not having value or being a waste material even though the consumer also pays for the packaging	• Incentivise reuse models or deposit- return schemes with consumers using discounts or other economic incentive mechanisms in stores • Educate and raise awareness of consumers that packaging has value and needs to remain in the economy
	• Competition between retailers and brand owners prevents collaboration, cooperation and knowledge exchange	• Collaborate with other retailers, brand owners, producer responsibility organisations and other stakeholders on more effective and single-messaging consumer education on OPRLs, separation of packaging after use from other material streams, and possibilities of alternative delivery models • Also apply these principles in business-to-business transactions
	• Lack of regulations or guidelines for OPRLs	• Support development of norms and standards for circular packaging design and labelling and promote broad adoption of these across all retailers and brand owners

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STAKEHOLDER	BARRIERS TO CIRCULARITY	OPPORTUNITIES
Brand owners	• Using packaging primarily for or prioritising branding and marketing purposes before considering environmental impacts and design for circularity	• Use outcomes of local LCSA studies to inform purchasing decisions and collaborate with other sectors through a platform such as the South African Plastics Pact to find solutions to current packaging challenges • Only introduce products in the market with packaging that is widely collected and recycled • Introduce innovative reusable alternatives to plastic packaging • The demand for circular packaging will flow up to converters and resin producers • Apply these principles in business-to-business transactions
	• Lack of expertise regarding packaging design for circularity and not taking end-of-life impacts into account	• Embed the South African Plastics Pact targets into organisational strategy to ensure alignment across all departments • Participate in the mandatory EPR scheme to unlock investment in packaging end-of-life infrastructure
	• Lack of guidance or norms and standards to provide clear OPRLs for disposal instructions	• Voluntarily collaborate with other retailers, brand owners, producer responsibility organisations and other stakeholders on more effective consumer education on OPRLs, separation of packaging after use from other material streams, and the possibility of alternative product delivery models
Hospitality services	• Problematic plastic items procured and used in hospitality facilities are selected with affordability in mind	• Ensure that procurement policy prioritises sustainable and circular materials, products and packaging • Work with suppliers, academia and other stakeholders to explore more sustainable or circular materials or alternative product delivery models
	• Lack of knowledge on more sustainable and circular alternatives	• Communicate and collaborate with other hospitality organisations, waste management and recyclers to explore best practice • Ensure that packaging suppliers participate in the EPR scheme
	• Charging clients for takeaway and food packaging may discourage business	• Collaborate with other stakeholders and the government on taking a united stand to phase out problematic items and explore alternative product delivery models • Educate consumers on problematic items to shift preferences and practices
Consumers	• Very little knowledge and awareness of the types and impacts of plastic packaging and products and where the plastic goes after use	• Research needed to gauge consumer awareness on plastics • Then design a single credible and ongoing education campaign on plastics

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STAKEHOLDER	BARRIERS TO CIRCULARITY	OPPORTUNITIES
Consumers (continued)	• Lack of knowledge of what can be recycled in South Africa, and what not	• OPRLs to become standard and a requirement on all packaging • Consumers should build the habit of reading OPRLs and ensuring that plastic products and packaging are disposed of and separated accordingly
	• Disparity in socio-economic circumstances with regard to affordability and access to alternative goods and waste services	• Formal and informal retailers to explore alternative materials and delivery of products to empower consumers to access healthier food with less packaging • Industry and the government to ensure better waste collection coverage and diversion through extended producer responsibility
	• Lack of alternatives available at formal and informal retailers, such as reuse and refill product delivery models and packaging formats	• Empower consumers to put pressure on upstream stakeholders • Retailers (formal and informal) to explore and incentivise reuse and refill models • Extra costs of these alternatives could be met through other incentives until sufficient scale is achieved
	• Acknowledge the direct link between dietary habits and packaging found in the environment – most snack and convenience foods are packaged in plastic	• Packaging for convenience foods to be redesigned for reuse and recyclability • Policy instruments or industry mechanisms to shift behaviour of consumers will be necessary
Waste collectors, contractors, recyclers and treatment facilities	• The recycling and informal waste sector has limited support from industry and the government	• Integrate informal waste reclaimers in waste management at municipal and community level (guidelines have been developed) • Implement the mandatory EPR scheme
	• Dependence on waste disposal to landfill	• Increase the value of plastics and stimulate end-markets through various policy (EPR) and voluntary mechanisms (the South African Plastics Pact) to unlock investment into new post-use material management technologies and infrastructure
	• No or low value of certain plastic items and formats makes it uneconomical to collect them • Recycled plastic not price competitive with virgin plastic	• Develop norms and standards on packaging design (information instruments) or use modulated extended producer responsibility to ensure more circular packaging • Implement mandatory extended producer responsibility to ensure that the cost of collection and reprocessing is economically viable for all plastic packaging formats • Tax on or regulation of packaging without recycled content

TABLE 5: TOWARDS A CIRCULAR PLASTICS ECONOMY: BARRIERS AND OPPORTUNITIES FOR INDIRECT STAKEHOLDERS

STAKEHOLDER	BARRIERS TO CIRCULARITY	OPPORTUNITIES
Research institutions	• Limited funding for research and data generation	• Government and industry to provide joint funding for increased research and capacity to support the industry and waste sector
	• Unclear on mandate for housing a data repository and providing accurate and credible data on plastic material flows and plastic pollution impacts	• Be the trusted and independent source for data reporting and research outcomes to inform policy and business decisions • Work with the Department of Trade, Industry and Competition (DTIC) to provide information on indirect plastic imports, which is currently unknown
Government departments	• Polarised policy strategies developed by Department of Environment, Forestry and Fishery (DEFF), DTIC and Department of Science and Innovation (DSI) on waste, the circular economy and economic growth	• Develop an integrated policy strategy across key government departments to drive circular economy principles in the plastics life cycle to minimise waste, economic losses and resource extraction • DTIC to look at growing investment in the waste or secondary resource sector in the plastic Master Plan • New Master Plan for the plastics sector should focus on activating and supporting the production of sustainable and circular plastic products and packaging, which aligns with the aims of the DSI's Waste Research, Development and Innovation Roadmap and DEFF's Waste Hierarchy in the National Environmental Management: Waste Act 59 of 2008
	• Policy uncertainty about industry responsibility for priority waste streams and lack of capacity at local government level to manage waste	• Collaborate with industry, local government, NGOs and informal waste sector to develop and implement the mandatory EPR scheme and other mechanisms to enable sustainable waste and material management
	• Limited resources available for data collection, knowledge generation and sharing	• Together with industry, expand funding available for research into developing circular plastic materials (products and packaging), alternative product delivery and sustainable materials management across the plastics life cycle (local government) • Introduce the circular economy concept into the curriculum to prepare the next generation of researchers and industry professionals
	• Lack of enforcement of South African Waste Information System (SAWIS)	• Ensure that accurate reporting is a requirement in the EPR scheme • Provide training, capacity building and the deployment of waste inspectors at local government level

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STAKEHOLDER	BARRIERS TO CIRCULARITY	OPPORTUNITIES
Government departments (continued)	• Access to trusted data to inform future national waste management strategies and municipal Integrated Waste Management Plans	• Establish a centralised data repository, including SAWIS data, in collaboration with academia and other experts to develop baselines and inform policy and regulatory frameworks
	• Public procurement policy currently does not stipulate the procurement of circular products	• Legislate green public procurement of plastic products and packaging that is recycled and reused and contains a minimum post-consumer recycled content
Civil society organisations	• Many NGOs and civil society organisations have different focus areas and primarily focus on end-of-pipe solutions such as environmental clean-ups, and education and awareness of shelf-facing consumers	• Align and mobilise civil society across all stages in the plastics life cycle and not only on end-of-pipe solutions • Improve education and awareness of consumers on plastics and implications of incorrect disposal by collaborating with all stakeholders in the value chain including producer responsibility organisations and industry bodies
Industry bodies	• Lack of a common vision among industry, industry bodies and producer responsibility organisations	• Strengthen current initiatives within the industry and collaborate with all stakeholders towards a common vision and industry strategy on tackling plastic pollution
	• Perceived lack of representation of all sectors in the value chain, a lack of infrastructure, business model lock-in and governance structures impede progress on sustainability issues and inhibit support for the recycling and waste management sector	• Collaborate as industry (all sectors, from resin producers to recyclers) to develop a plastic industry strategy that addresses sustainability and growth in end-markets for circular products and packaging in South Africa and Africa • Support the Master Plan that is being developed by the DTIC • Support future policy-based approaches and other voluntary initiatives to transition to a circular plastics economy
Informal sector representatives	• Delays in adopting guidelines to integrate the informal waste sector with municipalities	• Put pressure on the DEFF and industry to adopt guidelines and prioritise implementation in parallel with the mandatory EPR scheme
	• Lack of nationwide representation and organisation due to lack of funding and resources	• Urgent access to funding and support from industry and government are required for current bodies to expand representation and coverage
	• Current voluntary EPR scheme has limited coverage, meaning only certain packaging formats have value at end of life and are collected	• A mandatory EPR scheme for all plastic polymers and formats to incentivise collection and end-markets and waste management to ensure better livelihoods for informal waste reclaimers and a cleaner environment for all citizens

ACTIONS FOR A CIRCULAR PLASTICS FUTURE

IN SUMMARY

The time has come to adopt a preventative approach to plastic pollution, collaborating across the plastics value chain towards a shared vision.

Solving the challenge of plastic pollution is not straightforward, but the roadmap exists. It requires the right policies and appropriate industrial strategy informed by the best available evidence and developed in a transparent and consultative process with all stakeholders. From here it will be possible to establish locally appropriate product and packaging standards and certifications and invest in new business models and the innovative delivery of products. With this in place, it will be a relatively straightforward task to make commitments, monitor and report on progress in a transparent manner. These all require a collective mindset shift and behaviour change interventions at individual and institutional levels. The ultimate result of these actions will be to precipitate the necessary shift towards the establishment of a local circular plastics sector.

Plastics might be one of the big new challenges of our century but it is comparatively manageable when considered alongside the larger challenges of climate change, infectious diseases and rising inequality. We can conceive a better way to do things without it having a massive impact on our lifestyles and the economy as a whole. As a result, the solutions are already taking shape.

All that is required now is collective action to take these solutions to a scale that matters and to make sure positive changes endure, delivering benefits to all – nature and people.

GLOSSARY

behaviour change: any transformation or modification of human behaviour using various approaches which focus on the individual, community and environmental influences

bio-based feedstocks: agricultural products such as sugar cane, cassava and maize from which plastic is made

bio-based plastics: plastics that are made from bio-based feedstocks

biofouling: micro-organism growth on plastic surfaces

bioplastics: a blanket term for plastic materials that are either bio-based (see bio-based plastics), biodegradable, or have features of both properties

chemical recycling: any process by which a polymer is chemically reduced to its original monomer form so that it can eventually be processed (re-polymerised) and remade into new plastic materials and, after that, products

circular economy: an economy based on the principles of designing out waste and pollution, reducing consumption of non-renewable materials, keeping products and materials in use, and regenerating natural systems

CO2 equivalent (CO2-eq): carbon dioxide equivalent; a measure used to compare the emissions from various greenhouse gases based on their global-warming potential. For example, the global warming potential for methane over 100 years is 21. This means that emissions of one million tonnes of methane is equivalent to emissions of 21 million tonnes of carbon dioxide

compostability: a property of a material to break down or biodegrade in controlled conditions (including temperature, pressure, humidity) to become a usable soil conditioner

debris: pieces from something that has been destroyed or broken down or pieces of rubbish or unwanted material that are spread around

end of life: a stage that starts at the end of the use in the life cycle of a material or product. In the case of packaging, the end-of-life stage starts the moment the product is consumed when the material loses its original purpose. The so-called end-of-life options for post-consumer packaging is to either treat it as waste or to recycle it, which has an impact on the sustainability of packaging

end-of-pipe solutions: methods used to remove already formed contaminants from a product. These methods are normally implemented as a last stage of a process before the product is disposed of or delivered

evaluation of recycling: gathering data on the collection, sorting and delivery systems to transfer the materials from the source to the recycling facility; whether recycling facilities are available to accommodate the collected materials; and whether and how much of the product is being collected and recycled

feedstock (fossil fuel or bio-based): the raw material to supply or fuel a machine or industrial process. In the case of plastic, the feedstock can either be derived from fossil fuel or bio-based

food-grade applications: products that come into contact with food before consumption

global commons: natural assets outside national jurisdictions such as the oceans, the atmosphere, outer space and the Antarctic

greenfields project: a project that lacks constraints imposed by prior work. In the case of infrastructure projects, greenfields projects are built on unused land where there is no need to remodel or demolish an existing structure

hotspot: the area or stage in a product or process life cycle where environmental and/or socio-economic impacts or externalities are greatest. Once identified, this area or stage can then be prioritised for various actions to reduce the impacts of a product or process

linear economy: an economy that uses a "take-make-waste" model of production

litter: products or materials at end of life that are discarded incorrectly, without consent, at an unsuitable location

lock-in: when organisations have made a large capital investment, usually in infrastructure, they are "forced" to make use of this infrastructure and associated processes for the life of the infrastructure. This could be 20+ years, which is usually the return-on-investment period

mechanical recycling: processing plastic polymers via physical processes for size reduction (grinding and shredding) and melting into plastic pellets that are used for plastic manufacturing

nurdles: polymer powders that are pelletised into lentil-sized plastic pellets

organic waste: waste that is capable of undergoing anaerobic or aerobic decomposition, such as food and garden waste or paper-based materials. This waste stream is made up of materials which originated from living organisms (food, wood)

persistent organic pollutants (POPs): chemicals of global concern due to their potential for long-range transport, persistence in the environment, ability to bio-magnify and bio-accumulate in ecosystems, as well as their significant negative effects on human health and the environment

photodegradation: when plastics degrade in the natural environment through exposure to ultraviolet (UV) light and oxygen

plastic leakage: the potential amount of macro- and microplastics that are not kept in a circular loop or properly managed at their end of life, and thus leak into the environment. Leakage is relevant to other materials as well

plastic scrap: plastic products or parts of those products that have been "scrapped" by the original users but still have value (or an end-market) and can be recycled into new products or reused in their current format

plastic waste: a plastic product or plastic material that is unwanted, rejected, abandoned, unusable or disposed of by the holder of the product or material and that has no economic value

primary packaging: first-level packaging that is in direct contact with the product itself

rationalisation of plastic materials and formats: consolidating and reducing the number of polymer types, formats, colours and additives in plastic packaging to support separation-at-source, collection, recycling and reuse

recyclable: a characteristic of a product, packaging or associated component that can be diverted from the waste stream through available processes and programmes and can be collected, processed and returned to use in the form of raw materials or products (ISO 14021)

recyclate: recycled material that can be used to manufacture new products

resins: the main base of plastics

reusable packaging: packaging that is designed to be reused a minimum number of times to carry or hold the same or other products within a systemreuse of packaging: an operation by which packaging is refilled or used for the same purpose for which it was designed, with or without the support of systems which enable the packaging to be refilled (ISO 18603)

reuse system: established arrangements (organisational, technical or financial) ensuring the possibility of reuse of packaging to fulfil the functionality of holding or preserving a product multiple times

reverse logistics: all activity associated with a product or service after the point of sale

rotational moulding: a plastic moulding technique used to manufacture hollow products such as tanks, bins and children's toys

secondary packaging: packaging used for branding display and protection for logistics purposes

secondary resources: materials that are recirculated into the system after being used, recycled or sold for remanufacturing into new products

single-use plastic: a broad range of plastic products – largely plastic packaging – that has a short useful lifespan and is made to be disposed of by the consumer after using the product only once

sink: end location, destination

tertiary packaging: packaging that facilitates the protection, handling and transportation of products

water-scarcity footprint: weighting of water consumption with the water-scarcity index or characterisation. This index is based on where (geography) that water is consumed, and each region will have a "stress factor" based on availability vs withdrawal.

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