Biodegradable and compostable plastics:

Draft Position Paper for Comment

Prepared by the South African Initiative to End Plastic Waste

THE MOSS GROUP

Draft position paper on biodegradable and compostable packaging in South Africa

The South African Initiative to End Plastic Waste has initiated a process of developing a position paper on biodegradable and compostable packaging in South Africa.

The objectives of this paper are two-fold:

- To provide a balanced perspective and consolidated position for South Africa with regard to biodegradable and compostable packaging, based on sound research and stakeholder inputs.
- To be used to inform players across the value chain, as well as other interested stakeholders around the responsible manufacture, use, management and disposal of biodegradable and compostable packaging.

This position paper focuses specifically on the country's current capacity to responsibly integrate these materials into the existing packaging economy and looks to provide direction on what is required going forward.

The Biodegradable and Compostable Plastics Working Group acknowledges that there are material types and applications of traditional plastics that are problematic and present specific challenges with respect to collection and recycling. The intention of this paper is not to compare the merits of traditional plastic relative to biodegradable alternatives.

Background

Plastic pollution, particularly in the marine environment, has become a focal point for campaigns highlighting the negative impacts of increased consumerism. Globally, major players in the plastics value chain, brand owners, NGOs and governments have recognised the need to work collaboratively to address the issue. This has led to the launch of the New Plastics Economy, by the Ellen McArthur Foundation and the UN Environment Programme, and the Global Alliance to End Plastic Waste.

Consequently, there is an increasing drive toward reducing the amount of plastic packaging, eliminating problematic packaging types, increasing post-consumer collection and recycling and transitioning away from petrochemical-based materials to more sustainable alternatives. The desire for alternatives that deliver better environmental performance than traditional plastics has created a growing market for biodegradable and compostable packaging.

South African context

The South African consumer packaging waste landscape has several defining factors that need to be considered when looking at integrating biodegradable and compostable packaging.

Formal municipal waste collection is not effective in capturing all post-consumer waste, with over 34% of households not having access to regular waste removal services. Separation at source is not widely practiced and where it is, it tends to be limited to separation of paper and packaging for recycling (i.e. not separation of organic waste). Informal waste pickers are responsible for collecting more than 80% of recyclable material, mostly from the environment, landfill and household refuse bins. As a result, contamination of recyclable materials is often high. Waste pickers are paid by buy-back centres for the materials they collect resulting in pickers mostly focussing their efforts on a select few, high value materials. The country has high levels of

visible litter in the environment, much of which is lightweight packaging that is not deemed economically viable to collect by informal pickers. The introduction of biodegradable and compostable packaging, in the absence of proper education and awareness, may mislead consumers into thinking that it will decompose organically in the environment and may therefore exacerbate the litter problem.

Organic waste is predominantly disposed of with general waste and therefore ends up in landfill. There is currently limited household collection infrastructure, municipal or private, for organic waste. However, there is pressure, especially in Cape Town, to eliminate organic waste from landfill. Composting facilities already exist around South Africa, with varying infrastructure and technologies in place. Plastic contamination is a challenge for most composters. It is important to note that, unlike recyclers, composters do not pay for waste entering their facilities.

There is currently very limited separation, collection and processing infrastructure to support the responsible post-consumer management of packaging made from biodegradable and compostable materials. Furthermore, informal pickers currently have no economic incentive to collect biodegradable or compostable packaging for processing.

At present, South Africa has no legislation and standards to regulate biodegradable plastic products or verify the scientific claims and international certifications. Most South African consumers have very limited understanding and awareness of what biodegradability and compostability mean and therefore how such materials need to be handled in order to break down effectively.

At this stage the majority of the raw materials (resins) and some finished products are imported, which has limited benefit for the South African economy.

Key terms and definitions

- **Fossil fuel-based polymers** are derived from petroleum, coal or natural gas products or by-products. The majority of plastics in use today are fossil fuel based.
- **Bio-based polymers** are defined as plastics that are derived from renewable (plant-based) sources. These may be identical to fossil fuel-based polymers (e.g. PET, PE, PP), where the monomeric units (e.g. ethylene) are produced from plant-based materials rather than fossil fuels, or may be so-called bioplastics (e.g. PLA, PBAT, thermoplastic starch). These can be first generation, derived from food crops such as corn, potatoes and sugar cane, or second generation, derived from agricultural by-products, non-food crops or organic waste. Bio-PET, Bio-PE and Bio-PP can be recycled with conventional fossil fuel-based plastics.
- **Biodegradable materials** degrade by biological activity, resulting in a specific change in the chemical structure of the material. Degradation can occur under aerobic or anaerobic conditions. The end products are gas (carbon dioxide or methane), water, biomass and mineral components. Plastics labelled “biodegradable” break down at a faster rate than conventional plastics. The degradation of biodegradable materials does not necessarily imply that the material can be converted into good quality compost or that degradation will take place within a specified timeframe. Biodegradable materials can be produced from renewable feedstocks (biomass) or fossil fuels.
- **Compostable materials** biodegrade in an aerobic composting process through the action of naturally occurring micro-organisms and do so to a high extent within a specified timeframe. The biological

processes yield carbon dioxide, water, inorganic compounds and biomass, leaving no visible contaminants or toxic residues.

- **Industrial composting** refers to the breakdown of biodegradable materials under controlled conditions (50-70˚C, forced aeration, managed humidity) in an industrial composting facility. Internationally, standards specify the conditions, timeframe and extent of degradation required for a material to be certified as "compostable".
- **Home composting** refers to the breakdown of biodegradable material under conditions (temperature and moisture) found in domestic compost piles. There are fewer international standards for this.
- **Prodegradent additives** refer to materials that are added to traditional polymers to initiate the accelerated degradation of the plastic structure. There are two groups of additives, oxo-additives (e.g. d2w) which rely on oxygen, heat and UV light to accelerate the initial degradation and bio-additives (e.g. Biosphere) which act as sites for microbial attack to accelerate biological degradation.

A more detailed description of the range of available materials, their key properties, application and research related to their environmental performance is available in the accompanying supplementary document.

Working group position

Based on the analysis of the information available in the public domain and academic literature, as well as the engagement with a range of stakeholders across the value chain, the working group has taken the following position on biodegradable and compostable materials. The position is structured using the value chain as a guide, as illustrated below.

Raw material and packaging production

- The potential for **developing local capacity** for the **production** of bio-based polymers and biodegradable **materials** should be continuously **assessed** and considered as **part of** the South African **Bio-economy Strategy**. The assessment should consider **socio-economic** (job creation, food security, etc.) and **environmental implications**. This will become increasingly relevant as the demand for these materials grows.
- The current global market size for **biodegradable plastics** made from food crops is **too small to negatively impact food security** (0.016% of global agricultural land in 2018, according to European Bioplastics). This position is unlikely to change in the medium term. However, it should remain a key consideration that is **evaluated regularly**.
- The **importing** of biodegradable and compostable packaging and raw materials **needs to be subject to regulatory control**. South Africa does not currently have national standards relating to biodegradability and compostability, so appropriate **international standards should be applied**. Importers need to be able to **produce the necessary certification**. Compliant products and materials should be **required by law** to **display an on-pack endorsement by the South African regulatory**

authority, similar to the National Regulator for Compulsory Specifications (NRCS) approval for carrier bags manufactured from recycled content.

- Biodegradable and compostable plastics need to be **allocated a unique resin code** that should be **visible on all products.** These are currently marked with the number 7 resin code which leads to confusion.
- **Food contact materials** need to be thoroughly **tested and certified** to ensure that they have the necessary barrier properties to ensure **effective food protection**, that they contain **no contaminants** (including naturally organic toxins) that may threaten food safety and that **material integrity** is not compromised by **extended shelf-life.**

Marketing and sales

- All **claims** related to degradability and compostability on packaging in accompanying marketing material must be **based on credible science and compliance to the appropriate standards**.
- Where products are **certified to conform to an international standard**, the appropriate **conformity logo** must be clearly displayed on the product. Furthermore, where certified **degradation rates** are dependent on **specific conditions** (i.e. temperature, moisture, aeration) these must be **clearly communicated** using **on-pack messaging**.
- **Messaging** related to the **degradation** of the materials **outside of the prescribed conditions** must **not be misleading**. Misleading messaging could create a "throw away" culture, adversely impacting on the environment and the existing recycling economy, while prejudicing the application of biodegradable materials where they may be appropriate.
- **Effective consumer education and awareness campaigns** are required for biodegradable and compostable plastics. While most consumers understand that traditional plastics take an extremely long time to degrade in the natural environment, most are unaware that many bioplastics can be similarly slow to degrade outside controlled environments.

Waste collection

- The current absence of an economic incentive for informal waste pickers to collect biodegradable or compostable plastics from the environment, landfill or household waste means that it is **highly unlikely** that these **materials will be collected if** they are **disposed of through conventional means.**
- Systems for the separation and collection of biodegradable and compostable waste need to be developed to enable responsible post-consumer management. Pilot systems could be evaluated at **events or in contained environments** (e.g. restaurants, office blocks). This is aligned with Target 2 of the SA Plastics Pact.
- The **incorporation** of biodegradable and compostable materials **into packaging** is **not the answer to visible litter** in the environment. While materials certified as compostable will degrade within a defined timeframe under controlled conditions, there is limited information on the degradation rates of different biodegradable materials outside a controlled environment. It is however reported that biodegradation is dramatically slowed down in dry climates. There is little published research on degradation in the terrestrial environment (on the surface) and available information on the

degradation rates in the aquatic and marine environments indicate that most materials will persist for years to decades.

Waste processing

- **South Africa** has a **mature, well-established mechanical recycling industry** that employs tens of thousands of people in the collection, transport and processing of recyclable plastics. Collection and recycling rates for certain material types, such as HDPE and PET beverage bottles are among the highest in the world. The **market for recycled polymer** is **dependent on confidence in the technical integrity** of the **recycled material**. Material sorting is primarily by hand or density separation. Therefore, **products made from incompatible materials** (e.g. PLA beverage bottles) that are indistinguishable from traditional polymers (e.g. PET beverage bottles) **must be avoided**.
- **Bio-based polymers**, such as bio-PET and bio-HDPE are **acceptable within the current collection and recycling landscape** in South Africa. However, **claims** related to the **environmental benefits** of these materials should be **supported** by a life cycle assessment (**LCA**) or similar **scientific analysis**.
- The effectiveness of **prodegrant additives** (oxo and bio) remains a matter of contention. There is a significant body of **academic literature** that **challenges** the claims that oxo-additives **speed up the degradation** of the plastic and that they do **not result in persistent microplastics**. No scientific research exists to conclusively prove that bio-additives do not result in fragmentation to microplastics. As a result, **traditional plastic materials containing these additives** are **not appropriate** for application **in South Africa** at this time.
- Notwithstanding some reports suggesting a small fraction (15%) of **oxo-additive containing products** do not compromise the integrity of recyclate, the recycling industry has indicated they are not willing to accept plastics containing oxo-additives. Therefore, their **incorporation** into **material streams** that are **currently** being **collected and mechanically recycled could have devastating consequences** for the industry, and should be avoided.
- **Prodegradent additives** that require microbial activity to function (i.e. not oxos) pose **less of a threat** to the **technical integrity** of recycled material than oxo-additives. The exception would be applications where the recycled product is used in environments where exposure to high concentrations of bacteria and fungi is likely, such as irrigation piping.

Support

- There is an urgent **need for an industry-funded producer responsibility organisation (PRO)** or similar structure to provide **oversight and promote the responsible sourcing, marketing and post-consumer management** of biodegradable and compostable materials.
- **Manufacturers, importers and brand owners** of biodegradable and compostable packaging need to **embrace** the concept of **Extended Producer Responsibility** (EPR). They need to play an active role in the establishment of systems and infrastructure to enable responsible post-consumer management.

Conclusion

Biodegradable and compostable materials have become a reality in South Africa, driven largely by consumer demand for alternatives that have improved environmental performance relative to traditional plastics. At this stage, the applications are primarily in food and drink containers, utensils and carrier and barrier bags for niche markets. Despite volumes being relatively low, post-consumer management is starting to become a concern due to the growth of this sector.

It is therefore critical that key stakeholders from industry, civil society and government collaborate to develop a coherent strategy for these materials, that is appropriate and relevant to South Africa. Six key principles need to underpin this strategy:

1. Biodegradable and compostable plastics that are certified and verified and are part of an effective collection and processing system can provide a responsible end-of-life option that is in line with circular economy principles.
2. The industry strategy and resultant decisions should be based on robust research that is relevant to the South African context.
3. The industry strategy should strive towards strengthening the local economy, supporting transformation and job creation.
4. Biodegradable and compostable plastics and the associated waste management systems and processes need to be implemented in a way that enhances existing collection and recycling systems and improves consumer behaviour.
5. All manufacturers, importers and brand owners need to actively participate in Extended Producer Responsibility programmes which should include *inter alia* aspects relating to consumer education and awareness, certification and collection and processing infrastructure set up and management.
6. Biodegradable and compostable plastics need to be used in “fit for purpose” applications. They should be avoided in applications that are currently widely recycled and should always be easily distinguishable from traditional plastics.