Sustainable Manufacturing and Environmental Pollution Programme

PLASTIC REDUCTION & MANAGEMENT

Regional policies and standards on biodegradation and compostability in East and West Africa

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Executive summary

This report addresses the critical need for comprehensive and effective strategies to combat the plastic pollution crisis in East and West Africa, with a particular focus on Kenya, Nigeria, and Ghana. These countries, as many others in the world, are grappling with inadequate waste management systems and the overwhelming presence of plastic waste in their environments. The report emphasizes the importance of integrating international policies and standards with national and regional frameworks to support the transition to a circular plastics economy (see Figure 1).

The issue of plastic pollution in East and West Africa is transboundary in nature, requiring a multi-faceted approach that involves collaboration at national, regional, and international levels. To effectively tackle this crisis, comprehensive policies and coordinated bans such as the proposed East African Community Single-Use Plastics (SUP) Bill and the international legally binding instrument on plastic pollution, including in the marine environment (Global Plastics Treaty) can be supported by the establishment of harmonized standards for the design, production, and disposal of plastics. Harmonized standards also contribute to facilitating trade, as mutual recognition of product or performance standards between countries facilitates compliance with environmental rules and enables easier market access across countries or regions where harmonization occurs. The development and enforcement of these standards will also facilitate a consistent framework to improve the design of plastics for reuse, recycling, composting and biodegradation, ensuring a level playing field across different jurisdictions.

The report's analysis focuses on the **food packaging, horticulture, and forestry sectors,** where single-use plastics are prevalent. It examines international, national and European standards that could be adapted for East and West Africa, such as those for compostable plastics and mulch films. The report also includes **three case studies** providing best practice examples of how environmental policies can be implemented in specific applications, particularly the use of standards for biodegradable agricultural mulch films in the European Union, approaches to developing natural substitutes to plastics in Ghana, and the use of certification and standards as tools to ensure the adequate use of compostable plastics in South Africa.

↓ Figure 1. Interplay between international, regional, and national policies, laws and standards

Source: UN Trade and Development, based on ECOS's conceptualization

The shift towards alternative materials and substitutes should be approached with caution to avoid unintended negative consequences, such as the substitution of plastics with other materials which can also be harmful to the environment. Material reduction and making products reusable should be promoted as a first-line solution, while biodegradables should only be used when they provide a clear added value in specific contexts, such as in applications where reuse and recycling are not feasible.

Standards can play a pivotal role in the transition to a circular economy and the leveraging of trade that supports circularity, by providing a common language and framework for the assessment and comparison of products and technologies across markets. They can help ensure that new solutions, such as biodegradable plastics, are thoroughly tested for their environmental performance and potential impacts on human health and the ecosystem (e.g., toxicity in soil, absence of persistent pollutants). By setting clear requirements for the certification of compostable and biodegradable products, standards can provide a reliable basis for claims made by manufacturers and facilitate informed decision-making.

The transition to new types of products should include solutions for their adequate disposal, as such it is important to establish infrastructure for the collection and management of bio-waste, such as industrial composting facilities, to ensure their proper end-of-life treatment with clear standards and communication to prevent contamination of the different waste streams (e.g. recycling and industrial composting).

In conclusion, this report provides insights and recommendations for policymakers and stakeholders in East and West Africa. It advocates for a harmonized approach that includes clear environmental regulatory guidelines, policies, and standards to support the reduction of plastic pollution and plastic waste at its source and enhance material circularity, biodegradability, and compostability. The integration of standards and best practices can significantly improve the region's capacity to manage plastic waste and reduce its environmental impact, while also promoting regional trade of alternatives and substitutes, where these bring environmental benefits.

SUMMARY OF KEY NATIONAL POLICY RECOMMENDATIONS

Plastic pollution in Kenya, Nigeria, and Ghana can be tackled by reinforcing policies across the entire plastics lifecycle—upstream, midstream, and downstream. Addressing plastic pollution with downstream solutions only (e.g. recycling, compostability, biodegradability) will not be sufficient on their own. It is important to keep in mind that plastics enter these countries through trade, so harmonized standards can help in effective regulation. Also, limits need to be placed on production and consumption to reduce the mounting pressure on natural ecosystems and human health. National policy recommendations are summarised below for each phase of the lifecycle:

1. **Adopt circularity targets** — Establish national circularity goals targeting:
   - Reducing plastics production.
   - Replacing single-use plastics with reusable products, especially in the food sector.
   - Substituting plastics in food, agriculture, horticulture and forestry sectors with natural, biodegradable, and locally available materials like leaves, plant fibres, bamboo, etc.
   - Increasing bio-waste collection for composting, using industrially compostable bags to aid separation.
2. **Reduce plastics** — Implement bans on unrecyclable or highly polluting plastics and apply financial measures (taxes, import duties) to curb the trade of problematic plastic types such as grocery bags and plastic packaging. Policy should ensure realistic transitions to prevent adverse effects.
3. **Control plastics in key sectors** — Extend plastic reduction efforts beyond consumer goods to sectors like agriculture, horticulture, as well as construction, and textiles, which also contribute significantly to plastic pollution.
4. **Support reuse business models** — Promote reuse models through tax incentives, consumer education, and the development of efficient refill systems, including for small-scale, low-income economies.
5. **Use biodegradable and compostable alternatives where they make sense** — Establish clear criteria for the use of biodegradable and compostable plastics, based on the proven lack of reusable or natural substitutes. Support this with stringent standards to ensure biodegradability and compostability.
6. **Develop supportive green public procurement policies** — Mandate the public sector to prioritize reusable, recyclable, and biodegradable products in public procurement, particularly for food packaging and forestry projects.
7. **Develop Extended Producer Responsibility (EPR) schemes** — Set up and enforce EPR schemes to appropriately hold producers accountable for plastic pollution and waste, applying appropriate eco-modulated fees and recovery targets based on the volume of plastics put on the market.
8. **Upgrade waste management infrastructure** — Expand waste management capabilities to enhance bio-waste segregation and plastic recycling through private-public partnerships and by including informal waste pickers in the system.
9. **Invest in research and innovation** — Encourage local research into reusable and biodegradable plastic alternatives and non-plastic substitutes, ensuring that they are environmentally sustainable and suitable for the region's resources, while creating jobs and livelihoods.
10. **Facilitate consumer education** — Launch education campaigns on the health and environmental risks of plastic use, targeting women as key agents of behavioural change.

1.

Introduction

Highlights

GLOBAL PLASTIC PRODUCTION

99%

▶ More than 99% of all plastics produced globally are fossil-based and non-biodegradable, with only about 9% recovered and recycled (OECD, 2022a).

Plastics have evolved as one of the most widely used materials in virtually all sectors of the global economy (Global Plastic Action Partnership, 2021a). This has driven rapid and unsustainable growth in plastics usage globally since the 1950s, with annual consumption estimated at 460 million tonnes in 2019 and projected to triple by 2060 at the current pace. More than 99% of all plastics produced globally are fossil-based and non-biodegradable with only about 9% recovered and recycled (OECD, 2022a).

Multidimensional pollution, arising from plastics production and the mismanagement of plastic waste, has far-reaching environmental, health, social, and economic impacts. Apart from the large-scale greenhouse gas emissions associated with fossil-based plastics across their lifecycle (particularly in the upstream production processes), their non-biodegradability and huge yearly output pose grave challenges downstream. Plastic waste has overwhelmed the capacity of solid waste management authorities across countries and leaks massively into terrestrial and marine environments where it remains for hundreds of years and endangers human, animal, and aquatic lives (WWF, 2021).

In developing economies like Kenya, Nigeria, and Ghana, waste management capacities are vastly inadequate for the volume of waste generated:

- In Kenya, complex and interconnected factors have led to over 90% of the generated waste being mismanaged (Griffin and Karasik, 2022). Despite recent efforts, out of an estimated 966,000 tonnes of plastic waste generated every year in Kenya, only 27% is collected, 19% is dumped and a mere 8% is recycled (Sugathan, 2022). These problems are exacerbated in cities, where plastic consumption outpaces even population growth such as in Nairobi, where over the last 25 years population growth tripled while plastic growth quadrupled (Veidis et al., 2022).
- Similarly, despite Government efforts, in Nigeria, the annual plastic waste output is estimated at 4.7 million tonnes, accounting for over 68% of West Africa's total waste output of 6.9 million tonnes. This is met by an equally high rate of mismanaged plastic waste: over 80% of collected waste ends up in uncontrolled dumpsites, making the country one of the largest contributors to plastic waste pollution globally largely due to river leakage (World Bank, 2024).
- In Ghana, where the Government has also been trying to improve waste management, about 68% of the country's plastic waste is mismanaged, with about 9.5% or 80,000 tonnes leaking into water bodies, including rivers, streams, lakes, and the ocean annually (Ghana NPAP, 2021). Ghana is paying the high price: the environmental costs of plastic pollution in the country was estimated at 450 million Ghanaian cedi annually, equivalent to 1.6% of its GDP (Trinomics, 2022).

The transboundary nature of the plastic pollution crisis has led to a global political movement against plastics and an urgency of transitioning to a circular plastics economy, prompting the ongoing intergovernmental negotiations for an international legally binding instrument on plastic pollution, including in the marine environment (Global Plastics Treaty) (UNEP, 2022a; UNEP, 2022b). The plastic pollution crisis can be solved via an absolute reduction in the global production of plastics, as well as waste prevention, particularly from single-use plastics.

Alternative product designs and materials to single-use plastics can first and foremost contribute to these objectives when they are long-lasting, reusable and fully recyclable. Where single-use plastics cannot be eliminated with reusable and recyclable alternatives, material substitution may be a relevant solution if their environmental added value is demonstrated compared to conventional designs, such as by using a lifecycle environmental assessment, and when they do not create new problems such as indirect land use change impacts such as from displaced agricultural production. This report thus explores the potential for standards to support the use of some biodegradable and/or compostable products (both plastic alternatives or from natural non-plastic substitutes) in agriculture, horticulture and forestry; applications, as well as some uses linked to biogenic and biodegradable waste (bio-waste, see *Recommended definitions* section p. 31–33) when food residue is mixed, such as composting bin liners and food packaging.

The absence of supporting national or regional standards suited to the requirements of the relevant countries, inadequate separate collection of bio-waste, lack of industrial composting infrastructures and the ever-increasing risk of mixing indiscriminately with conventional plastics however raise concerns about achieving real environmental added value from the switch to biodegradable plastic alternatives. More generally, with increasing recognition of the issue of plastic pollution and the need for solutions, numerous policies have been developed to combat plastic pollution in Kenya, Nigeria, and Ghana, some of which have generated international recognition, such as single-use plastic bans.

In this report, we analyse the existing framework of policies, regulations and standards aiming to reduce plastic pollution and waste at source in Kenya, Nigeria and Ghana. We provide recommendations to better support material circularity, biodegradability and compostability through environmental regulatory guidelines, policies and standards that focus on the food packaging, horticulture and forestry sectors. It also assesses the potential for international policies and regulations as well as international and European standards to be replicated in, or adapted for, East and West Africa. The report also presents a pathway to integrate standards in supporting the effective implementation of regulatory measures. Finally, it further explores higher environmental ambition in relevant plastics policies and standards in the food sector, as well as horticulture and forestry; specifically for bakery and seedling tubing applications through case studies in Ghana, South Africa and Europe.

↓ Image 1. Progressive decomposition of biobased packaging bottles. Shellworks, a London-based company developing compostable alternatives to conventional plastics, showcased its products at the Marine-based Products and Services (MAPS) Expo in Geneva, March 2025. The image illustrates the potential for material substitution when supported by appropriate standards and waste infrastructure.

2.

Scope of the report

2.1 Kenya, Ghana and Nigeria as cases for the East and West African regions

Highlights

BAN ON SINGLE-USE PLASTICS

▸ Kenya, Ghana, and Nigeria have introduced policies to phase out or ban single-use plastics and promote biodegradable or compostable alternatives, but face major implementation challenges due to the lack of national or regional standards, limited infrastructure, and enforcement capacity.

The geographical scope of this report covers East and West Africa, focusing on Kenya, Ghana and Nigeria. These three countries aptly represent the growing response among Sub-Saharan countries in East and West Africa to manage the ubiquitous global plastic pollution crisis. In recent years, these three countries have developed and are seeking to implement a series of policies and laws targeted towards plastics management including through phase-outs and bans of single-use plastics and a wide range of conventional plastic polymers, with a push towards the uptake of biodegradable or compostable plastic alternatives and non-plastic substitutes.

The challenges in the implementation of these policies and regulations in these countries lay in the absence of supporting national or regional standards suited to the requirements of the specific countries, challenges related to implementing a regionally coordinated approach, insufficient knowledge and logistics capacity, as well as inadequate governance and infrastructure of end-of-life plastics management.

As such, this report analyses the policies and regulations in place within the scope of plastics management. It also provides guidance on an appropriate framework of standards and waste management approaches to support implementation and enforcement of the policies and laws within these three countries and regions.

2.1.1 Plastic products in the food packaging, horticulture and forestry sectors

This report provides specific insights into the use of plastics in the food sector, horticulture and forestry, particularly:

- Plastic carrier bags and bin liners, which have been the subject of various attempts to regulate their use (such as replacing them with reusable, recyclable or compostable/biodegradable plastic alternatives and non-plastic substitutes).
- Single-use food packaging, such as bottles, packets, pouches and other containers, which tend to be a driving source of plastic pollution due to very high volumes and short production-to-waste lifespan.
- Agricultural or horticultural mulch films, often the largest of all uses of plastics in the sector.
- Forestry sector products such as tree seedling tubes, of particular relevance to Kenya's objective of growing 15 billion trees by 2032.

The term 'plastics' refers to a wide variety of polymers or combination of polymers of high molecular mass modified or compounded with additives, which are used for different applications depending on their physical and chemical characteristics (see Annex I, Table 2. Most common types of plastic polymers used per product category and by sector).

In Kenya, Nigeria and Ghana, the improper disposal of plastic bags and plastics from the food sector increases the accumulation of waste, which often blocks waterways and contributes to disasters such as floods and health epidemics, as well as soil, water and sea pollution (Ghana NPAP, 2021; Khoironiet al., 2019; Worm, 2017).

The use of plastics is also very common in horticulture and forestry. In these sectors, plastics are purposely placed in the environment (farm or forest) to fulfil a function often related to improving plant growth and overall productivity. Due to their prolonged residence time in the environment and high dispersal over large areas, these plastics tend to cause pollution that is often not addressed, also breaking down into microplastics which can be detrimental to plant growth while also potentially contaminating food sources (UNEP, 2021; Salama and Geyer, 2023).

2.1.2 The use of alternative designs and materials

Bio-based, biodegradable, compostable?

This report briefly explores the various solutions to the plastic pollution crisis, and deep dives into material substitution, i.e. switching conventional plastics with biodegradable and compostable plastics (see see *Recommended definitions* section p. 31–33) as well as non-plastic substitutes. Doing so, it sets the bar for uses of biodegradable and compostable plastics which have environmental added value in certain applications. The use of these innovative plastics can also present challenges which we consider here.

We suggest a clear-cut distinction of **bio-based**, **biodegradable** and **compostable** plastics. The generic, encompassing term "bioplastics" that has been used in common language and marketing triggers confusion. Below we provide definitions for these key terms.

Table 1. Definitions of **bio-based, biodegradable**, and **compostable** plastics

Plastic-related term	Definition
Bio-based	Fully or partially made from biological resources rather than fossil raw materials. They are not necessarily compostable or biodegradable.
	See also the related standard definition of bio-based product from ISO 16559:2022 in the Recommended definitions.
Biodegradable	Designed to biodegrade in a specific medium (e.g. soil, compost) under certain conditions and in varying periods of time and leave no persistent, hazardous or toxic residue.
	See also the related standard definition of ultimate aerobic biodegradation from ISO 17088:2021 in the Recommended definitions.
Compostable	Category of biodegradable plastic designed to biodegrade and disintegrate together with bio-waste under the conditions of a home compost or of an industrial composter or digester, leaving no visible, distinguishable, persistent, hazardous or toxic residue. Compostable plastics do not biodegrade well in the environment.
	See also the related standard definition of compostable plastic from ISO 17088:2021 in the Recommended definitions.

In this report we do not delve into the full range of **bio-based** plastics, as some are not biodegradable. We also do not use the confusing, ambiguous term '**bioplastic**', which can suggest that a plastic is biodegradable (when it is not) and may instead refer to a bio-based plastic. Finally, we do not consider **oxo-degradable** plastics as a real solution to plastic pollution as the biodegradation of these plastics only occurs after very slow fragmentation of the material, with significant remaining microplastic pollution (Thomas et al., 2012; Miles, 2017).

The waste hierarchy: reduce, reuse, recycle

The plastic pollution crisis is best solved by following the waste hierarchy, which suggests as a first step eliminating the use of plastics altogether (**reduce**), then making multiple uses of the product (**reuse**), and finally ensuring that the product is fully recyclable and can substitute primary plastics (**recycle**).

A fourth possible step of the hierarchy is **composting**, whereby a material is degraded in a home compost or an industrial facility without leaving toxic substances for plants and soil organisms, and a fifth step is **biodegradability**, when the product is designed to degrade in an open environment.

While reuse and recycling maintain the product and materials in use, the last two steps imply a complete loss of the material (e.g. the biodegradable plastic), meaning a new product should be made from new raw materials to provide the same service. The substitution of non-biodegradable plastics with other materials, including biodegradable and compostable plastics, can in some specific cases provide environmental added value, but they can also cause new issues and may not constitute a relevant solution to solving the plastic pollution crisis.

When do compostable and biodegradable plastics make sense?

Highlights

BIODEGRADABILITY IN CONTEXT

► Biodegradability is only relevant in select cases and should not be seen as a general solution to plastic pollution; in many situations, reuse, recycling, or substitution with non-plastic materials offer greater environmental value.

The use of biodegradable and compostable alternatives to conventional plastics should be carefully studied, tested, regulated and supported with robust standards through which their biodegradation in all environments is demonstrated.

Compostable plastics can inadvertently contribute to environmental harm by ending up in an environment where they will not biodegrade properly, e.g. due to lower temperatures. Biodegradability depends on the conditions of the environment in which plastic waste is disposed. These conditions vary widely among landfills, home composts or different types of industrial composting facilities (when separate collection schemes and facilities are in place), or in the open environment (marine or freshwater, soil, farmland, etc.).

Valuable uses of industrially compostable plastics include applications where they support bio-waste composting, thus contributing to the circularity of organic material to be recycled into agricultural fertilisers. While compostable plastics themselves add no value to the quality of compost, they may be used to carry bio-waste (such as kitchen and gardening waste), thus contributing to bio-waste collection targets. This includes products whose primary purpose is to carry bio-waste (such as compost bin liners). Industrially compostable bin liners can make more sense than non-biodegradable equivalents also because disposing of the product with bio-waste could impede bio-waste composting and require manual separation for landfilling or burning (i.e. loss) of both the product and the bio-waste. It is important that the chemical composition of the plastic product contain no persistent, hazardous or toxic substances in order to preserve compost quality. This is also true for paper and plastic composites found in food service and packaging which have been found to be coated with highly persistent substances like PFAS, harming compost quality thus causing soil pollution and possible health risks from use in agriculture.

The report also provides recommendations about standards which can be of use to assure the use of plastics which are meant to biodegrade in the open environment, such as a farm or forest, such as tree seedling tubes, horticultural mulch films, or planting pots, etc. For these applications, reusability can be difficult to achieve in practice, therefore a biodegradable material can be considered. It is however possible that the use of natural substitutes could fulfill the product's function with even fewer negative impacts than biodegradable plastics (see section below). **We consider that biodegradability is only relevant in select cases, and it is not a solution to improper disposal of other plastic products, which could be reused, recycled or replaced with non-plastic substitutes**.

Biodegradable products used in agriculture, horticulture and forestry may only be beneficial when they can remain in function long enough to fulfil their primary role, e.g. protect tree seedlings during early growth stages, and at the same time fully biodegrade once this role is fulfilled, while leaving no persistent, hazardous or toxic residue.

These innovative forms of plastics can also bring about some challenges:

- **Most bio-based and some biodegradable plastics are derived from food sources** like starch. Considering Kenya, Nigeria and Ghana's challenges with food security, hunger and famine, production of biodegradable and compostable plastics can create **excessive pressure on the supply of the base crops** (roots, tubers, cereals and certain fruits). This possible competition of uses of crops could lead to **indirect land use change** (such as deforestation for the purposes of food, feed or material production), **shortages and higher prices** that would undermine the food system with grave economic and social consequences.
- Their **price differentials** should be considered. In Nigeria for instance, biodegradable and compostable plastics are reported to be about **three to five times more expensive** than fossil-based plastics (Abioye, 2018).
- Some plastics that have been sold as biodegradable do not add environmental value compared to more circular alternatives: **products which can be reused, upcycled, repurposed or recycled should not be replaced with single-use biodegradable alternatives**. This is for instance the case for biodegradable plastic beverage bottles, where bottles could be made reusable or at least recyclable, are unlikely to biodegrade in all environments and do not bring valuable material to composts.
- **Poorly engineered landfills and poorly managed industrial or home composts cannot guarantee the full degradability of even compostable plastics.** This is due to the lack of the necessary oxygen, water, micro-organisms and sunlight for breakdown (European Bioplastics, 2015).
- The efficacy of biodegradable and compostable alternatives critically depends on addressing **gaps in waste management infrastructures** and implementing **supportive policies** for effective collection, disposal and processing.
- When inadvertently collected with other plastics, biodegradable plastics, such as Polylactic Acid (PLA), can **impede recycling processes and limit the recyclability of other plastic types**, e.g. mechanical recycling of PET. Lack of **public awareness on how to handle compostable plastics** at the disposal stage can lead to improper disposal. Clear **labelling of the appropriate disposal** is therefore necessary.

2.1.3 The potential of non-plastic natural substitutes

Non-plastic natural substitutes can offer solutions to address the risks from compostable and biodegradable plastics. In Kenya for instance, substitutes to plastic tree seedling potting bags and tubes are being explored, such as **fibre baskets and bamboo tubes**. **Plant leaves** can be used as packaging, and cotton tote bags as shopping bags. Emerging research globally suggests that many products also can be used to manufacture biodegradable and compostable mulch as alternative solutions to plastic mulch, including coconut coir (addressed in the case study in Annex), **hay, straw, pineapple crowns, leather, plant chippings, wood materials, seaweed film and fibre, and repellent plants/legumes** (Santulli et al., 2022; Sharma et al., 2018; Van Dork et al., 2011).

These solutions could avoid the use of the edible parts of food crops to produce materials by instead using agricultural, horticultural and forestry by-products which are typically wasted. In cases where the material is indeed waste-based, its cost can be quite low and require minimal processing, therefore offering an economically attractive solution. In such cases, costs may largely depend on the initial research and testing costs to check adequacy of the material in given applications, followed by the costs of transporting the material from production sites (e.g. farms) to the place of utilisation, with possible transformation prior to final use.

↓ Image 2. Processed pineapple fiber prepared for sun drying by Mananasi, a SMEP-supported project developing sustainable fiber-based materials from agricultural waste. Mananasi presented these non-plastic natural substitutes at the Marine-based Products and Services (MAPS) Expo in Geneva, March 2025.

3.

Policies and regulations for plastics reduction and management

3.1 Policy and regulatory landscape at national level

3.1.1 Kenya

Kenya's efforts to develop a sustainable and resource-efficient zero-waste economy are guided by international treaties, national and local policies, laws, regulations, strategies and plans. Under the leadership of the Kenyan Ministry of Environment and the National Environment Management Authority (NEMA), the country has developed a long-term policy framework addressing plastic pollution (Opondo, 2020):

1. The **Constitution of Kenya** (2010) mandates sustainable waste management and the zero-waste principle, which aims to eliminate all waste by designing and managing products and processes that reduce and eventually eradicate the volume and toxicity of waste. The Constitution also upholds the right to "a clean and healthy environment" (Republic of Kenya, 2010) The 4th Schedule of the Constitution assigns county governments the responsibility for waste management, with only some of the 47 counties effectively enacting laws to uphold this duty.

The key policies governing the sector include:

1. The **Vision 2030** (2008) aims for middle-income status through sustainable practices, including waste management and reduced plastic pollution.
2. The **National Environmental Policy** focuses on sustainable consumption and minimising environmental impacts.
3. The **Green Economy Strategy and Implementation Plan 2016-2030** provides a set of targets along key environmental objectives.
4. The **Sustainable Waste Management (SWM) Policy** emphasizes waste reduction, recycling, and the use of biodegradable materials.

Highlights

TOWARD A ZERO-WASTE KENYA

50% by 2025

▶ Kenya aims to reduce plastic waste by 50% by 2025, as outlined in its National Solid Waste Management Strategy, Republic of Kenya (2022).

Kenya's plastic pollution management framework is governed by several key laws, which have many ambitious targets around combatting plastic pollution and frame the management of plastic pollution across sectors like food packaging, agriculture, and forestry:

1. The **Environmental Management and Coordination Act (EMCA)** of 1999 defines waste and lays the foundation for environmental protection.
2. The **Sustainable Waste Management Act** of 2022 integrates existing laws, emphasising the zero-waste principle and promoting waste as a recoverable resource (Republic of Kenya, 2022).
3. The **Public Health Act (Amendment)** of 2012 addresses health concerns related to waste, ensuring sanitation and health protection.
4. The **County Governments Act of 2012** assigns responsibilities to counties for effective waste management.
5. The **National Solid Waste Management Strategy** which seeks to achieve a 50% reduction in plastic waste by 2025.

Kenyan policies and regulations to curb plastic pollution have focused on reduction, raising awareness on the alternatives to single-use plastics, and transitioning the country from a linear to a circular economy. This is exemplified by the 2017 **strict single-use plastic bans for secondary packaging carrier bags and for plastic tree seedling potting bags**, the 2024 **notice for the use of biodegradable organic waste collection bags**, and the **Sustainable Waste Management Act** of 2022 that upended the decade-long view of solid waste as refuse to be dumped but rather a resource to be exploited.

The Ministry of Environment and Forestry also adopted an **Extended Producer Responsibility (EPR) regulation** in 2022. This law will attract much-needed private finance for sustainable waste management in the country, including through eco-modulation fees. The law has however not yet been enforced which has made more challenging the implementation of EPR and the work of existing producer responsibility organisations like PAKPRO and KEPRO, as most plastics and packaging manufacturers have not signed up due to the lack of enforcement. This has led to free-riding, where some producers avoid contributing EPR fees and therefore to improving waste management. The governance of these schemes has also been identified as lacking clarity, inclusivity and accountability (Ong'are and Vyalu, 2023).

In sum, the Kenyan governments has shown many positive policy commitments, however the regulatory framework lacks clear targets and has faced implementation challenges and delays in meeting objectives. This has been attributed to low public buy-in, absence of clear guidelines for implementation such as on suitable alternatives or non-plastic substitutes to the banned single-use plastic carrier bags, and of an adequate transition time to ensure compliance and proper enforcement (see Annex II, Table 3. Overview of Kenya's Policies, strategies and plans targets to stop plastic pollution and their respective challenges.). Despite prohibiting plastic bag production in Kenya, bags continue to pour onto the market due to illegal smuggling. The legal framework has succeeded in supporting reusable bags in some businesses, but the packaging alternatives resulted in an economic burden to the bottom of the pyramid with more environmental and health challenges (Geoffrey and Mutune, 2020).

Highlights

TOWARD A ZERO-WASTE KENYA

► Kenya banned plastic carrier bags in 2017 and later extended restrictions to plastic tree seedling potting bags and non-woven bags, but continues to face enforcement challenges and illegal smuggling.

For food packaging, NEMA has published **guidelines on the acceptable substitutes to the banned plastic carrier bags**: all bags made from non-plastic materials, e.g. jute/sisal, paper, cloth, papyrus and 100% biodegradable bags (starch and cassava bags) (NEMA, n.d.). The widely available non-woven bags touted as 'eco-friendly' and reusable, proved to be more detrimental to the environment because of poor quality and lack of infrastructure to manage them at end-of-life, and were banned too from March 2019. But **Kenya has yet to provide specific requirements on the use of '100% biodegradable bags', e.g. to ensure non-ecotoxicity.**

Similarly, Kenya's specific requirements on the use of biodegradable mulch films and biodegradable tree seedling potting bags are **missing in the agricultural, horticultural and forestry sectors**. The lack of available biodegradable materials to substitute commonly used plastic bags for potting seedlings – or lack of research into suitable substitutes – could hinder the goal of increasing Kenya's tree cover by 30% by 2032, which requires growing 15 billion trees (The Standard, 2023). To address this problem, NEMA is piloting the use of biodegradable seedling bags (NEMA, 2023).

Concerning waste management, the provisions under the Sustainable Waste Management Act of 2022 for **segregation of waste at source cannot yet be fully implemented** in Kenya due to the absence of adequate collection, sorting and disposal system. The waste management system in Kenya has room for improvement, with most mixed waste ending up in open dumpsites or burnt on-site in rural areas (UNIDO, 2021). This has hindered the implementation of obligations to segregate bio-waste at source without adequate infrastructure. Further delay in the implementation of NEMA's directive to use "100% biodegradable garbage bags/bin liners only" for disposal as a follow-up to the ban on plastic garbage bags and bin liners (Sowek, 2024) was caused by the lack of regulation on colour codes for source separation, which however are currently under development and receiving public feedback at timing of writing this report.

3.1.2 Nigeria

Nigeria's plastic policy and regulatory landscape has evolved significantly over the last 20 years with a focus on fostering a circular plastics economy, led by the Federal Ministry of Environment (FME) and the National Environmental Standards and Regulations Enforcement Agency (NESREA). Notably, these instruments lay greater emphasis on plastics in the food and beverage packaging sector when compared to the agricultural and forestry sectors.

The country's key legislative, policy and regulatory instruments for plastics reduction and management derive from the **Constitution of the Federal Republic of Nigeria** (1999), which mandates the State to "protect and improve the environment", ensuring the preservation of the country's water, air, land, forest and wildlife (Section 20 of Chapter 2) (Federal Republic of Nigeria, 1999).

The following set of instruments deal generally with pollution control and solid waste management across sectors, including plastics, led by the FME and the NESREA:

1. The **National Environmental Standards and Regulations Enforcement Agency (NESREA) Act** of 2007 (Amended) establishes and empowers NESREA as a national environment regulator driving regulatory compliance. NESREA has championed the fight against plastic pollution with important regulations that supports mandatory implementation of an EPR programme (2016) for the four largest plastic end-use sectors: food and beverage packaging, e-waste, batteries and tyres.
2. The **National Environmental (Sanitation and Waste Control) Regulations** of 2009, 2023 reviewed aims to reduce pollution through sustainable practices for waste management and environmental sanitation, including promoting the use of waste bins and prohibiting and fining careless discarding of waste.
3. The **National Environmental (Chemical, Pharmaceuticals, Soap and Detergent Manufacturing Industries) Regulation** (S.I No.36) of 2009 aims to prevent upstream pollution from manufacturing activities in the target sectors by mandating manufacturers to recover and recycle or dispose responsibly of all manufacturing waste from their operations. Plastics are covered under chemical industries and includes food packaging.
4. The **National Policy on Solid Waste Management** of 2020 lays a comprehensive framework for the sustainable management of all categories of solid waste, including plastics, prioritising the circular economy and zero-waste approaches.

Highlights

FRAMEWORK FOR KEY PLASTIC SECTORS

▸ Nigeria made Extended Producer Responsibility (EPR) mandatory in 2016 for key plastic end-use sectors, including food and beverage packaging, e-waste, batteries, and tyres, led by NESREA.

In addition, the following four instruments target plastics and related materials:

1. The **National Environmental (Food, Beverages and Tobacco Sectors) Regulations** of 2009 mandates companies in the target sectors to adopt waste reuse, recovery and recycling as part of their waste management strategies. The regulation places emphasis on plastics as the predominant packaging material in the food and beverage sector with a large footprint in the waste stream.
2. The **National Environmental (Domestic and Industrial Plastic, Rubber and Foam Sector) Regulations** (S.I. No.17) of 2011 introduces the polluter-pays-principle to induce households as well as companies in the target sectors towards responsible disposal of household and industrial waste in order to minimize waste littering and pollution, including fines for individual and corporate defaulters.
3. The **Operational Guidelines for the Implementation of the Extended Producer Responsibility (EPR) Programme** of 2014 sets out guidelines for implementation of the EPR programme for packaging materials with a focus on three sectors - food and beverages, e-waste and batteries, as the pilot sectors. The guidelines include a requirement for setting up sector-based Producer Responsibility Organisations (PROs).

4. **The National Policy on Plastic Waste Management (NPPWM)** of 2020 aims to foster a "resource and energy-efficient circular plastics economy" with three objectives: making Nigeria plastic litter-free; ensuring sustainable consumption and production of plastics; and reducing carbon footprint and benefiting from carbon credit financing. It outlines 12 goals that include developing legislative instruments, standards, trade measures, models and systems to support plastic waste management while boosting economic growth. The policy further outlines ambitious targets against the 2020 baseline, including reducing plastic waste generation and plastic litter in the environment by 50% by 2025 notably via a ban on certain categories of plastic, and achieving 50% recycling rate by 2030. The policy also sets high ambitions for plastics circularity, biodegradability and compostability, by aiming that by 2030 all plastic packaging in the market meet at least 2 out of 4 criteria of being recyclable, biodegradable, compostable or reusable; and to promote the sustainable use of non-plastic substitutes to single-use plastics e.g. jute bags, leaves, paper, glass bottles, etc. from May 2020 (Nigeria Federal Ministry of Environment, 2020).

Overall, these instruments have helped to **raise awareness among stakeholders about the environmental impact of plastic pollution** and attract technical and funding support from development partners for capacity building. They have also induced various initiatives towards plastics reduction and sustainable management, especially by the major players in the plastics sector.

The **main policy and regulatory objectives remain largely unachieved**, however, due to issues related to the formulation, implementation, and enforcement of this framework. This is seen in the persistently high rates of plastic waste generation and mismanagement across the country (World Bank, 2023). The targets set in the NPPWM were likely too ambitious and lacked robust implementation and enforcement tools, and the operational guidelines for the policy implementation are still being developed four years after initial publication. Despite the avowed commitment to minimising single-use plastics, a bill seeking to ban the production, sale and use of plastic grocery bags has stalled in the National Assembly since 2019, thus enabling the indiscriminate use of these bags across the country. The FME is nevertheless pushing on with its agenda with the recent ban on single-use plastics in national government offices, and the ongoing preparation for a nationwide ban by 2025.

There are ongoing initiatives to fix some of the gaps and accelerate progress. The **draft National Environmental (Plastic Waste Control) Regulations** of 2023, currently awaiting approval (as of September 2024), aim to enforce a number of key measures, including: a mandatory EPR scheme across various sectors; the phasing out of avoidable plastics including non-recyclables, hard-to-recycle and certain categories of single-use plastics; a mandatory recycled PET (rPET) content ratio for food and beverage packaging; and the mainstreaming of biodegradable plastics in certain products, such as diapers. A Draft Guidance Document for the Implementation of Extended Producer Responsibility (EPR) Programme for (plastic) packaging has also been developed to enhance implementation of the Draft National Environmental (Plastic Waste Control) Regulations and is due for adoption by the end of 2024.

Implementation guidelines for the NPPWM are now being developed with support from UNIDO and some other development partners. The country also launched the **Nigerian Circular Economy Roadmap (NCERM)** in 2023 focusing on 5 priority sectors, including waste for which plastics is a focal point. The Roadmap suggests the importance of biodegradable plastics, however it does not identify priority sectors with high environmental value-added as identified in this report.

3.1.3 Ghana

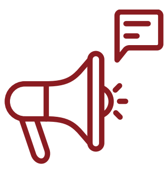
The environmental policy framework in Ghana relating to plastic pollution has been largely driven by the Ministry of Local Government and Rural Development, who developed general sanitation and waste-related policies, and the Ministry of Environment, Science, Technology and Innovation (MESTI), whose role has been more specific to developing national policy on plastic pollution. The Ghana Environmental Protection Agency further holds powers to set environmental standards and enforce their compliance.

1. The **National Environmental Policy** (1995) summarizes Ghana's vision for environmental policy as "To manage the environment to sustain society at large", thus underscoring its commitment to address the challenges of environmental quality (which is impacted by plastic pollution) as part of its developmental agenda.
2. The **Environmental Sanitation Policy** (1999 and 2009) aims to develop a nationally accepted vision of environmental sanitation as an essential social service and a major determinant for improving health and quality of life in Ghana. It highlights the environmental challenges arising from the substitution of biodegradable packaging materials, like leaves and paper, that were used traditionally with various forms of packaging plastics in recent years. The policy outlines the following actions to control pollution and safeguard the environment:
   i. recycling of waste materials, including plastics, to prevent littering as well as other potential pollution of land, water and the air.
   ii. promote use of biodegradable materials to minimize use of conventional plastics.
   iii. direct levies on producers of pollutants, especially nonbiodegradable pollutants such as plastics as well as the use of a reasonable proportion of the District Assemblies' Common Fund to subsidize the cost of sanitation service.
   iv. identification of sustainable financing options like the polluter-pays-principle for plastic producers and users to be implemented at both national and subnational levels.

   The policy is currently under review to ensure comprehensive coverage of the issues vis-à-vis the current realities as well as to enhance its effective implementation.

Highlights

RETHINK PLASTIC USE



▶ Ghana's Environmental Sanitation Strategy and Action Plan (2010) includes awareness campaigns to promote biodegradable materials as alternatives to plastics, aiming to reduce plastic use and pollution.

3. The **National Environmental Sanitisation Strategy and Action Plan: Materials in Transition, MINT** (2010) is the accompanying strategy and action plan to the Environmental Sanitation Policy. It adopts the 4Rs: Reduction, Re-use, Recycling, and Recovery as a strategy to mitigate plastic pollution. It confirms and provides targets for the promotion of biodegradable materials as alternatives to minimize the use of plastics through awareness campaign as well as specific levies on importers and producers of plastic products, including extending these to the distributors and end-users at the Metropolitan, Municipal, and District Assemblies (MMDAs) level. The policy also maps the value chain for the sustainable management of plastic films (Ministry of Local Government and Rural Development, Ghana, 2010).
4. The **National Plastics Management Policy** (2020) provides policy direction for plastics manufacturing and use as well as for plastics waste management in Ghana (Ghana NPAP, 2022). The NPMP is built on four focal areas, covering: 1) Behavioural change, 2) Strategic planning and cross-sectoral collaboration, 3) Innovative resource mobilisation towards a Circular Economy, and 4) Good governance, inclusiveness and shared accountability. This is further cascaded into 17 strategic actions to deliver objectives that include awareness creation, capacity building for plastics waste management (collection, recovery, recycling, remanufacturing),

financing through EPR schemes and operationalisation of the Environmental Tax Regime (Act 863). The policy defines biodegradable plastics as those that "are entirely degraded by biological activity (compostable) without leaving behind any residue. They can be manufactured from renewable materials and fossil fuels, as well as mixtures of those". While it promotes biodegradable and compostable plastics, the policy notes however that there is a need for detailed study or assessment on the environmental and human health risks of different classes of biodegradable additives, especially in connection with migration of chemicals into food and beverages. A conclusive report of such a study is yet to be issued. The policy also outlines the establishment of collection, recovery, recycling and remanufacturing targets as one of its 17 strategic actions (Government of Ghana, 2013).

These policy documents outline the government's official positions and aspirations on plastic management, circularity, biodegradation and compostability. However, **up-to-date and plastic specific strategic plans which would articulate the action plans and targets to drive progress are lacking as well as up-to-date operational guidelines and regulations that would enable the implementation of these policies.**

Ghana has adopted several regulations that address the scope of plastics products, circularity, biodegradation and composability:

1. The Customs and Excise (Duties and Other Taxes) Act of 2012 initially imposed a 15% ad valorem duty on some plastic bags and packaging. A review conducted in 2013 named the **Customs and Excise (Duties and Other Taxes) (Amendment) Act (Act 863)** reduced the rate to 10% and extended the coverage to a wide range of plastic products. In the 2023 budget, the tax was designated as 10% Environmental Excise Tax on selected plastic materials at the entry ports. In addition, the Government has recently imposed a 5% excise tax on locally produced plastic products also intended to address environmental issues caused by plastics.
2. The **Oxo-biodegradable plastics (OXOs) Directive** published by MESTI in 2015 states that all flexible plastics produced in the country must contain additives to make them biodegradable for easy disposal (Smith-Asante 2015). The directive also indicated that all plastics produced in Ghana should be above 20 micron.

This regulatory framework poses some challenges to effectively addressing plastic pollution. As stipulated in the original Customs and Excise (Duties and Other Taxes) Act, at least 50% of the revenue proceeds was to be paid into a Plastic Waste Recycling Fund to promote the recycling of plastic waste, including production of plastic waste bins and bags for sorting, as well as to promote the production and use of biodegradable plastics. **However, the fund was never operationalised, which has negatively impacted efforts to implement an EPR scheme**.

In parallel, the adoption of the OXOs Directive has been accompanied by statements from the government that using oxo-biodegradable plastics would address the plastic pollution crisis in Ghana (Smith-Asante 2015). However, no laboratory test has shown more than 91% degradation of oxo-degradable plastics in soil over a period of two years, and some show that degradation stops completely after 13-65% degradation (Hogg et al., 2016; Ledingham 2017). Although they disintegrate faster than conventional plastics, the disintegration process leads to the breaking of plastics into microplastics which then easily disperse in the environment. In the European Union, a study for the European Commission concluded that "Claims presenting oxo-degradable plastic as an "oxo-biodegradable" solution to littering which has no negative impact on the environment, in particular by not leaving any fragments of plastic or toxic residues behind, are not substantiated by evidence" (European Commission, 2018). In the United States, the Federal Trade Commission (FTC) has also concluded that an oxo-degradable plastics manufacturer made false, misleading and unsubstantiated claims regarding the biodegradation of its oxo-degradable plastics (FTC, 2014).

3.2 From regional to global

Towards a coordinated ambitious policy and legal framework to curb plastic pollution

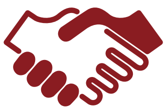
3.2.1 A multi-level governance framework

To tackle plastic pollution effectively, the **East African Community (EAC)**, composed of Burundi, Kenya, Rwanda, South Sudan, Tanzania, Uganda and the Democratic Republic of Congo,could develop coordinated regional policies on plastics reduction and management. **Relying on voluntary initiatives driven by individual countries fails to address the pervasive and transboundary issue of plastic pollution**, such as the illegal smuggling of banned plastic bags from neighbouring countries into Kenya following the 2017 Kenyan ban on the manufacture and use of single-use carrier bags. This resulted in illicit cross-border trade due to smuggling of the banned products into Kenya. Similarly, the pollution of beaches from mismanaged plastics produced in neighbouring countries is another transboundary issue which requires a regional approach.

Within the EAC, the East African Legislative Assembly (EALA) and the East African Court of Justice (EACJ) have the power to draft and enforce legislation. Leveraging the EAC's commitment to environmental sustainability, as outlined in the EAC Development Strategy, can promote significant progress in addressing plastics pollution.

Highlights

CROSS-BORDER COORDINATION



► Regional coordination in East Africa is essential to curb transboundary plastic pollution, as shown by the smuggling of banned plastic bags into Kenya despite national bans.

The **East African Community Polythene Materials Control Bill** of 2016, passed by the East African Legislative Assembly in 2017, exemplifies a regional effort to tackle plastic waste by establishing a legal framework for managing polythene materials. While the Bill sets ambitious goals—including promoting environmentally friendly packaging, preventing pollution, and enhancing recycling—its implementation faces delays pending assent from all EAC Heads of State. The Bill's objectives, such as a comprehensive ban on polythene bags and addressing issues like smuggling, highlight the need for effective coordination between regional and national regulations (UNCTAD, 2023).

The more recent **EAC Single Use Plastics Bill** first proposed in 2023 and awaiting approval by the EALA provides an excellent case study to guide plastics reduction and management within East Africa. With a broader coordinated push, environmentally necessary and ambitious initiatives can be launched in other African regions.

Following the spirit of these initiatives, national governments across the continent should feel empowered to pursue a coordinated approach with sub-regional (Regional Economic Communities), regional (African Union), and global (Global Plastics Treaty) ambition to curb plastic pollution across Africa.

The **African Union** and/or individual member states should take an ambitious coordinated regional and national approach to discussing plastics pollution, driving its approach to implement the **Continental Circular Economy Action Plan**. The AU should take a more proactive approach to environmental issues, and coordinate and harmonise the policies of the Regional Economic Communities, promoting best environmental practice between the Communities.

The African continent is divided into eight **Regional Economic Communities** (REC, AMU, COMESA, CEN-SAD, EAC, ECCAS, ECOWAS -WAEMU, IGAD, and SADC) (UNCTAD, 2018). Each REC would contribute to curbing plastic pollution by pursuing ambitious circular economy strategies, single use plastics bans, and common frameworks on the sustainable use of alternatives to conventional plastics.

At the global level, a process is underway to develop an international legally binding instrument on plastic pollution, including in the marine environment (**Global Plastics Treaty**) by the end of 2025, which is to be based on a comprehensive approach to address the full life cycle of plastic, including its production, design, use, and disposal.

International policies can create a level playing field among member states and positively influence national law making. Individual countries should however be committed to fully enforce the provisions. Regional and international policy efforts can take time, and their progress is also dependent on national level ambition. Taking first steps nationally has multiple advantages: it is the best way to showcase political will and ability to progress at the regional and global level, and it also ensures that countries are gearing up towards rapid implementation of plastics reduction goals by setting up clear targets, instruments and enforcement mechanisms aligned with global ambitions. What is more, standardisation at the international (e.g. ISO), regional (e.g. ARSO), and national level can help support such a coordinated policy and regulatory framework.

3.3 Policy recommendations

Addressing plastics pollution at the national level

The regulatory frameworks of Kenya, Nigeria or Ghana showcase the need to reinforce policies tackling the upstream stages of the plastics lifecycle so as to prevent and reduce plastics at source, and via packaging reuse; the midstream manufacturing stage of plastics (e.g. through suitable plastic substitutes depending on the application), and the downstream stage to improve plastic waste management. Addressing plastic pollution with downstream solutions only (e.g. recycling, compostability, biodegradability) will not be sufficient on their own. Limits need to be placed on production and consumption to reduce the mounting pressure on natural ecosystems and human health.

Further coherence and coordination of policies and laws across the plastic lifecycle can accelerate plastic reduction and pollution management. By designing systems that reduce resource use, prolong product lifespans, and promote reuse and repair, the circular economy (with clear targets), offers part of the solution for reducing material footprints. We suggest below a set of recommendations adapted to the situations of Kenya, Nigeria and Ghana:

Highlights

BEYOND RECYCLING

1. Limit
2. Reuse
3. Substitute

▶ Recycling and biodegradability are not sufficient on their own to address plastic pollution; national policies must also target upstream and midstream stages such as production limits, packaging reuse, and material substitution.

1. Adopt national-level circularity targets: establish clear targets to encourage sustainable practices, guide policymaking, and attract private sector investment, while providing for public participation and reasonable notice period to allow for coordinated transitions. We recommend national lawmakers to adopt specific targets for each of the following circularity aspects, following the waste hierarchy:
   a. **Targets to reduce the production, trade and use of plastics**, such as plastic production and import reduction targets, and sector-specific targets to reduce the use of plastics (including in the food sector, agriculture, forestry). Apply the waste hierarchy principles to all types of plastics regardless of the feedstock, thus ensuring that material use is first and foremost reduced and that products are then reusable and recyclable.
   b. **Targets to replace single-use products with reusable alternatives**, for instance by increasing the share of reusable packaging, bottles and cutlery used in the food sector.
   c. **Targets to replace the use of plastics with materials that are natural, waste-based, biodegradable and locally/regionally available**, such as leaves and other plant material.
   d. **Targets to increase the share of bio-waste collected separately for industrial composting including from the food, horticultural and forestry sectors**, supported by the use of industrially compostable bags where they are shown to help separate collection and composting.

   Targets should then be supported by measures which contribute to their achievement, such as the policy tools recommended below.

2. **Curtail the unsustainable growth of fossil plastics usage and waste generation**: following the leadership of regional initiatives such as the East African Community Single Use Plastics Bill, we recommend:
    a. Bans or phase-outs on unrecyclable, hard-to-recycle and highly polluting plastics, including oxo-degradable plastics.
    b. Financial measures to reduce the trade of avoidable plastics, such as taxes and import duties.

    Problematic and avoidable plastics often include single-use grocery bags and secondary or tertiary packaging with plastic wraps as well as beverage and food packs and cutlery in on-premises consumption channels (hotels, restaurants, and cafes, etc.).

    Measures should be implemented against a realistic impact assessment, and their implementation should be foreseeable for businesses and citizens to help minimise unintended negative effects such as regrettable substitutions, trade effects which do not ultimately contribute to reducing overall plastic pollution, and social impacts. This means ensuring the availability at commercial scale of the identified substitute materials and reuse systems.

3. **Enact and implement Extended Producer Responsibility (EPR) Schemes**: enforce EPR regulations to hold producers accountable, attract private finance, and promote sustainable consumption with mandatory eco-modulation of EPR fees for plastics with annual recovery and recycling targets based on a company's put-on-market plastic volumes.

4. **Incentivise reuse business models**: support reuse models in the food sector through tax incentives and consumer awareness, and developing a systems thinking to deploy efficient and affordable refill systems, including for the 'kadogo economy',[1] while supporting consumers' adoption through awareness raising.

5. **Support investments in research and innovation**: encourage local research and development for reusable and recyclable designs that support the higher tiers of the circular economy, providing incentives for sustainable practices, as well as natural and locally available biodegradable substitutes with lower life-cycle impacts than conventional plastics considering the countries' natural resources.

    Substitutes, including biodegradable and compostable plastic alternatives, should not compromise food security of base crops (roots, tubers, cereals, and fruits). Public and private research bodies such as universities and specialised institutions can be leveraged to create bespoke solutions in the food sector, horticulture and forestry. When demonstrated as effective, innovations can then be standardised in order to scale up their use and benefits.

Where research and innovation has demonstrated the availability, affordability, environmental added value and absence of detrimental effects of relevant alternatives:

6. Provide a clear and consistent framework for biodegradable and compostable alternatives to conventional plastics:
    a. **Develop stringent criteria specifying applications for which biodegradable or industrially compostable plastics can be used**, based on proven unfeasibility of reusable or natural substitutes to be used.
    b. **Set minimum requirements on the biodegradability or compostability of relevant alternatives to plastics, whether they are made of plastic or not**, such that they are accepted and treated in existing composting infrastructure within composting time frames and practices.

1 The 'kadogo economy' is the sale of fast-moving consumer goods in tiny portions prevalent in low-income areas. It has led to various food and nonfood commodities, for example, instant coffee, margarine, tea leaves, snacks, and candy, being packaged in small portions of single-use plastic wrappers that have very high littering potential posing huge difficulties to their collection.

c. **Provide clear definitions to ensure the definite identification of product characteristics, such as reusability, recyclability, compostability, and biodegradability.** These definitions will support regulatory implementation and enforcement, marketing claims and consumer understanding. This report provides a set of Recommended definitions which can be adopted from existing international standards (e.g. ISO 17088:2021 and ISO 16559:2022), European standards (e.g. EN 17427:2022) and laws (e.g. the European Single-Use Plastic Directive (EU) 2019/904).

d. **Support the implementation of regulatory requirements by mandating the use of robust standards to test biodegradability or compostability of the plastics, depending on the environment in which the product might end up.** Where robust standards are missing, governments can request the development of new standards from national, regional or international standardisation bodies, detailing the necessary technical characteristics of the standard.

In line with our recommendations on Relevant standards on biodegradation and compostability, we particularly recommend the adoption of ambitious international standards at national or regional level, or the development of national/regional standards for:

- Non-plastic substitutes such as products or wastes originating from agriculture, horticulture and forestry, e.g. coconut coir for use as mulch, leaves used as packaging, bamboo stems used as seedling tubes, cotton tote bags, etc. Standards can be used to assess the soil biodegradability and performance using these substitutes, as well as their impacts on soil conditions, plant productivity, food safety, and other relevant areas of impacts (e.g. based on ISO 23517:2021).
- Plastics biodegradable in soil (e.g. ISO 23517:2021 on soil biodegradable plastics materials for mulch films in agriculture and horticulture).
- Plastics biodegradable in soil for forestry applications.
- Compostable packaging typically mixed with bio-waste in food applications (e.g. ISO 17088:2021 on industrially compostable plastics, if separate collection and composting infrastructures are available, or EN 17427:2022 on carrier bags suitable for treatment in well-managed home composting installations), while ensuring clear differentiation through labelling systems for consumers.

Biodegradation should be tested and determined for all separate constituents of a product and for the final product as a whole. For the limited industrially compostable plastics that should be allowed, it remains important to ensure their full and harmless composting in industrial composting facilities, tested realistically and demonstrated for their **ultimate aerobic biodegradation, disintegration and non-toxicity**. It is also important to consider that colorants, additives, printing inks and glues can influence the results of biodegradation, disintegration and ecotoxicity tests.

Laws and standards should ensure clear product labelling (e.g. ISO 14021:2016, Environmental labels and declarations – Self-declared environmental claims, is being revised), particularly regarding the adequate disposal of the product (reuse, recycling or composting), and exclude detrimental alternatives or alternatives that have worse impacts than conventional plastics over the entire lifecycle. This is the case for oxo-degradable plastics that do not properly biodegrade and contribute to microplastic pollution (Eunomia, 2016; Miles, 2017).

Effective coordination between national authorities and national/regional standardisation bodies is required to ensure that standards effectively support policies and regulations to achieve circular economy goals.

Highlights

STANDARDS MATTER

industrially
compostable
7PXXXX

▶ Clear definitions and robust biodegradability and compostability standards are essential for effective regulation, consumer understanding, and the safe use of plastic alternatives.

Note: The Seedling logo is a registered trademark of European Bioplastics and certifies that a product is industrially compostable according to EN 13432.
For more information, please visit: https://www.european-bioplastics.org.

Voluntary standards often reflect disproportionate influence from industry stakeholders, leaving limited room for input from critical groups such as environmental agencies, scientists, small businesses, trade unions, and consumers. Governmental and standardisation bodies should ensure inclusivity in standardisation processes, allowing relevant and affected stakeholders to intervene alongside industry and government actors.

Based on a well-informed selection of demonstrably effective alternative solutions to conventional plastics, the following measures should be taken:

7. **Upgrade and expand solid waste management infrastructure**: enhance segregated waste collection – especially of bio-waste – sorting, optimise value recovery of plastics and other recyclables by leveraging private and public funding, with joint efforts between local governments and recognition of informal waste pickers to minimise waste to dumpsites.

8. **Extend plastic control measures beyond packaging and consumer goods products**: define plastic waste prevention, reduction and recycling regulations and targets to specific sectors such as agriculture, horticulture, forestry, fishing, construction, textiles, etc. where indiscriminate use of plastics and resultant pollution are equally damaging to the environment.

9. **Run awareness campaigns and consumer education programmes**: educational campaigns and clear labelling in local languages needs to inform consumers about the negative health and environmental impacts of plastics, reusable alternatives to single-use plastics, and proper disposal methods for biodegradable and compostable plastics, especially women as behavioural change champions (Global Plastic Action Partnership, 2021b).

10. **Develop supportive green public procurement policies**: mandate public sector purchasing and use of reusable and recyclable solutions, but also natural substitutes and biodegradable products to substitute single-use non-biodegradable food packaging, public horticultural or forestry projects, where there is a clear environmental added-value.

↓ Image 3. Plastic filtering system at TakaTaka Solutions, a Nairobi-based waste management company supported by the SMEP Programme. The image shows the removal of microplastics from wastewater during the recycling process. It illustrates the importance of infrastructure investment and circular solutions for effective plastic pollution mitigation.

3.4 Policy recommendations

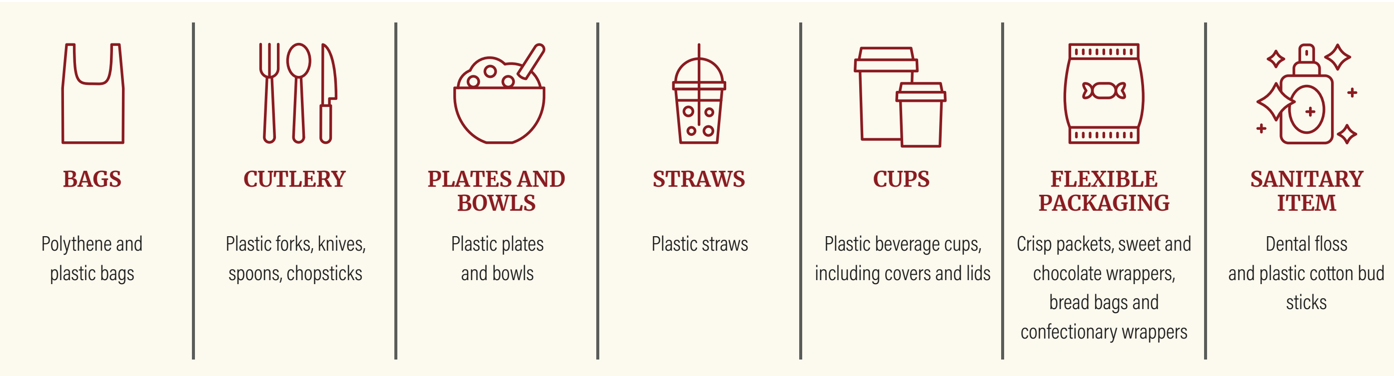
3.4.1 Towards an effective East African Community Single Use Plastics Bill

A key initiative of the EAC is a proposed Bill on the prohibition of manufacturing, importation, use and sale of single use plastics (SUP Bill), to be considered by the East African Legislative Assembly. The SUP Bill presents a unique opportunity to harmonise national legal frameworks on regulating single-use plastics across East Africa, offering a solution to the problem of transboundary trade of single use plastics and associated pollution.

The scope of the proposed SUP Bill includes a list of single-use plastics for which alternatives exist, including:

↓ Figure 2. Types of SUP items included in the EAC's proposed SUP Bill with available alternatives.

Source: ECOS



These plastics are commonly found in beach cleanups and were for the most part also subject to a ban in other regions, such as in the European Union with the Single Use Plastics Directive.

It is highly recommended that the East African Legislative Assembly adopts the proposed SUP Bill as it was tabled in 2023.

Key elements of the proposed SUP Bill which need to be maintained and should be effectively implemented by the EAC Member States include:

- The definition of 'problematic plastics,' defined as plastic packaging items, components or materials for which alternatives exist, and for which consumption should therefore be eliminated and replaced with reusable products or with products made of more environmentally-friendly materials.
- The prohibition of production, import, sale and use of problematic plastics, including the full list of prohibited single-use plastics.
- Clear penalties and enforcement measures on these prohibitions.
- A mandate for governments to develop waste management system and preventing dumping.
- Measures towards a smooth and equitable transition away from using SUPs.
- Measures to recognise the role of informal waste pickers and improve their welfare.
- A mandate for the allocation of EPR fees to improving infrastructure and supporting the informal waste sector workers.
- Measures for governments to raise awareness and educate citizens about the new rules and the use of alternatives to plastics.
- Provisions for the clear marking of products containing plastic, their appropriate disposal route, the prevention of littering and inappropriate disposal, and the negative environmental and health impacts from plastic litter.

Furthermore, we recommend the EAC Member States to improve the proposed Bill and its implementation by:

- Clarifying which products are to be exempted in the list of permitted single-use plastics in order to prevent loopholes. In particular, some plastics under 'industrial purposes' and 'agriculture and forestry' could be classifiable as problematic according to the definition and should be phased out (e.g. plastic mulch films which can be replaced with natural substitutes).
- Setting clear timelines for the achievement of goals, including on bans, in order to allow for an effective transition away from single-use plastics.
- Allocating technical and financial support for the implementation of the SUP framework, including for adequate waste infrastructure, enforcement and education.
- Establishing monitoring and reporting structures that track progress and ensure compliance.
- Giving manufacturers the responsibility to also educate their staff and the consumer population about the new rules and the meaning of labels.

3.4.2 Policy recommendations towards a robust Global Plastics Treaty

The ongoing intergovernmental negotiations (INC) on an international legally binding instrument on plastic pollution, including in the marine environment present a pivotal opportunity to address plastic pollution, a pressing global issue with pronounced impacts on Africa. Given the transboundary nature of plastic waste, international cooperation is essential as no single nation can effectively tackle the problem in isolation. The African Group (AF) has taken a leadership role in advocating for a legally binding, ambitious instrument aimed at addressing the root causes of plastic pollution.

Highlights

AFRICA LEADS ON GLOBAL PLASTICS TREATY

▶ The African Group is advocating for a legally binding Global Plastics Treaty that prioritizes waste prevention, elimination of problematic plastics, and extended producer responsibility, drawing from the waste hierarchy and lessons from the Montreal Protocol.

The AF has consistently championed an approach based on the waste hierarchy, emphasising waste prevention and reduction over non-toxic recycling and disposal. Their proposals include product design requirements, the elimination of problematic polymers, chemicals, products, and applications of concern, and the implementation of mandatory EPR schemes. The AF has also highlighted the urgent need to combat illegal plastic waste dumping in Africa and called for measures that ensure transparency and information disclosure along the entire plastic value chain. Moreover, the AF has been a strong supporter of intersessional work to advance the development of criteria to identify chemicals of concern, problematic, and avoidable plastics and product design (Africa Group, n.d.; Africa Group, 2024).

The AF's efforts have been commendable in driving the treaty negotiations forward, laying a strong foundation for a comprehensive and effective global agreement. Building on these achievements, we have developed a set of recommendations that support and strengthen their approach, ensuring the treaty is fit for purpose and capable of addressing the full scale of the plastic pollution crisis. As negotiations progress, it is essential that the following priorities are addressed at INC-5.2 to guarantee the treaty's success:

1. **Support global binding rules**

   The strength of any global treaty lies in its ability to enforce common standards across all signatories through binding rules. Without such rules and frameworks to reduce pollution, it is projected that mismanaged plastic volumes could double by 2040 (WWF, 2022). A binding framework that covers the entire lifecycle of plastics is essential to the effectiveness of the treaty. The success of the Montreal Protocol, which achieved a 98% reduction in ozone-depleting substances through a global ban, demonstrates the power of binding global agreements over voluntary measures (UNEP, 2019). The AF should leverage its leadership position to advocate for binding rules for all treaty provisions.

2. **Reduction in plastic production**

Global plastic production is forecast to nearly triple by 2060, far outpacing current waste management capacities (OECD, 2022b). Addressing this requires the treaty to include binding rules that specifically target reductions in plastic production. Key measures include:

a. Targets to **phase down plastic production**, with emphasis on primary production.
b. **Inclusion of feedstock and precursors in the treaty's scope**.
c. Provisions to **eliminate products containing problematic, avoidable, and unnecessary plastics**, including microplastics, single-use, and short-lived plastics.
d. Rules to **ensure the systematic application of the waste hierarchy, circular economy principles, and life cycle assessment** when designing, producing, using, and disposing plastic products.
e. Rules to **prioritise and establish reuse systems**.
f. **Harmonized extended producer responsibility** (EPR) principles and clear rules for implementation, taking into account developing countries contexts;
g. Rules and targets to **increase high quality recycling**.
h. Rules around **environmental claims for plastic products**, i.e. recycled content, compostability, biodegradability.

3. **Avoidance of regrettable substitutions**

As discussed in this report's section on The use of alternative designs and materials, alternative plastics and non-plastic substitutes can also play a role in reducing plastic waste globally, but their use should be carefully managed to avoid negative environmental trade-offs. To prevent negative environmental externalities, the treaty should incorporate binding rules on the sustainable use of alternative plastics and non-plastic substitutes, including:

a. Rules to **prevent the substitution of single-use plastics with other single-use products**, e.g. alternative plastics or non-plastic substitutes.
b. **Rules and guidance to ensure the application of the waste hierarchy**, circular economy principles, and comparative life cycle assessments when considering alternative plastics or non-plastic substitutes.
c. Rules around **environmental claims on alternative plastics**, e.g. biobased or biodegradable and non-plastic substitutes, e.g. carbon neutral.
d. Rules and **standards for compostable** or **biodegradable plastics**, following this report's Recommendations for an effective African standardisation framework on biodegradation and composting.

4. Appropriate use of standards

Several provisions in the current treaty draft emphasise the development of global voluntary standards. To ensure that standards align with the treaty's goals, they should be overseen by the treaty's governing body in the following way:

a. The treaty's governing body, or a subsidiary body designated by the governing body, should set technical measures and minimum performance criteria for systems enabling the reusability, refillability, and recyclability of plastics and plastic products.
b. Parties to the treaty should adopt standards that meet the technical measures and minimum performance criteria established by the governing body.
c. The development of these standards should involve equitable participation from all impacted communities and sectors, including small businesses, formal and informal workers, consumers, and environmental and public health experts.
d. The governing body should establish a committee to oversee the global harmonization and maintenance of reuse, refill, and recycling standards. This body should also facilitate capacity-building for the development and implementation of these standards worldwide, drawing on similar efforts in other multilateral environmental agreements, such as the International Plant Protection Convention and the Montreal Protocol's Standardisation Taskforce.

5. Ensure transparency

Transparency is a critical element of effective governance and accountability in the plastics treaty. It is essential to ensure that all stakeholders, including signatories and large corporations, adhere to transparent reporting practices across the entire plastic lifecycle. Key recommendations include:

a. Mandatory **standardised reporting requirements** for chemicals, plastic materials, and plastic products throughout their lifecycle. At a minimum, parties should report:
    - Progress on their contributions to national and global targets to phase down plastic production.
    - Country-level data on annual production, imports and exports of primary polymers.
    - Complete information about environmental and health impacts, and safe use, reuse and disposal of chemicals and polymers of concern.

b. Establish **mandatory globally harmonized transparency, traceability and labelling systems for the chemical composition of plastic materials and products.**[2] The transparency system shall define the reporting format and requirements. The traceability systems shall set guidelines for the development of labelling systems.

c. Establish a global database for management of transparency and traceability for chemical composition data of plastic materials and products.

d. Establish a multistakeholder science-policy subsidiary body to ensure a two-way science and policy interaction in policy- and decision-making for implementing and evaluating the treaty.

e. Create an accountability mechanism to track and enforce compliance with treaty provisions.

2 For more details see HEj Support brief on transparency and traceability systems for plastics: https://www.globalchemicaltransparency.org/wp-content/uploads/2024/04/INC4-Transparency-Information-paper.pdf.

4.

Review of standards on plastics circularity, biodegradation and compostability

4.1 The role of standardisation in support of plastic circularity

Image 4. KEBS, SON and GSA are the official bodies responsible for developing plastics standards in Kenya, Nigeria and Ghana, respectively.

KEBS
Kenya Bureau of Standards

son
Standards Organisation of Nigeria

GSA
Ghana Standards Authority

4.1.1 In East and West Africa

In Kenya, the **Kenya Bureau of Standards (KEBS)** plays a key role in supporting plastic policies and regulations by developing standards, and by providing metrology and conformity assessment services. Nevertheless, these efforts could be reinforced by fostering closer interaction between KEBS and NEMA and synergy in their mandates, e.g. on the development of biodegradability criteria for tree seedling pots. KEBS aims to better protect consumers from unsafe products and services, promote fair trade and facilitates trade, supports the manufacturing of high-quality goods and services, and empowers local communities (e.g. through training and technical assistance). Imported and nationally manufactured products should meet the standards developed by KEBS for accessing the Kenyan market.

In Nigeria, the **Standards Organisation of Nigeria (SON)** develops plastic product standards as well as metrology via the National Metrology Institute under SON's management. However, better collaboration between SON and National Environmental Standards and Regulations Enforcement Agency (NESREA) is imperative in order to mainstream the recyclability of plastic products.

In Ghana, the **Ghana Standards Authority (GSA)** plays a similar role as an Agency of the Government in charge of standardisation, metrology and conformity assessment activities. Within GSA Food, Chemistry and Material Standards (FMS) Department, the Chemistry Standards Bureau develops and maintains standards for areas such as plastics.

At the regional level, the **East African Community (EAC)** provides a framework for cooperation in Standardisation, Quality Assurance, Metrology and Testing in the EAC region. It has established the East African Standards Committee (EASC) to develop and issue East African Standards (EAS)[3]. Harmonized EAS are aimed at removing trade barriers within the Community. Similarly, the **West African Standards Organisation (WASO)** serves as the regional standards body for West African countries, including Ghana. Standards developed by WASO can in principle be developed to address plastic products' circularity, biodegradation, and compostability, aligning with the sustainability goals of members.

At the continental level, the **African Organisation for Standardisation (ARSO)** seeks to harmonise Regional Standards into African Standards and provides for conformity assessment procedures to reduce technical barriers to trade, thereby promoting intra-African and international trade, as well as enhancing the industrialisation of Africa.

4.2 Zooming in on specific national and regional standards

In Kenya, KEBS has developed four standards aimed at developing technical specifications for plastic-related products, such as bags and sacks, and a fifth one (KEBS DKS 3009:2024) is being developed for biodegradable polymer materials for plant seedling potting (listed in Annex III, Table 4. Overview of KEBS, SON and GSA standard specifications on plastics.). This draft standard, based on ISO 23517:2021, aims to specify requirements, test methods, and evaluation criteria of biodegradable polymer materials for plant seedling potting by addressing biodegradation, the control of constituents, and negative effects on terrestrial organisms. However, ISO 23517 requirements on the control of constituents have been weakened in DKS 3009:2024, e.g. the requirements on organic constituents present between 1% and 15% to be evaluated separately on biodegradation have been deleted. Such separate evaluation for biodegradation is important and is unfortunately missing from the current draft.

Moreover, KEBS has adopted nationally several ISO standards for use in Kenya, i.e. adopted them without any changes, including standards on reusable packaging (e.g. KS ISO 18603:2013, commonly called a 'domesticated standard'), material recycling from packaging (e.g. KS ISO 18604:2013), plastic biodegradability and composting (e.g. KS ISO 17088:2012 on plastics industrial composting, see Annex III, Table 4. Overview of KEBS, SON and GSA standard specifications on plastics.). Nevertheless, separate bio-waste collection and industrial composting infrastructure are still needed to implement several of these standards (e.g. KS ISO 17088, KS ISO 5412 and KS ISO 5424). Besides, several ISO standards have been revised, but KEBS has not yet adopted nationally these revised versions.[3]

In Nigeria, SON has developed 21 standards related to plastics production and focused mainly on products from virgin plastic materials (listed in Annex III, Table 4. Overview of KEBS, SON and GSA standard specifications on plastics.). Of these, the NIS 1125:2019 standard is unique for its focus on recycled rather than virgin PET material and was motivated by the need to promote plastic reduction and circularity and to safeguard consumer health and safety. It helped unlock private sector investments in two food-contact rPET plants or bottle-to-bottle recycling plants – and at least two other plants are in the pipeline as of 2024. There are currently no industrial standards for recycling other plastic types or for producing or assessing biodegradable or compostable plastics. Additionally, the scopes of the existing standards, including the NIS 1125:2019, do not extend to the environmental risks inherent in plastics production nor to the end-of-life management of plastic products. This gap underscores the need for holistic and environmentally-sensitive standards to support the national drive towards a more circular economy and plastic pollution reduction.

In Ghana, GSA has developed five standards related to plastics for various applications (listed in Annex III, Table 4. Overview of KEBS, SON and GSA standard specifications on plastics.). Four of these standards relate to food packaging and one relates to the use of oxo-biodegradable additives in various polymers for plastics manufacturing (GS 1183:2018). This last standard sets criteria for oxo-biodegradable additives and their use in plastics, including plastic carrier bags and bags for packaging bakery items, based on ASTM D6954 (Standard Guide for Exposing and Testing Plastics that Degrade in the Environment by a Combination of Oxidation and Biodegradation). It measures the molecular weight, loss in weight and tensile elongation resulting from oxidation. However, no timeline is mentioned for this accelerated laboratory testing, so that it can take several years in nature. Secondly, the biodegradability criteria require 60% biodegradation for homopolymers and 90% for multipolymers, but there is again no maximum test period and it can take years to reach these pass levels under laboratory conditions. Worst, the constituents are not tested separately on biodegradation. Thirdly, the standard requires the soil or aquatic ecotoxicity to be evaluated, not both, whereas these products can end up in both environments. For these reasons, GS 1183:2018 does not allow for ensuring enough strength loss, biodegradation and non-ecotoxicity of plastic products ending up in the open environment, such as for packaging and bakery applications.

3 As a follow-up of the EAC Standardization, Quality Assurance, Metrology and Testing Act (SQMT Act) of 2006, the Standardisation, Accreditation and Conformity Assessment (SACA) Bill was approved by the Council of Ministers to proceed to the East African legislative Assembly (EALA) for enactment. Further information: East African Community (EAC). (2006). Standardization, Quality Assurance, Metrology, and Testing Act (SQMT Act). Available at: https://www.eac.int/trade/sqmt/sqmt-act-implementation.

Highlights

STANDARDS GAP

MAY 2024

▶ Ghana validated three new PET/rPET standards (GS 1239, DGS 1387, DGS 1388) but biodegradable/compostable plastics remain unregulated.

Two other standards (DGS 1387 and DGS 1388), currently under development process, were validated, along with GS 1239, at a stakeholder workshop in May 2024 and are presently awaiting final approval and publication. These three forthcoming standards are specific to PET and rPET packaging, including rPET for food-contact application. There are as yet no national standards in Ghana specifically focusing on compostable and biodegradable plastics, nor on plastic applications in the agricultural, horticultural or forestry sectors. The available GSA standards target plastic public health impacts but not necessarily its environmental impacts, such as disposal risks. The framework of these standards should therefore be expanded to include environmental considerations in order to support the national strategy and policy framework aimed at controlling and mitigating plastic pollution.

The situation with standards in Nigeria is similar in other West African countries. Ghana conducted a validation session for its draft national standards for food-contact rPET in May 2024 and Cote d'Ivoire has reportedly initiated the process. The growing awareness and interest by national governments to develop food-contact rPET also suggests that a coordinated regional approach should be explored to ensure consistency between the national standards (i.e. at the regional level via WASO, or Africa-wide via ARSO), which would facilitate recyclers' feedstock across borders and upscaling of their value chains.

This concern has led to the ongoing efforts to develop a common African continental standard for food-contact rPET in line with the regional integration agenda. At the sub-regional level, **ECOWAS** has initiated the development of a West Africa Regional Action Plan on Plastics Management and Circular Economy, which presents a veritable opportunity to harmonise the different national standards for food-contact rPET and develop new common standards for recycling other plastics. In addition, **ARSO** has initiated the development of a pan-African standard for rPET bottles for food contact applications, with several partners, to tackle the growing fragmentation on rPET standards on the African continent.

Similar momentum could be deployed to draft common standards for materials biodegradable in soil for agriculture, horticulture and forestry applications, based on robust existing standards (e.g. ISO 23517:2021), and more generally for compostable packaging, including plastic packaging, for product groups where there is a clear value-added. Such a regional – or even continental – approach is needed to support trade and agree on common specifications that ensure actual biodegradation of products, where there is a clear environmental added value, in the relevant environment (e.g. soil for agricultural, horticultural and forestry applications). For example, it is essential to test the biodegradation of both the final product and all ingredients present in a concentration between 1% and 15% in line with international standards (such as ISO 17088:2021 for industrial composting).

↓ Image 5. CEN is the official body responsible for developing European standards on plastics and packaging, including biodegradable and compostable products.

European Committee for Standardisation

4.2.1 In Europe

The **European Committee for Standardisation (CEN)** is one of three European Standardisation Organisations (together with CENELEC and ETSI, although they are not relevant to this analysis) officially recognised by the European Union and by the European Free Trade Association (EFTA) as responsible for developing and defining voluntary standards at the European level.[4] CEN is in charge of developing European standards in the plastic and packaging sectors, including for biodegradable and/or compostable products.

Coordination is often necessary to ensure the coherence of environmental policy implementation with adequate market response via standards. In practice, policy-makers and standardizers therefore can benefit from close cooperation to achieve common environmental goals. In the European Union (EU), the European Commission prepares and drafts 'standardisation requests' mandating CEN to support and underpin the EU's legislation and policies with the necessary standards. Standardization requests specify the technical content and deadlines for CEN to develop the requested standard(s). The European Commission drafts standardization requests in close consultation with the relevant CEN technical bodies and

4 Regulation (EU) No 1025/2012 of the European Parliament and of the Council of 25 October 2012 on European standardisation.

CEN members, social partners, consumer associations, environmental stakeholders, small and medium-sized enterprises (SMEs), industry associations, and EU Member States. Once the EU Member States and CEN formally accept the standardisation request, it becomes an official public-private collaboration between the European Commission and CEN with concrete standardization deliverables and deadlines for delivery.

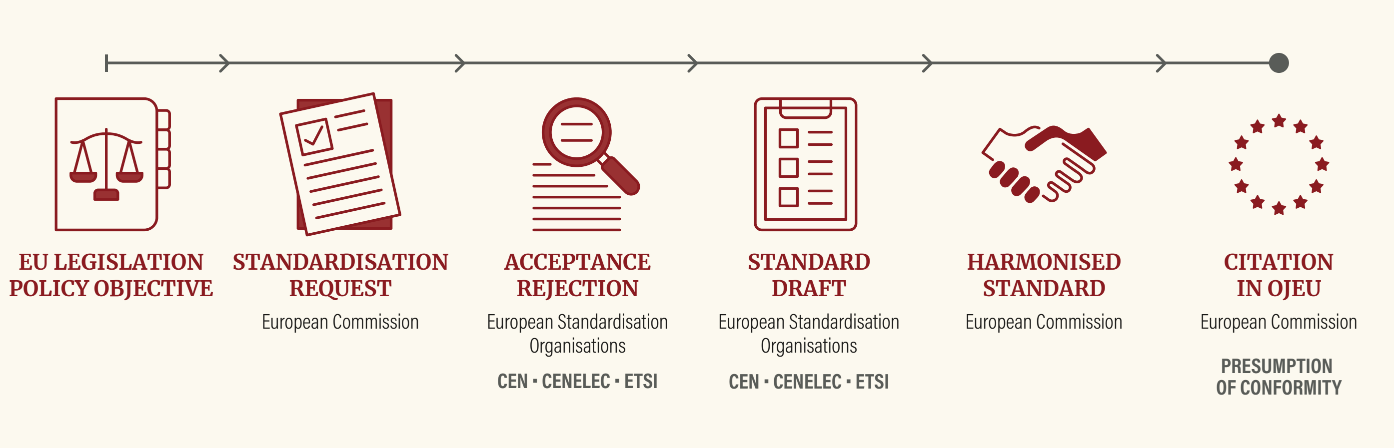
Standards delivered based on such requests are legally called 'harmonized standards.' They can help meet essential requirements set in EU legislation. If referenced in the EU Official Journal, harmonized standards provide a presumption of conformity with the legal requirements they aim to cover. For example, the European standard for packaging recoverable through industrial composting (EN 13432:2000) was published in the EU Official Journal (OJEU) in 2001, following a standardisation request for the EU Packaging and Packaging Waste Directive.[5]

Once European standards are adopted, the National Standardization Bodies (NSBs), members of CEN, should transpose them into identical national standards and withdraw any conflicting national standards.

→ Figure 3. Interplay between EU policy and European standards (simplified representation).

Source: UN Trade and Development based on ECOS.

Note: For a comprehensive description of the European standardization request process, see this presentation (slides 62-77).



4.3 Relevant standards on biodegradation and compostability

Considering this project scope, standard specifications on three different end-of-life options are assessed:

- Industrial compostability, which is relevant for food packaging.
- Home compostability, also relevant for food packaging.
- Biodegradability in soil, which is relevant for horticultural and forestry use.

4.3.1 Industrial composting standards

Standard specifications with criteria for materials suitable for industrial composting have been developed at the international (ISO, ASTM), European (EN), and national levels. The standard specifications most frequently used in practice are listed in Annex IV, Table 5. Standard specifications most commonly used for industrial composting (and anaerobic digestion).

In general, all these standard specifications have detailed requirements related to four aspects:

1. control of constituents (e.g. regulated metals such as cadmium, copper, mercury, nickel, lead zinc, other toxic and hazardous substances, volatile solids).
2. aerobic biodegradation under conditions that are representative for industrial composting (i.e. 58°C ± 2°C).
3. disintegration under conditions that are representative for industrial composting.
4. no toxicity towards terrestrial organisms.

5 Commission Decision of 28 June 2001 relating to the publication of references for standards EN 13428:2000, EN 13429:2000, EN 13430:2000, EN 13431:2000 and EN 13432:2000 in the Official Journal of the European Communities in connection with Directive 94/62/EC on packaging and packaging waste.

The international standard **ISO 17088:2021**, *Plastics – Organic recycling – Specifications for compostable plastics*, allows for ensuring better biodegradation and non-toxicity criteria on plastics. ISO 17088:2021, for example, requires that, not only the final product, but also all constituents present between 1% and 15% are tested separately for biodegradation[6] (EN 13432:2000 is currently being revised, notably to align with this requirement). This is important because the 90% biodegradation pass level could be met with products consisting of 97% biodegradable polymer and, for example, 3% non-biodegradable polyethylene (PE). Detailed requirements including reference to applied test methods are detailed in Annex V, Table 8. Overview of the criteria of ISO 17088:2021 *Plastics – Organic recycling - Specifications for compostable plastics*. ISO 17088:2021 has also been revised recently and includes up-to-date evaluation methods. It has more recent toxicity evaluation requirements on plants and earthworms with several terrestrial organisms (higher plants and earthworms are mandatory, while bacteria are optional), clearer plant toxicity testing requirements, and a more advanced 1-15% testing rule for biodegradation than ISO 18606:2013, *Packaging and the environment – Organic recycling*.

4.4 Home composting standards

Standard specifications with criteria for materials suitable for home composting, in which household vegetable and fruit waste is composted, have been developed on European (EN) and national levels. The standard specifications most frequently used are listed in Annex IV, Table 6. Standard specifications used for home composting.

The main difference between the standard specification for industrial compostable materials and home compostable materials is related to the **duration and the temperature of biodegradation and disintegration testing**. Home composting conditions are less optimal because users are often less actively involved in maintaining the compost (i.e. ensuring good aeration, addition of water if too dry, mixing, etc.), also leading to a slower process compared to industrial composting. The duration of biodegradation and disintegration testing under home composting conditions (1 year and 180 days; respectively) is longer than the duration of biodegradation and disintegration testing under industrial composting conditions (6 months and 84 days; respectively) as a higher temperature is associated with a higher microbial activity.[7]

For compliance with standard specifications for industrial compostability, biodegradation and disintegration testing are both performed at high temperatures (58°C for biodegradation or a high-temperature profile for disintegration)[8]. These high temperatures are representative of the high temperatures that are acquired in industrial composting facilities. Temperatures in home composting conditions are much lower since only small volumes of bio-waste are composted under less optimal conditions. Therefore, the temperature testing range for biodegradation and disintegration testing under home composting conditions was set significantly lower (25°C ± 5°C) when compared to industrial composting. It is very close to the temperature of the environment.

The average temperature in Kenya (25°C), Nigeria (27°C) and Ghana (28°C) is much higher when compared to the European countries (Trading Economics, 2024). Considering that these average temperatures are in the range of 25°C ± 5°C as prescribed by the disintegration test methodology EN 17428:2023, this standard is most probably a very suitable test method to simulate disintegration under home composting conditions in Kenya, Nigeria and Ghana. Only in the case that certain regions in these countries would be characterised by significantly lower temperatures, disintegration might also proceed a bit slower in reality when compared to under laboratory conditions.

The European standard **EN 17427:2022**, *Packaging – Requirements and test scheme for carrier bags suitable for treatment in well-managed home composting installations*, allows for ensuring high biodegradation and non-toxicity criteria for home compostable materials since (1) it has

6 EN 13432 is being revised within CEN/TC 261/SC 4/WG 2 "Degradability and organic recovery of packaging and packaging materials" notably to align it with ISO 17088.

7 Some products will disintegrate at high temperatures, but not at a lower temperature (e.g. for polymers, for which the glass transition temperature lays between the home composting temperature range and the industrial composting temperature range). Therefore, some products may fulfill the disintegration requirement under industrial composting conditions, but not under home composting conditions.

8 ISO 16929 prescribes following temperature profile (for disintegration testing and compost production for subsequent toxicity tests):
- **Days 2 to 7** between 60°C and 75 °C;
- **Days 8 to 28**: between (55 ± 5) °C and (70 ± 5) °C;
- **Days 29 to 56**: between (50 ± 5) °C and (65 ± 5) °C;
- **Days 57 to 70**: below 55°C;
- **Days 71 to 84**: below 45°C.

stringent biodegradation criteria for additives that are added to the plastic and (2) it requires that toxicity tests are performed with several terrestrial organisms (higher plants, earthworms and bacteria). Although this standard specification was developed for carrier bags, it can also be used for the evaluation of the home compostability of other plastic materials like food packaging. Detailed requirements with a reference to applied test methods are given in Annex VI, Table 9. Overview of the criteria of EN 17427:2022 *Packaging – Requirements and test scheme for carrier bags suitable for treatment in well-managed home composting installations*. They can be compared with the French criteria of NF T51-800:2015 *Plastics – Specifications for plastics suitable for home composting* (Annex VII, Table 10. Overview of the criteria of NF T51-800:2015 *Plastics – Specifications for plastics suitable for home composting).* See Annex IV, Table 6. Standard specifications used for home composting.

4.5 Biodegradability in soil standards

Standard specifications with criteria for materials that are biodegradable in soil have been developed on international (ISO) and European (EN) level. Two standard specifications are most frequently used (see also Annex IV, Table 7. Standard specifications used for mulch film biodegradability in soil.):

- **ISO 23517:2021** *Plastics – Soil biodegradable materials for mulch films for use in agriculture and horticulture - Requirements and test methods regarding biodegradation, ecotoxicity and control of constituents*.
- **EN 17033:2018** *Plastics – Biodegradable mulch films for use in agriculture and horticulture - Requirements and test methods*.

Both standard specifications have detailed requirements related to 3 aspects: (1) control of constituents (e.g. regulated metals such as cadmium, chromium, copper, mercury, nickel, lead zinc, substances of very high concern, volatile solids), (2) aerobic biodegradation in soil and (3) no toxicity towards terrestrial organisms. The most recently published ISO 23517:2021 is based on EN 17033:2018, but it has **more stringent requirements on biodegradation**. For example, EN 17033:2018 requires testing "the whole material or for each organic constituent" on aerobic biodegradation, whereas ISO 23517:2021 requires proving biodegradation separately for both the final product and organic constituents, which are present in the material at a concentration between 1% and 15%. Detailed requirements with a reference to applied test methods are given in Annex VIII, Table 11. Overview of the criteria of ISO 23517:2021 *Plastics – Soil biodegradable materials for mulch films for use in agriculture and horticulture – Requirements and test methods regarding biodegradation, ecotoxicity and control of constituents*.

↓ Image 6. Plastic mulch films in use at a pineapple plantation in Ghana. This image was captured as part of the Blue Skies project, supported by the SMEP Programme. It illustrates the need for robust standards on soil biodegradability of agricultural plastics.

↑ Image 7. Organic waste sorting at TakaTaka Solutions in Nairobi. Supported by the SMEP Programme, TakaTaka composts organic waste, showcasing the role of infrastructure in effective biodegradability standards.

© SMEP Programme

4.6 Recommendations for an effective African standardisation framework on biodegradation and composting

Based on the assessment of available standard specifications on industrial composting, home composting and biodegradability in soil, the following standard specifications allow for ensuring better biodegradation and non-toxicity criteria in their standards requirements, and could be considered by the national authorities of Kenya, Nigeria and Ghana and their national standardization bodies KEBS, SON and GSA:

→ Figure 4. Standard specifications ensuring better biodegradation and non-toxicity criteria for food packaging, agriculture, horticulture and forestry applications.

* On condition that industrial composting plants are operational and on condition that these composting plants accept compostable food packaging, including plastics, as input material.

Nevertheless, **industrial composting conditions cannot be fulfilled when waste is not properly collected with bio-waste for industrial composting and ends up in landfills (e.g. in Kenya), or is not well-managed in a home compost**. Composting processes are best ensured under the following conditions:

- For industrial composting, the bio-waste needs to be separately collected and subsequently treated in industrial composting facilities. If bio-waste collection systems and/or industrial composting facilities do not exist yet, industrial composting is not an option.
- For home composting, it is important to carry out education and awareness raising campaigns towards households on how it should be performed (e.g. when buying a home composting unit). If home composting is not well managed the process will be sub-optimal and the biodegradation/disintegration of home compostable materials, particularly plastics, might be delayed.
- When ending up in landfills, soil biodegradable products may not biodegrade in practice. This is due to that fact that the conditions of landfilling (i.e. anaerobic) are not the same as in soil (i.e. aerobic and a lot of bacteria and fungi). Some polymers biodegrade under aerobic conditions, but not under anaerobic conditions.

Regional harmonization of these standards should be promoted in the East African Standards Committee (EASC), the West African Standardisation Organisation (WASO), and the African Organisation for Standardisation (ARSO) to improve regional coherence and to reduce Technical Barriers to Trade, such as through:

Highlights

REGIONAL RULES, SHARED GAINS

▶ Harmonising definitions and adopting international standards for biodegradable and compostable plastics across African regions can reduce trade barriers, improve labelling clarity, and support sustainable market development.

1. **Clear and harmonized definitions**: establish consistent definitions for biodegradable, compostable, and conventional plastics across the countries' regulatory frameworks to improve clarity, in coherence with state-of-the-art international standards (see see *Recommended definitions* section p. 31–33, such as composting, organic recycling and ultimate aerobic biodegradation). These are also essential for related certification and labelling schemes to show consistency in both business-to-business and business-to-consumers communications.

2. **Adopt international standards for biodegradable and compostable plastics where consistent with local circumstances**: adopt the relevant and most recent international standards, ideally at regional level, to stimulate market awareness and interest in these products, foster trade, and attract pilot investments in their value chain development for applications where there is a clear added-value, considering the countries' environmental conditions and available natural substitutes to plastics. Two examples of standards are ISO 23517:2021 on soil biodegradable plastics for mulch films in agriculture and horticulture and ISO 17088:2021 on plastics suitable for industrial composting, this latter which can only be effective if bio-waste is separately collected and subsequently treated in industrial composting facilities (e.g. the 2012 version of ISO 17088 has been adopted nationally by KEBS, and the revised 2021 version of ISO 17088 should be adopted nationally too, but industrial composting is not widely available in Kenya).

   Such standards can also be referenced in national regulation, legislation or policies (ISO, 2024), as well as in national strategies to support high-level policy targets. They can help verify and test whether a product complies with the relevant national and/or regional rules and regulations. Relying on such internationally agreed good practices can allow regulators to save resources, especially where national capacity might not fully be developed yet, and facilitate trade. It is then important to reference the standard publication year in national regulation, legislation or policies.

3. **Targeted applications**: issue recommendations on the use of the relevant biodegradable and compostable plastics standards in the selected sectors, considering the available waste management infrastructures, natural substitutes and their impacts to avoid detrimental substitutions.

4. **Conformity assessment**: empower conformity assessment bodies and services to verify the environmental and performance criteria of biodegradable and compostable plastics, and their natural substitutes.

5.

Recommended definitions

The following list of recommended definitions has been developed based on our assessment of the most appropriate definitions in state-of-the-art standards, especially ISO standards (whose definitions are publicly available on ISO Online Browsing Platform) and CEN standards, as well as ambitious legislation relating to single-use plastics, looking at the European Union's legal framework. We have nevertheless not listed any definition of 'bioplastics' or 'biopolymers', which leave the door open to misunderstandings and inappropriate use to characterise bio-based plastics, biodegradable plastics or both.

Terminology	Definition
bio-based product	product wholly or partly derived from biomass ▶ the bio-based product is typically characterised by the bio-based carbon content or the bio-based content *Source: ISO 16559:2022, 3.25*
bio-waste	biodegradable garden and park waste, food and kitchen waste from households, offices, restaurants, wholesale, canteens, caterers and retail premises and comparable waste from food processing plants *Source: European Waste Framework Directive (EU) 2008/98/EC, 3.4*
community composting	controlled waste treatment process of organic waste collected from small neighbourhood or produced by centralised sources (e.g. hospitals, canteens, restaurants) usually at a scale bigger than home composting and smaller than industrial composting *Source: EN 17427:2022*
compostable plastic	plastic that undergoes degradation by biological processes during composting to yield CO2, water, inorganic compounds and biomass at a rate consistent with other known compostable materials and leave no visible, distinguishable or toxic residue ▶ "Hazardous" is used synonymously to "toxic" *Source: ISO 17088:2021, 3.2*
composting	aerobic process designed to produce compost starting from biodegradable waste ▶ Composting is classified into industrial composting, home composting and worm composting *Source: ISO 17088:2021, 3.3*
disintegration	physical breakdown of a material into very small fragments *Source: ISO 17088:2021, 3.4*
home composting	composting process performed by private individuals with the aim of producing compost for their own use *Source: EN 17427:2022*

Terminology	Definition
home compostable packaging	packaging that can biodegrade in non-controlled conditions that are not industrial scale composting facilities and the composting process of which is performed by private individuals with the aim of producing compost for their own use *Source: European Packaging and Packaging Waste Regulation, 2024, article 3.42, publication pending*
industrial composting	composting process performed under controlled conditions on industrial scale with the aim of producing compost for the market ► In some regions industrial composting is referred to as professional composting ► Industrial composting does not hinder or jeopardise the separate collection and the composting or anaerobic digestion process *Source: ISO 17088:2021, 3.13, modified – Note 2 added based on the European Packaging and Packaging Waste Regulation, 2024, article 3.41*
laboratory scale composting	aerobic process designed to produce compost at laboratory scale under environmental conditions simulating those experienced in an industrial compost pile *Source: ISO 20200:2023, 3.4*
organic constituent	chemical constituent that contains carbon covalently linked to other carbon atoms and to other elements, most commonly hydrogen, oxygen or nitrogen ► Inorganic carbonates, carbides, cyanides and simple oxides such as carbon monoxide and carbon dioxide are not classified as organic constituent ► Allotropes of carbon, such as diamond, graphite, carbon black, fullerenes, and carbon nanotubes are also not regarded as organic constituent *Source: EN 17427:2022*
organic recycling	aerobic (composting) or anaerobic (digestion) treatment of plastics waste under controlled conditions using micro-organisms to produce, in the presence of oxygen, stabilised organic residues (compost), carbon dioxide and water or, in the absence of oxygen, stabilised organic residues (compost), methane and carbon dioxide ► The term "biological recycling" is used synonymously *Source: ISO 17088:2021, 3.6*
oxo-degradable plastics	plastic materials that include additives which, through oxidation, lead to the fragmentation of the plastic material into micro-fragments or to chemical decomposition ► Oxo-degradable plastics are non-biodegradable. Once oxo-degradable plastics and their fragments are buried in the soil, out of sunlight, the degradation process stops or slows significantly and persistent small plastic particles remain intact, causing the release of microplastics. The resulting microplastics are made of oxidised non-biodegradable polymers *Source: Single-Use Plastic Directive (EU) 2019/904, 3.3, Note added*
plastics	synthetic material or modified natural material, either a polymer or combination of polymers of high molecular mass modified or compounded with additives such as fillers, plasticizers, stabilizers, flame retardants and colorants *Source: UNEP, 2023. Technical guidelines on the environmentally sound management of plastic wastes, UNEP/CHW.16/6/Add.3/Rev.1*

Terminology	Definition
recycling	any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes including the reprocessing of organic material, but excluding energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations *Source: European Waste Framework Directive (EU) 2008/98/EC, 3.17*
reusable packaging	packaging or packaging component which has been designed to accomplish or proves its ability to accomplish a minimum number of trips or rotations in a system for reuse *Source: ISO 18603:2013, 3.2*
ultimate aerobic biodegradation	breakdown of an organic compound by microorganisms in the presence of oxygen into carbon dioxide, water and mineral salts of any other elements present (mineralisation) plus new biomass *Source: ISO 17088:2021, 3.8*
volatile solid	solids obtained by subtracting the residue of a known volume of test material or compost after incineration at about 550 °C from the total dry solids (3.7) of the same sample ▶ The volatile-solids content is an indication of the amount of organic matter present *Source: ISO 17088:2021, 3.9*
well-managed industrial composting process	composting process performed under controlled conditions where the temperature, water content, aerobic conditions, carbon/ nitrogen ratio and other conditions are optimised *Source: ISO 17088:2021, 3.12*

6.

Case studies on plastics reduction and management

6.1 Case study 1: Europe

Biodegradable mulch films

Mulch films are used to (1) increase soil temperatures, (2) avoid evaporation from soil, (3) control the growth of weeds, (4) avoid soil erosion, (5) reduce runoff of nutrients due to excessive rainfall, etc. As a consequence, the use of mulch films increases crop yields, lengthens the growing season and reduces the requirement for irrigation and fertiliser and herbicide applications.

6.1.1 Issues with conventional mulch films

Traditionally mulch films are made from conventional oil-based plastics (LDPE). A presentation of European Bioplastics of 2016 shows that the total European mulch film market was 80 000 tonnes, consisting of 4 000 tonnes of certified biodegradable mulch film and 76 000 tonnes of PE mulch film. However, from the PE mulch film, over 15 000 tonnes ends up as microplastics in the soil, while over 30 000 tonnes is dumped or burned alongside field due to the fact that PE mulch film is not reusable or recyclable (European Bioplastics, 2016).

Poor collection and retrieval management are especially observed for thin non-biodegradable mulch films (thickness less than 30 µm) as they tear during use (due to physical damage and photodegradation). Another disadvantage of the use of conventional mulch film is associated with their degree of contamination with soil and plant residuals when they are removed from fields. Often up to 60-80% of the initial weight of the film is soil/plant residue contamination. At such high levels of contamination, recycling is uneconomic and used mulch films are often disposed of at a sanitary landfill. Moreover, the collection of conventional non-biodegradable mulch film causes a removal of top soil (166 000 tonnes per year in Europe) (European Bioplastics, 2024).

Due to the problems associated with conventional mulch film, a European standard specification with criteria for biodegradable mulch films (EN 17033 *Plastics – Biodegradable mulch films for use in agriculture and horticulture - Requirements and test methods*) was developed in Europe by CEN/TC 249 "Plastics" and finalised in 2018.

↓ Image 8. In Europe, biodegradable mulch films improve growing conditions while avoiding the pollution and recovery issues linked to conventional plastics. Standards like EN 17033 support their safe use in agriculture.

6.1.2 Challenges and transferable lessons

Highlights

FIT FOR EAST & WEST AFRICA

25–28°C

▶ Average soil temperatures in Kenya, Nigeria, and Ghana (25°C–28°C) match ISO 23517:2021 testing conditions, supporting in-situ biodegradation of mulch films in African agriculture.

1. For proving conformity with national requirements on plastic mulch film biodegradation in soil, ISO standard 23517:2021 allows for ensuring better biodegradation than EN standard 17033:2018 since biodegradation is reached for the final product and the organic constituents, which are present in the material at a concentration between 1% and 15%.
2. When the testing temperature (e.g. 20°C to 28°C ± 2°C in ISO 23517:2021) reflects the real-life soil temperature range, the biodegradable mulch film can biodegrade effectively in situ (i.e. at least 90% aerobic biodegradation is reached for the final product and organic constituents, which are present in the material at a concentration between 1% and 15%). These climatic conditions are met in most areas of East and West Africa, e.g. the average temperature in 25°C in Kenya, 27°C in Nigeria, and 28°C in Ghana. But the existing standard test methods should also ensure the biodegradation process is fulfilled when leakages occur in other environments than soil (e.g. in aquatic environments).
3. In the study "Conventional and Biodegradable Plastics in Agriculture" performed by Eunomia commissioned by the European Commission (Hann et al., 2021), following recommendations were given towards the use of biodegradable agri-plastics:
   - Incorporate biodegradable plastics into agri-plastics EPR schemes, but exempt biodegradable plastic producers from contributing to EPR collection and treatment costs as they would not apply to these plastics as they are left to biodegrade in the environment.
   - Only certified biodegradable plastics should be exempted from EPR collection and treatment costs.

6.2 Case study 2: South Africa

Standards and certification for compostable plastics

South Africa's waste management landscape is centred around the National Environmental Management Waste Act of 2008. This law emphasises waste minimisation, recycling, and recovery. A key pillar of this framework is the Extended Producer Responsibility (EPR) regulations, which hold producers accountable from production to end-of-life management. While significant progress has been made, South Africa continues to grapple with challenges such as inadequate waste infrastructure and illegal dumping.

South Africa has established key standards, SANS 1728 and SANS 1788, to regulate the marking, identification, and specific properties of compostable plastics. These standards aim to ensure product clarity for consumers and verify the compostability claims of manufacturers, aligning with international best practices.

↑ Image 9. COPCO, a dedicated body established in South Africa to oversee compostable plastics, serves as both a certifying authority and a Producer Responsibility Organisation.

6.2.1 Compostable Plastics Council (COPCO)

The creation of the Compostable Plastics Council (COPCO), an industry body and a Producer Responsibility Organisation (PRO) exclusively focusing on management of compostable plastics and packaging, was triggered by the risk of a ban on compostable plastic products due to pollution and contamination concerns from the conventional plastics industry. Another factor was concern from manufacturers on false marketing and rapid filling up of landfills hence the need to redirect compostable bio-waste together with properly labelled and approved compostable bags.

↑ Figure 5. COPCO labels for Industrially-compostable plastics and for home-compostable plastics.

COPCO has supported the creation and implementation of standards and certifications for plastics compostable at home or at industrial scale.

COPCO played a pivotal role in establishing SANS 1728 and SANS 1788 to regulate the marking, identification, and specific properties of compostable plastics. These standards aim to ensure product clarity for consumers and verify the compostability claims of manufacturers, aligning with international best practices:

- SANS 1728:2019 mandates polymer identification marking and demands that claims on compostable packaging conform to ISO 1708, EN13432, ASTM D6400 or ASTM D686 certification.
- SANS 1788:2020 outlines specific biodegradation and disintegration requirements for compostable plastics.

COPCO supports implementation of these standards by providing verification and certification services for compostable products and packaging; working in tandem with the South African Government's Council for Scientific and Industrial Research (CSIR) which carries out compostability testing. COPCO ensures all verified and certified products meet stringent certification requirements for compostability including international ones, such as ISO 17088, EN13432, ASTM D6400, ASTM D686 and the local South African standard SANS 1788:2020 through rigorous testing and compliance checks. The COPCO logos clearly differentiate home and industrial compostable packaging, guiding consumers and waste management systems (see Figure 5).

The role of certification has been crucial, with a majority of the retailers requiring agreed upon, local, COPCO certified compostable plastics labels in order to put the products on their shelves. This, in turn, helped to ensure consumer confidence.

↑ Image 10. Home-compostability label developed by COPCO being adopted by biodegradable bag producers in South Africa. The label supports clear consumer communication and standardisation, helping promote the safe and verified use of compostable packaging.

6.2.2 Challenges and transferrable lessons

1. The absence of effective standards and regulations for compostable products and packaging has posed significant challenges to South Africa's waste management system. By establishing COPCO as a dedicated organisation responsible for product certification, labelling, and collection infrastructure, South Africa has developed a robust framework for managing compostable materials. By implementing similar measures, governments can improve waste management and reduce reliance on landfill disposal.

2. High costs of the local process for certifying new products have discouraged local companies from producing compostable products and packaging, as opposed to importing already certified products. This was mitigated by an agreement to recognise European certifications and only require local re-verification by CSIR. Adopting other global certifications and accepting products and packaging that meet these standards is an effective way for policy makers and standardisers to fast-track adoption of valuable solutions within their jurisdictions while not reinventing the wheel.

3. While there are pros and cons for promoting voluntary and mandatory certification and verification schemes, this case study goes to show the crucial interplay of both government and private sector roles. The lack of mandatory certification and policing by government bodies like the South African Bureau of Standards and advertising ombudsman led to a lot of confusion and illegal activities during the initial phases. This therefore calls for critical assessment of the prevailing circumstances and very close collaboration between policy makers, standard-writers and enforcement agencies to promote maximum compliance and faster adoption of compostable products and packaging, for applications where there is a clear added-value.

← Image 11. Coconut waste during agricultural mulch production at Blue Skies in Ghana. Supported by the SMEP Programme, Blue Skies transforms coconut coir into natural mulch, demonstrating the potential of agricultural by-products in plastic-free solutions.

6.3 Case study 3: Ghana

Testing coconut coir as a natural substitute to agricultural plastic mulch

The National Plastics Management Policy (NPMP) in Ghana adopts plastic waste reduction as one of its priorities and promotes biodegradable plastics. The main challenges with plastic alternatives as identified by the policy is the low incentives to shift from the cheap and conveniently available conventional plastics. Innovation in plastics reduction is nevertheless still very much alive in Ghana with initiatives such as the FreshPPact project, which can serve as a testbed for affordable plastic-free solutions, providing useful lessons for policymaking.

6.3.1 FreshPPact

FreshPPact was initiated in 2022 to explore the viability of plastics alternatives and substitutes in agriculture.[9] The project is funded under the Sustainable Manufacturing and Environmental Pollution (SMEP) Programme.[10] FreshPPact has commenced trials of alternatives to conventional plastic mulch used on pineapple farms, comparing the use of coconut fibre/coir with conventional plastic mulch, and with a starch-based biodegradable mulch procured from the Council for Scientific and Industrial Research (CSIR) in South Africa (Blue Skies, 2024).

Coconut coir is a common horticultural mulching product known to be effective in protecting soils from wind and water erosion, improving water infiltration by supporting good soil structure. Coconut coir also retains water in the soil and feeds the soil microbiota as it naturally decomposes. The main possible drawbacks from the use of coconut coir relate to the possible presence of chemicals used during coconut production and processing. Coconut fibre/coir is abundant in Ghana thanks to the country's large coconut production (over 500,000 metric tonnes),[11] and it is usually discarded as agricultural waste. This makes it a reliable and affordable feedstock.

The project is testing farm productivity from each mulch alternative. While data is for now still not published at the time of writing this report, some positive results could already be observed.

Apart from agricultural mulch alternatives testing, the FRESHPACT project also seeks to address other challenges with plastics used in the agricultural fresh produce value chain, including replacing fresh cut fruit plastic packaging with a seaweed-based biodegradable polymer alternative.

9 Information obtained for this case study come from the FreshPPact Research and Development Hub, funded by SMEP Programme.

10 For more information about the projects supported by SMEP Programme, please visit: https://smepprogramme.org/.

11 Coconut production data for Ghana is available in the FAO Statistical Database (2022).

6.3.2 Challenges and transferable lessons

1. Using waste from agriculture, horticulture, food processing, or forestry can provide abundant sources of natural mulches which will not only biodegrade easily but also provide many additional benefits to soil quality where plastic mulches do not, and in fact often cause more harm than good over the long term as they affect soil fertility due to leftover plastic particles. Natural mulches may not all be adapted to each type of crop production, as they can affect the soil in different ways. For instance, coconut coir's neutral pH will be adapted for many types of crops which thrive in such conditions, but not for others (e.g. potatoes, spinach and kale, which require slightly acidic soils). It is important to test the use of natural mulches in order to find a mulch which can truly optimise plant growth.

2. Substituting plastic mulches with biodegradable alternatives requires that these are affordable and available to farmers, which may be the case for most waste-based mulches. Another key factor to consider for the successful uptake of alternatives to plastic mulch is current practice and knowledge about alternatives. The use of different types of mulch on farms (or no mulch at all) is a cultural practice observed in some countries or regions and not others. Raising awareness about the long-term impacts of plastic mulches on farm productivity, the environment and health, but also about the potential benefits and availability of natural mulches is key. It is also important to build capacity among farmers about the adequate use of alternatives to plastic mulches.

3. Currently in Ghana such projects do not receive any regulatory support for their expansion and may not reach a large scale until legislation is adopted which implement a progressive phase-out of horticultural plastics, alongside research for viable alternatives and communication campaigns. Testing and rolling out alternatives to plastics requires the use of standards. Biodegradable polymers used for horticultural and forestry applications (e.g. seedling tubes) require testing the biodegradability of the product in soil, such as ISO 23517:2021 for biodegradable mulch films.

↓ Image 12. Rolls of COCO360, a biodegradable agricultural mulch developed by Blue Skies in Ghana. The mulch is produced from coconut coir and supports sustainable farming by replacing conventional plastic mulch with a natural, soil-friendly alternative.

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Annex I

Most common types of plastic polymers used per product category and by sector

Table 2. Most common types of plastic polymers used per product category and by sector

Product category	Polymer	Food packaging and bags	Agriculture and horticulture	Forestry
Flexible films	LDPE PP	Rolls, wrappers, twisted wrappings	Mulch film, greenhouse film, shading nets and silage), polymer coated fertilisers	Greenhouse film
Sachets, pouches, and multilayer films	HDPE LDPE PP MULTILAYER	Beverage and dairy packaging	Pesticide packaging	—
Food-grade and non-food grade bottles	HDPE LDPE PET PACKAGING LABELS PLA, PP, PS, PVC	Water bottles, beverage bottles, food and fruit packs	—	Fertiliser containers
Pots, tubs and trays	HDPE PP	—	Organic and inorganic fertiliser bags	Pesticide containers
Business-to-business packaging	HDPE LDPE PP	—	Pesticide containers	Seed containers
Other rigid mono-material packaging	HDPE LDPE PVC	Plastic cutlery (plates, forks, knives, spoons, etc.)	Irrigation drip tape, harvesting bags	—
Food service disposables	PS	Plastic food service disposables, such as cutlery and plates	—	—
Carrier bags	LDPE	Plastic food service disposables, such as cutlery and plates	—	—

Annex II

Policies, strategies and targets to stop plastic pollution and their respective challenges

Table 3. Overview of Kenya's Policies, strategies and targets to stop plastic pollution and their respective challenges

Frameworks	Targets	Challenges
Notice on the ban of plastic seedling potting bags	Reduce impact of single use plastic and raise awareness on use of sustainable 'greener' options	Absence of standards High cost of production
Notice on transition to biodegradable bags for organic waste	Reduce impact of single use plastic and raise awareness on use of sustainable 'greener' options	No gazetted standards Regulations on the biodegradable bags
Ban on Single-Use Plastics	Eliminate the use of single-use plastic items in protected areas such as national parks, forests, beaches, and conservation areas	Continued use of these single use plastics outside protected areas somehow find their way into these areas, hence a complete ban/ phase out is encouraged
National Solid Waste Management Strategy	Achieve a 50% reduction in plastic waste by 2025	Absent national plastic waste data system to track and measure this reduction target
Extended Producer Responsibility (EPR)	Ensure producers take responsibility for the entire lifecycle of their plastic products, including post-consumer waste management	Delay in gazettement of the regulations with the deadline set to expire on 26 July 2024
Green Economy Strategy and Implementation Plan (GESIP) 2016-2030	Transition to a green economy by promoting sustainable waste management practices and the use of biodegradable materials	The key strategy guiding Kenya's green transition, though its implementation faces resource constraints
Kenya Plastic Action Plan (KPAP)	Reduce plastic waste and promote a circular economy	A private sector-led initiative that excludes many manufacturers by involving only a select group of aligned players

Annex III

Standard specifications on plastics in Kenya, Nigeria and Ghana

Table 4. Overview of KEBS, SON and GSA standard specifications on plastics

NSB	Standard	Standard title
KEBS	KS 511-3:2001	Specification for plastic containers PART 3 – PLASTIC BOTTLES (UP TO 5 LITERS)
	KS ISO 15270:2008	Plastics – Guidelines for the recovery and recycling of plastics waste
	KS ISO 17088:2012	Specifications for compostable plastics
	KS ISO 14855-1:2012	Determination of the ultimate aerobic biodegradability of plastic materials under controlled composting conditions Method by analysis of evolved carbon dioxide PART 1 – GENERAL METHOD, FIRST EDITION
	KS 1146:2013	Specification for woven polyolefin sacks for packing fertilisers
	KS ISO 16929:2013	Plastics – Determination of the degree of disintegration of plastic materials under defined composting conditions in a pilot-scale test FIRST EDITION
	KS ISO 20200:2015	Plastics – Determination of the degree of disintegration of plastic materials under simulated composting conditions in a laboratory scale test FIRST EDITION
	KS EAS 882:2018	Packaging – Flexible carrier bags SPECIFICATION
	KNWA 2884:2019	Non-woven polypropylene bags SPECIFICATION
	KS ISO 5412:2022	Plastics – Industrial compostable plastic shopping bags
	KS ISO 5424:2022	Plastics – Industrial compostable plastic drinking straws
	DKS 3009:2024	Biodegradable Polymer Materials for Plant Seedling Potting SPECIFICATION (DRAFT)
SON	NIS 216: 1989	Specification for woven bags (Polypropylene)
	NIS 607:2017	Standard for Polyethylene Terephthalate (PET) Bottles for food contact application FOR NCB, CSD
	NIS 835: 2017	Standard for Polyethylene shopping bags
	NIS 611:2019	Standard for Polyethylene Terephthalate (PET) Preforms for food contact Application FOR NCB, CSD

Table 4. Overview of KEBS, SON and GSA standard specifications on plastics (cont.)

NSB	Standard	Standard title
SON (cont.)	NIS 1125: 2019	Nigerian industrial standard for Recycled Polyethylene Terephthalate for packaging of edible products
	NIS 422: 2000	Standard for vest shaped carrier shipping plastic bags
	NIS 494:2004	Standard for plastic jerry cans
	NIS 535:2006	Standard for polyethylene water storage tank
	NIS 537:2006	Standard for plastic drinking straw
	NIS 541:2006	Standard for plastic tableware
	NIS 800:2017	Standard for plastic bowls for domestic use
	NIS 801:2017	Standard for plastic buckets for domestic use
	NIS 970:2017	Standard for plastic table
	NIS 770:2017	Standard for Linear Low-Density Polyethylene (LLDPE) films for water packaging
	NIS 1037:2018	Standard for Polyethylene Terephthalate (PET) resins
	NIS 799:2020	Standard for multipurpose, adult and child plastic chairs and chaise lounge
	NIS 1149:2020	Plastic crates for fruits and vegetables SPECIFICATION
	NIS 954:2020	Standard for plastic crates for glass bottles
	NIS 1156:2020	Standard for seamless plastic tube packaging
	NIS 1143:2020	Standard for plastic drawer set
GSA	GS 534:2004	Methods of Test for the determination of specific and/or overall migration of constituents of plastic materials intended to come into contact with food, pharmaceuticals and drinking water
	GS 598:2006	Plastics – List of pigments and colourants for use in plastics in contact with food, pharmaceuticals and drinking water
	GS 613:2018	Specification for Compression and Injection - Moulded Plastic Household Wares for Food Contact Applications
	GS 1183:2018	Plastics – conformity assessment protocol for oxo-biodegradable additives and its use
	GS 1239:2018	Plastics – Specification for Polyethylene Terephthalate (PET) Preforms (under review)
	DGS 1387	Recycled Polyethylene Terephthalate (rPET) for Food Contact Applications (draft)
	DGS 1388	Code of practice for the collection, sorting, pretreatment, storage, and recycling of PET packaging waste in Ghana (draft)

Annex IV

Standard specifications most commonly used

Table 5. Standard specifications most commonly used for industrial composting (and anaerobic digestion)

Standard	Standard title
ISO 18606:2013	Packaging and the environment – Organic recycling
ISO 17088:2021	Plastics – Organic recycling SPECIFICATIONS FOR COMPOSTABLE PLASTICS
ISO 5412:2022	Plastics – Industrial compostable plastic shopping bags
ISO 5424:2022	Plastics – Industrial compostable plastic drinking straws
EN 13432:2000	Requirements for packaging recoverable through composting and biodegradation TEST SCHEME AND EVALUATION CRITERIA FOR THE FINAL ACCEPTANCE OF PACKAGING
ASTM D6400:2023	Standard specification for labelling of plastics designed to be aerobically composted in municipal or industrial facilities
ASTM D8410:2021	Standard specification for evaluation of cellulosic-fiber-based packaging materials and products for compostability in municipal or industrial aerobic composting facilities
ASTM D6868:2021	Standard specification for labelling of end items that incorporate plastics and polymers as coatings or additives with paper and other substrates designed to be aerobically composted in municipal or industrial facilities
AS 4736:2006 AUSTRALIA	Biodegradable plastics – Biodegradable plastics suitable for composting and other microbial treatment
CAN/BNQ 0017-088: 2010 CANADA	Specifications for compostable plastics

Table 6. Standard specifications used for home composting

Standard	Standard title
EN 17427:2022	Packaging – Requirements and test scheme for carrier bags suitable for treatment in well-managed home composting installations
NF T51-800: 2015 FRANCE	Plastics – Specifications for plastics suitable for home composting
AS 5810:2010 AUSTRALIA	Biodegradable plastics – Biodegradable plastics suitable for home composting
NCh3726:2021 CHILE	Waste management – Plastics suitable for composting in domestic composters REQUIREMENTS

Table 7. Standard specifications used for mulch film biodegradability in soil

Standard	Standard title
ISO 23517:2021	Plastics – Soil biodegradable materials for mulch films for use in agriculture and horticulture REQUIREMENTS AND TEST METHODS FOR BIODEGRADATION, ECOTOXICITY, AND CONSTITUENT CONTROL
EN 17033:2018	Plastics – Biodegradable mulch films for use in agriculture and horticulture REQUIREMENTS AND TEST METHODS

Annex V

Overview of the criteria of ISO 17088:2021

Table 8. Plastics – Organic recycling – Specifications for compostable plastics

Parameter	Test method	Criteria
Control of constituents	—	Limit values for regulated metals and other elements.
	—	Per- and poly-fluorinated compounds (PFCs) may not be intentionally added.
	—	Hazardous substances may not be intentionally added.
	—	Minimum 50% volatile solids.
Aerobic biodegradation	ISO 14855-1 ISO 14855-2 COMPOST ISO 14851 ISO 14852 FRESHWATER ISO 17556 SOIL	At least 90% biodegradation (absolute or relative when compared to positive reference material cellulose) after 180 days for the final product and biodegradability of organic constituents, which are present in the material at a concentration between 1-15% (by dry mass), shall be proven separately. Biodegradation is preferably evaluated in compost at 58°C ± 2°C.
Disintegration during composting	ISO 16929 ISO 20200	At least 90% disintegration after 12 weeks.
No toxicity towards terrestrial organisms	OECD 208 ISO 11269-2	HIGHER PLANTS At least 90% seedling germination and at least 90% plant biomass in the sample compost exposed to the test material when compared to the corresponding blank compost.
	ISO 11268-1 ACUTE TESTING	EARTHWORMS | OPTION 1 Survival and biomass of the surviving adult earthworms in the sample compost exposed to the test material shall be more than 90% of those from the corresponding blank compost not exposed to the test material (after an incubation period of 14 days).
	ISO 11268-2 CHRONIC TESTING	EARTHWORMS | OPTION 2 After an incubation period of 28 days, the survival and the biomass of the surviving adult earthworms in the sample compost exposed to the test material shall be more than 90% of those from the corresponding blank compost not exposed to the test material. After an incubation period of 56 days, the observed number of offspring in sample compost exposed to the test material shall be more than 90% of those from the corresponding blank compost not exposed to the test material.
	ISO 15685 OPTIONAL	BACTERIA The nitrite formation in the sample compost exposed to the test material shall be more than 80% of those from the corresponding blank compost to which no test material was added at the start of testing.

Annex VI

Overview of the criteria of EN 17427:2022

Table 9. Packaging – Requirements and test scheme for carrier bags suitable for treatment in well-managed home composting installations

Parameter	Test method	Criteria
Control of constituents	—	Limit values for regulated metals and fluorine.
	—	Per- and polyfluoroalkyl substances (PFAS) may not be intentionally added.
	—	Substances hazardous to the environment and very high concern may not be intentionally added
	—	Minimum 50% volatile solids
Aerobic biodegradation	ISO 14855-1 ISO 14855-2 COMPOST ISO 14851 ISO 14852 FRESHWATER ISO 17556 SOIL	At least 90% biodegradation (absolute or relative when compared to positive reference material cellulose) after 365 days for the final product and biodegradability of organic constituents, which are present in the material at a concentration between 1% and 15% (by dry mass), shall be proven separately. Biodegradation is preferably evaluated in compost at ambient temperature (25°C ± 5°C).
Disintegration during composting	EN 17428	At least 90% disintegration after 180 days
No toxicity towards terrestrial organisms	OECD 208 ISO 11269-2	HIGHER PLANTS At least 90% seedling germination and at least 90% plant biomass in the sample compost exposed to the test material when compared to the corresponding blank compost.
	ISO 11268-1 ACUTE TESTING	EARTHWORMS | OPTION 1 Survival and biomass of the surviving adult earthworms in the sample compost exposed to the test material shall be more than 90% of those from the corresponding blank compost not exposed to the test material (after an incubation period of 14 days).
	ISO 11268-2 CHRONIC TESTING	EARTHWORMS | OPTION 2 After an incubation period of 28 days, survival and biomass of the surviving adult earthworms in the sample compost exposed to the test material shall be more than 90% of those from the corresponding blank compost not exposed to the test material. After an incubation period of 56 days, the observed number of offspring in sample compost exposed to the test material shall be more than 90% of those from the corresponding blank compost not exposed to the test material.
	ISO 15685	BACTERIA The nitrite formation in the sample compost exposed to the test material shall be more than 80% of those from the corresponding blank compost to which no test material was added at the start of testing.

Annex VII

Overview of the criteria of NF T51-800:2015

Table 10. Plastics – Specifications for plastics suitable for home composting

Parameter	Test method	Criteria
Control of constituents	—	Limit values for regulated metals and fluorine.
	—	No endocrine disruptors, carcinogenic substances, mutagenic substances or substances that are toxic for the reproduction might be added.
	—	Minimum 50% volatile solids.
Aerobic biodegradation	ISO 14855-1 ISO 14855-2 COMPOST Alternative ISO 14851 ISO 14852 FRESHWATER	At least 90% biodegradation (absolute or relative when compared to positive reference material cellulose) after 365 days for the final product. Biodegradation is preferably evaluated in compost at ambient temperature (25°C ± 5°C).
Disintegration during composting	ISO 20200 MODIFIED AT 25°C ± 5°C	At least 90% disintegration after 180 days (quantitative testing in three replicates with exact determination of disintegration based on mass balance). At least 81% disintegration after 180 days (qualitative testing in two replicates with determination of disintegration based on surface area analysis; only allowed when a plastic fulfils the disintegration requirements at high temperature of EN 13432).
No toxicity towards terrestrial organisms	OECD 208	HIGHER PLANTS At least 90% seedling germination and at least 90% plant biomass in the sample compost exposed to the test material when compared to the corresponding blank compost.

Annex VIII

Overview of the criteria of ISO 23517:2021

Table 11. Plastics – Soil biodegradable materials for mulch films for use in agriculture and horticulture Requirements and test methods regarding biodegradation, ecotoxicity and control of constituents

Parameter	Test method	Criteria
Control of constituents	—	Limit values for regulated metals and fluorine.
	—	Poly- and perfluoroalkyl substances (PFAS) and hazardous substances shall not be intentionally added.
	—	Minimum 60% volatile solids.
Aerobic biodegradation	ISO 17556 SOIL	At least 90% biodegradation (absolute or relative when compared to positive reference material cellulose) after two years for the final product (testing temperature: 20°C up to 28°C, preferably 25°C). Biodegradability of organic constituents, which are present in the material at a concentration between 1% and 15% (by dry mass), shall be proven separately.
No toxicity towards terrestrial organisms	OECD 208 ISO 11269-2	HIGHER PLANTS Germination rate and plant biomass of the tested plant species in the soil exposed to the test material shall be more than 90 % of those from the corresponding blank soil not exposed to the test material.
	ISO 11268-1 ACUTE TESTING	EARTHWORMS | OPTION 1 Survival and biomass of the surviving adult earthworms in the soil exposed to the test material shall be more than 90% of those from the corresponding blank soil (after an incubation period of 14 days).
	ISO 11268-2 CHRONIC TESTING	EARTHWORMS | OPTION 2 Survival and biomass of the surviving adult earthworms in the soil exposed to the test material shall be more than 90% of those from the corresponding blank soil after an incubation period of 28 days. The observed number of offspring in soil exposed to the test material shall be more than 90% of those from the corresponding blank soil after an incubation time of 56 days.
	ISO 15685	BACTERIA Nitrite formation in soil exposed to the test material shall be more than 80% of those from the corresponding blank soil.

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