Evidence Brief | Spotlight Series No. 4

This brief draws on key insights from the presentation "Effects of Biodegradation in Africa and Possible Solutions" presented by Dr. Mwangi Muchiri at the fourth CAPCHA Spotlight Webinar Series. Themed. ***Biodegradation, Waste Management and Possible Solutions***

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Africa's waste challenge is growing rapidly, with municipal solid waste in Sub-Saharan Africa projected to increase from 174 million tonnes in 2016 to 516 million tonnes annually by 2050. Organic and biodegradable materials account for 30-70% of municipal waste, yet collection and appropriate treatment remain limited. Poorly managed biodegradable waste generates methane and contributes to pollution, flooding, soil degradation and the loss of valuable resources.

The challenge, therefore, is how biodegradable waste is managed. With approximately 1.6 million tonnes of methane generated annually from municipal solid waste, there is a significant opportunity to shift from disposal towards waste-to-wealth approaches that recover energy, improve soils, produce animal feed, create jobs and generate economic value. This presentation demonstrated that better management of biodegradable waste can reduce environmental and health risks while supporting climate action, resource recovery and sustainable development.

Biodegradation and Resource Recovery

Biodegradation is the natural breakdown of organic materials by microorganisms into simpler components such as carbon dioxide, water, methane, and biomass. When properly managed, it can reduce waste, support nutrient cycling, restore soils, and enable bioremediation. Its benefits depend on the conditions under which it occurs: aerobic processes can minimise methane generation, while anaerobic digestion can capture methane for renewable energy. Other approaches include composting to improve soil health, water retention and crop productivity; bioremediation to remove pollutants such as oil and pesticide residues; and black soldier fly larvae to convert organic waste into animal feed and frass fertiliser. These approaches offer practical pathways for recovering resources while reducing disposal costs and supporting climate, environmental, health and economic goals.

African Innovation and Emerging Solutions

Across Africa, locally relevant innovations are demonstrating the practical application of these approaches. In Kenya, lesser mealworm (Alphitobius diaperinus) larvae are being explored for degrading polyethylene and polystyrene, while white rot fungi have degraded pesticide residues, including diazinon and methomyl, by more than 80% within 30 days. In Hammarsdale, South Africa, indigenous hydrocarbon-degrading bacteria were used to treat petroleum-contaminated soil in Situ, achieving more than 90% reduction in total petroleum hydrocarbons and saving an estimated US$2 million compared with excavation. In Nigeria, agro-waste is being converted into animal feed and compost.

These examples point to wider economic potential. The presentation noted that circular economy approaches could generate 11 million jobs by 2030 and contribute to a potential 2.2% increase in Africa's gross domestic product (GDP), while creating opportunities for micro, small and medium-sized enterprises. Black soldier fly larvae, for example, can convert one tonne of organic waste into approximately 200 kg of protein and 200 kg of frass fertiliser within 14 days, demonstrating how waste recovery can generate feed and fertiliser alongside economic value.

What is holding Back Progress?

Despite these opportunities, the shift from waste disposal to resource recovery is constrained by limited infrastructure, high investment costs, weak source separation, fragmented markets, and inadequate standards. Poor separation can result in contaminated, low-quality compost, while the absence of harmonised certification systems creates uncertainty around recovered products. Short-term contracts, limited finance and weak demand further hinder investment and scale-up.

Poorly managed biodegradation can also create climate, environmental and health risks. Anaerobic decomposition can increase methane emissions, while organic waste entering water bodies can reduce dissolved oxygen and harm aquatic life. Some biodegradable plastics require specific conditions to break down and may persist in household or marine environments. Plastic, heavy metal and other contamination can also compromise compost quality and pose risks to health and the environment.

From Waste Management to Circular Bioeconomy Action

To unlock the potential of biodegradation, there is need to:

- Improve waste separation and treatment through better collection, source separation and investment in composting, anaerobic digestion and landfill gas recovery.
- Strengthen standards and markets through harmonised certification, testing capacity and demand for compost, biofertilisers, animal feed and recovered energy.
- Support local enterprises and innovation through finance, training and research in bioremediation, Black soldier Fly (BSF) technology, biodegradable materials and decentralised waste recovery.
- Strengthen policy coordination by aligning national and regional action with the African Union Continental Circular Economy Action Plan and national circular economy roadmaps.

Key Message for Decision Makers

Biodegradable waste should no longer be viewed solely as a disposal challenge. With appropriate policies, infrastructure, financing, standards, and community participation, it can support climate mitigation, soil restoration, renewable energy, animal feed production, employment, and economic growth. Moving from a linear "take–make–dispose" model towards a circular bioeconomy requires coordinated action to reduce methane emissions, recover valuable resources, strengthen local enterprises and scale African innovations beyond pilot projects into sustainable, locally driven solutions.