

**BIO4HUMAN**

## D5.3 – Annex

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*Roadmap for policymakers*

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## Document information

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## Document history

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## Roadmap for Policymakers

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Based on the comparative Life Cycle Assessment (LCA) in Deliverable 5.3, this roadmap provides recommendations to help reduce the environmental impacts of humanitarian organisations' activities by focusing on assistance kits, their packaging, and end-of-life (EoL) practices.

### I. Purpose and scope of this roadmap

This document is a roadmap for policymakers that draws on LCA evidence, generated under Deliverable 5.3, to identify where policy, regulatory, and system-level actions can most effectively reduce the environmental impacts of humanitarian assistance in the Democratic Republic of Congo (DRC) and South Sudan (SS).

While the technical analysis focuses on humanitarian products, kits, and end-of-life practices, the recommendations presented here are not intended as operational guidance for humanitarian organisations alone. They rather highlight structural constraints and leverage points that humanitarian actors cannot address independently, such as market availability, supplier incentives, infrastructure gaps, standards, and regulatory frameworks.

The roadmap, therefore, is addressed to policymakers at multiple levels, including EU institutions, donors, funding national governments, local authorities, etc.

Recommendations are prioritised based on the main environmental impact drivers identified by the LCA, and where policy action can enable or accelerate change at scale (by shaping markets, supporting infrastructure development, and aligning incentives, for instance).

The operational examples included in this roadmap illustrate the implications of policy choices on humanitarian practice. These will be further translated into a concise policy brief that focuses explicitly on policy instruments, governance mechanisms, and investment priorities.

## **II. 10 priority policy actions**

To reduce environmental impact, hereunder is a list of the top actions to implement in the humanitarian aid (HA) sector. These actions can be fostered by a wide range of policymakers (in a European context): European Union, donors, national governments and regulators, HA organisations, local authorities, and suppliers.

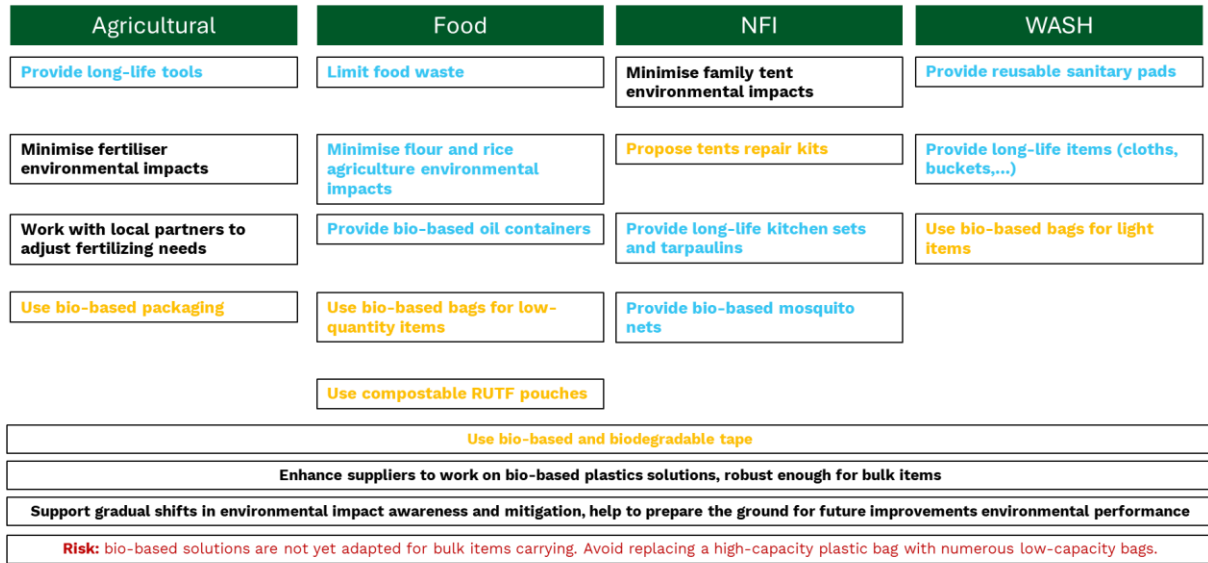
- A. Embed LCA-based environmental criteria in donor funding and procurement rules.
- B. Prioritise durability and lifetime extension standards for high-impact items (especially tents).
- C. Enable and fund repair, refurbishment, and reuse systems as part of humanitarian responses.
- D. Shape markets for lower-impact agricultural inputs (fertilisers and seeds).
- E. Use procurement rules to signal demand for lower-impact food supply chains.
- F. Support innovation and standards for bio-based packaging where system conditions allow.
- G. Invest in waste management and composting infrastructure in humanitarian contexts.
- H. Integrate humanitarian waste streams into national and local waste strategies.
- I. Coordinate standards and specifications across humanitarian actors to create consistent market signals.
- J. Institutionalise environmental monitoring and feedback mechanisms.

The following sections develop further each of these points based on the LCA study of Bio4HUMAN WP5.

## **III. Policy leverage points in humanitarian supply chains**

This section highlights where policy, funding conditions, standards, and market-shaping actions can influence the environmental performance of humanitarian assistance across key sectors.

Therefore, actions to reduce environmental impacts associated with the Agricultural, Food, NFI and WASH sectors are presented. Please refer to Figure 1 and the sub-sections for more detailed information.



Low effort  
Experimental

**Figure 1 Roadmap: Actions to reduce environmental impacts of humanitarian assistance**

## 1.1 Agriculture assistance, impacts mitigation

Policy levers should focus on sourcing and market availability. Indeed, impacts are dominated by fertiliser and crop seeds (more than 70% on single score<sup>1</sup>), not packaging. Modifications to packaging, including only the identified Bio4HUMAN solutions, lead to limited reductions in environmental impacts at the kit level.

### 1. Policy-relevant drivers of environmental impact reduction

- Prioritise locally available fertiliser with sustainable production practices. Where fertiliser is unavailable or only available in insufficient quantities, prioritise fertiliser imports from suppliers with verified lower LCA impacts; explore regional suppliers only if quality and environmental performance align.
- Work with agronomists or local partners to avoid over-fertilisation and align quantities with realistic needs.
- Use durable, long-life tools (hoes, etc.), even if slightly heavier upfront, to avoid frequent replacement. This is critical due to weak local markets for replacement parts. SS and the DRC may allow limited tool repair services in local markets.

### 2. Incentives for packaging impact reduction

- Use bio-based packaging for small and light items (e.g., vegetable seeds), for which impacts are reduced (around 18% less on single score).
- Take caution in using bio-based packaging for bulk items (fertiliser, crop seeds) and tertiary films, as the impacts may increase. They are unfavourable

<sup>1</sup> Single score is an impact evaluation method, normalized by the European when using PEF methodology. See Deliverable 5.2 for more information.

until stronger mechanical capacity and/or lower-mass bio-based bags become available.

## **1.2 Food assistance, impacts mitigation**

Policy levers should focus on food sourcing and food waste management. Indeed, most impacts come from food production itself (about 80% on single score) rather than packaging.

### **1. Policy-relevant drivers of environmental impact reduction**

- Prioritise environmental screening of flour and rice suppliers (water use, fertiliser intensity, methane emissions for rice) and consider suppliers with better farming practices.
- Make sure there is no food wastage happening, and if so, propose measures to reduce this waste.

### **2. Incentives for packaging impact reduction**

- Use bio-based bags for low-quantity items (1 kg salt → -64% impact on single score with bio-based packaging).
- Do not use multiple small PLA bags for heavy items (flour, rice, sugar) as these increase the impact by 4% to 6% on the single score. But encourage providers to include bio-based packaging for their products (even if full implementation is not yet feasible, strong market demand is expected to drive continued development and future innovation).
- The compostable RUTF pouch offers EoL benefits but similar overall impacts. It can be kept as a future-oriented solution, with potential improvements if the production of barrier layers becomes less intensive.
- Replace HDPE oil jerrycans with PLA alternatives only when robustness is adequate (≈-13% impacts on single score). Prioritise buying locally or regionally.

## **1.3 NFI assistance, impacts mitigation**

Policy levers should focus on items durability. Indeed, most impacts come from the production of items rather than packaging.

### **1. Policy-relevant drivers of environmental impact reduction**

- Focus primarily on the family tent, which accounts for ~80% on single score of total kit impacts:
  - Procure durable, repairable, modular tents to increase their lifetime as much as possible.
  - Establish refurbishing/repair schemes (provision of repair kits) in areas where these do not exist. Alternatively, facilitate connections with local repair outlets that exist in many communities, at markets, and community centres.
- For kitchen sets and tarpaulins, select high-durability materials to extend lifespan.

- Replace polyester mosquito nets with PLA nets with equivalent repelling efficiency ( $\approx -23\%$  on single score).

#### **2. Incentives for packaging impact reduction**

- Use bio-based adhesive tape for small gains, even though the improvement is negligible.

### **1.4 WASH assistance, impacts mitigation**

Policy levers should focus on product choice and on supporting infrastructure, social acceptance, and waste management systems.

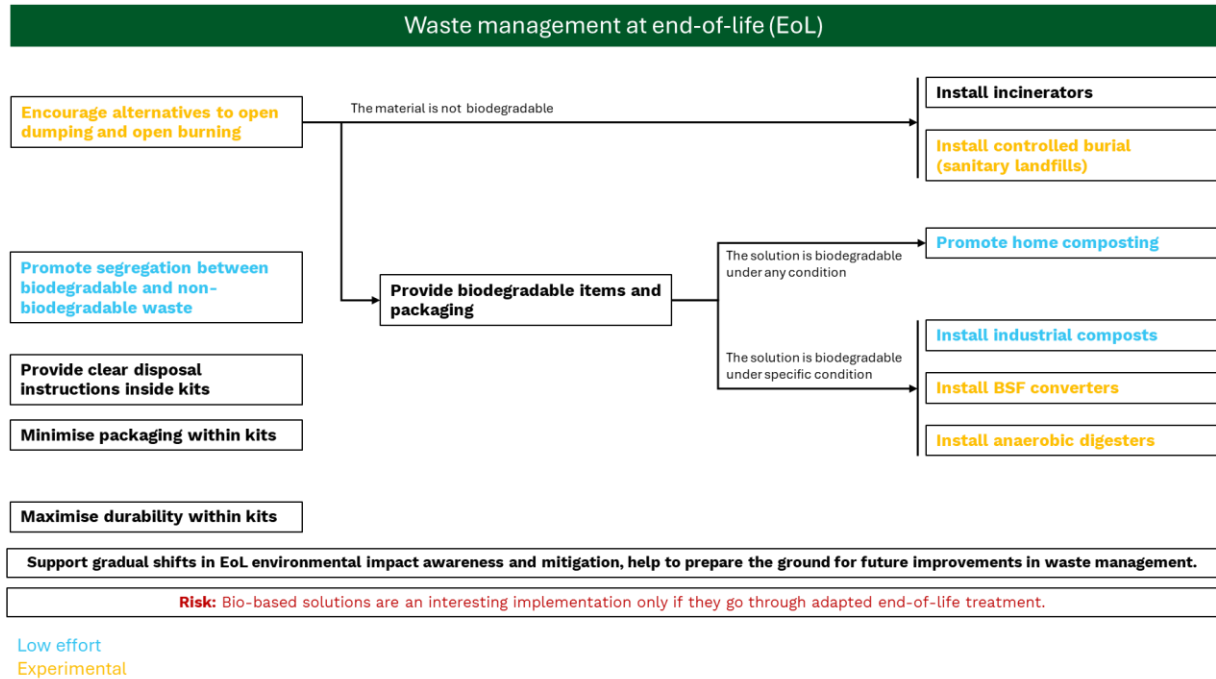
#### **1. Policy-relevant drivers of environmental impact reduction**

- Maintain procurement of *reusable sanitary pads* when washing is possible, as they provide significant reductions compared to disposable ones. In some contexts, cultural preferences and established practices may limit acceptance; therefore, it is recommended to engage communities early, communicate clearly, and select reusable sanitary pads that are as close as possible to locally familiar materials and designs. Hygiene education and user guidance are also essential to support safe and sustained use, while recognising that behavioural change may require time and continued accompaniment.
- Choose high-durability buckets, multipurpose cloths, and washing items to minimise replacement frequency.

#### **2. Incentives for packaging impact reduction**

- Avoid replacing water jerrycans with multiple PLA bottles due to an increase of 45% on single score impact, until an adequate replacement is found. As previously mentioned, encourage providers to work on providing stronger bio-based packaging.
- Use bio-based packaging selectively for lightweight items (bio-based packaging has yet limited mechanical resistance).

## **IV. Roadmap for End-of-Life (EoL) management: infrastructure gaps**



**Figure 2 Roadmap: Actions to reduce environmental impacts at EoL**

EoL conditions strongly influence the environmental impacts of toxicity, particulate matter, and plastic leakage. The impacts of end-of-life occur locally and directly affect HA beneficiaries.

### **System-level enablers for improved end-of-life management**

- Encourage controlled disposal practices instead of open dumping or burning. Municipal incinerators would require financial investment, but waste treatment of biodegradable products (treated through home/industrial composting, anaerobic digestion, or BSF conversion) would be more affordable.
- Promote segregation of biodegradable vs non-biodegradable waste through simple two-bin/bag systems.
- Support community-level sanitary waste management (e.g., dedicated bins, controlled disposal areas).
- Use biodegradable material to promote composting and organic waste (food, agriculture, biodegradable plastics) digestion solutions.
- Partner with local actors<sup>2</sup> to establish controlled disposal areas, such as managed dumps or small-scale composting initiatives.
- Provide clear disposal instructions inside kits, using pictograms or short multilingual text. The instructions must adapt to the local waste management solutions.
- Consider implementation of the Anaerobic Digestion and Black Soldier Fly technologies as they confirmed considerable reduction in impacts and provision of additional benefits.

<sup>2</sup> See stakeholders mapping in Bio4HUMAN Deliverable 3.1.

- To enable the effective use of many bio-based solutions, it is essential to promote the establishment of industrial composting infrastructure. This can be achieved with relatively low capital expenditure and through appropriate guidance.<sup>3</sup>
- To minimise waste generation impacts, the primary focus for packaging should be:
  - Minimising packaging,
  - Maximising durability.
  - Offering safe, controlled disposal options.
- To avoid methane (CH<sub>4</sub>) emissions during composting by promoting oxygen O<sub>2</sub> distribution within the compost. This can be achieved by:
  - A regular turn-over of the compost (preferably manually).
  - Layering the compost with dry and humid waste to improve porosity.
  - Adding wood ash or charcoal to enhance porosity.

### **3. Cross-Cutting policy instruments and mechanisms**

#### **1. Greener procurement and tendering**

- Introduce environmental criteria in all major tenders (carbon footprint, durability, recyclability/compostability).
- Prioritise the items that dominate impacts in each sector:
  - Agriculture: fertilisers, seeds.
  - Food: flour, rice.
  - NFI: tents.
  - WASH: cloths, buckets, reusable pads.
- Require suppliers to provide environmental documentation where possible.

#### **2. Market shaping: collaboration with suppliers and innovators**

- Work with suppliers to improve:
  - Strength, load capacity, and barrier properties of bio-based packaging to avoid heavier packaging substitutes.
  - Lower impact bio-based barrier layers for pouches and laminated films.
- Perform pilot tests of the solutions in controlled field trials before mainstream adoption.

#### **3. Monitoring, data collection, and reporting**

- Track performance of new materials, whenever possible: durability, user feedback, breakage rates. Request updates on the products' environmental performance.

#### **4. Policy coherence: coordination and communication**

- Coordinate specifications across multiple HOs to stimulate consistent demand, enabling suppliers to innovate.

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<sup>3</sup> Source: [Ghana: ejemplo mundial en reciclaje » GRÜN Engineering](#)

- Communicate clearly to communities about the purpose, use, and proper disposal of compostable materials.
- Ensure environmental considerations do not compromise primary humanitarian objectives.

#### **5. Time-phased policy strategy**

The following timeline illustrates how policy, funding, and regulatory actions can progressively enable lower impact humanitarian assistance.

#### **6. Short-term (0–2 years)**

- (Re)introduce and mainstream reusable pads, PLA mosquito nets, and selected bio-based packaging (small items).
- Improve waste segregation and controlled disposal systems.
- Update procurement standards with minimum environmental criteria.

#### **7. Medium-term (2–5 years)**

- Collaborate with suppliers to improve high-capacity bio-based packaging.
- Establish and/or support existing local repair/refurbishment for tents.
- Launch community-level waste initiatives (composting, improved dumps).

#### **8. Long-term (>5 years)**

- Systematically integrate LCA into procurement decisions.
- Expand local sourcing of low-impact items.
- Advocate and support the development of basic waste infrastructure in SS and the DRC.
- Use bio-based solutions to support gradual behaviour change, even where waste infrastructure is still limited. Introducing these options with simple guidance can help communities build awareness and habits (e.g., reuse, basic segregation, more informed choices) over time, so they are better prepared to benefit as local waste systems improve over time.