Identifying bio-based solutions for waste management applicable to the humanitarian sector

Andrea Motola, Bio4HUMAN Project Coordinator, Enspire Science Ltd.

inquiry@bio4human.eu

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Bio4HUMAN project fact sheet

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- Full name: Identifying bio-based solutions for waste management applicable to the humanitarian sector
- Horizon Europe, Cluster 6, CSA
- Duration: 30M (Start: 1 Jan 2024; End: 30 June 2026)
- 10 Partners
- 9 Work packages

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IRISH BIOECONOMY FOUNDATION Growing Ireland's Bioeconomy Together

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The challenge & explored solution

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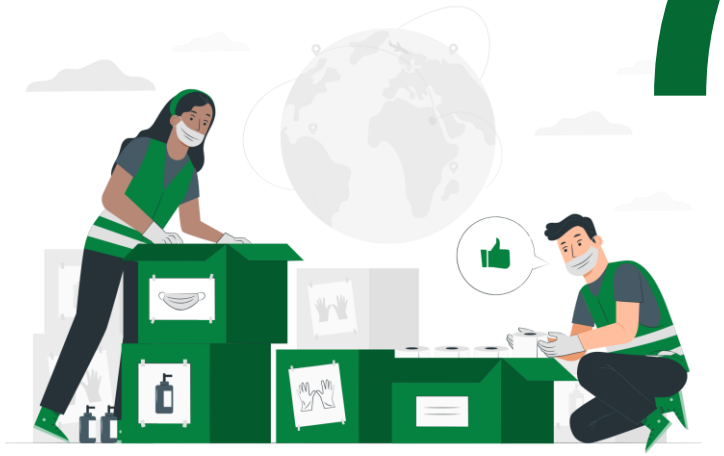

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The challenge & explored solution

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Objectives

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Assess the scope to which bio-based innovative technological solutions and bio-based systems have the potential to be applied under the humanitarian context

Define and catalogue needs of the humanitarian sector in SWM

Assess the scope of available different bio-based innovative technological solutions and systems

Life Cycle Assessments of identified solutions

Conduct environmental LCAs of different bio-based innovative technological solutions

Map the process of LCA methodologies identification in the context of waste management solutions for humanitarian aid

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Objectives

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Socio-economic and governance aspects & Replication potential of identified solutions

Evaluate socio-economic and governance aspects of bio-based solutions identified

Conduct feasibility study for theoretically proposed solutions in 2 African countries

Study locations: DRC & South Sudan

Development of guidelines and recommendations

Develop a set of guidelines and recommendations for policymakers, bio-based sector actors, humanitarian aid practitioners, and the scientific community

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Outputs

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Mapping the ground

Scoping exercise + LCA of innovative bio-based solutions

Stakeholder analysis

Humanitarian sector needs assessment report with regard to SWM

List of bio-based solutions

Gaps identification report

Hotspot analysis of the current and innovative solutions

Best available innovative solutions based on LCA

Socio-economic and governance aspects evaluation + Knowledge, confidence and capacity building + Replication + Dissemination, communication and exploitation

Socio-economic and governance aspects analysis report

Community engagement

SWOT analysis

Practice abstracts

Replication roadmap

Guidelines and recommendations for key groups of stakeholders

Training and information package

Clustering with other projects

Presentation at international events

Knowledge sharing activities

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List of bio-based solutions

Damian Kuznowicz, Scoping Exercise Work Package leader, PRO CIVIS Foundation, Poland

d.kuznowicz@procivis.org.pl

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The bio-based solutions – expected, but challenging

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Economic viability	Operational challenges	Knowledge gaps	Logistical issues	Social and cultural barriers	Regulatory hurdles
sustainable **business models** around bio-based solutions	**integrating new systems** into existing waste management practices	**local expertise** in bio-based waste management techniques	**difficulties in transporting** necessary equipment or materials	resistance to **handling or separating** certain types of waste	navigating **complex or unclear regulations** in host countries
limited markets for end products (e.g., compost, biogas) in humanitarian contexts	ensuring consistent **waste separation** at source	**limited data on long-term effectiveness** of waste management practices in humanitarian contexts	challenges in establishing **reliable supply chains**	lack of **community engagement** or participation	obtaining **necessary permits** for waste processing activities
competition with cheaper, **non-sustainable alternatives**	managing odors and pests associated with **organic waste processing**		managing **seasonal variations** in waste composition and volume	cultural **taboos related to waste** or waste products	

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Scoping the bio-based solutions with multi-level investigations

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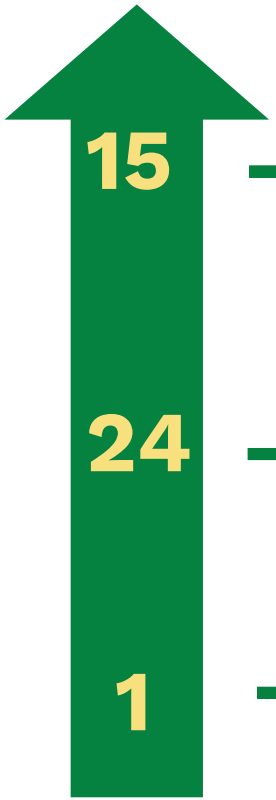
81 bio- based solutions

- **18** — Surveys with members of BIC
- **17** — The bio-products and bio-services delivered by CBE JU projects
- **6** — Applications submitted to the European Patents Office (patents)



- **15** — Web pages of national and international organisations advocating for the bio- based solutions
- **24** — Awards given to the exceptional products at the biggest trade fair events
- **1** — Solution developed by University of Cantabria

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Clustering the bio-based solutions with potential application in the humanitarian settings

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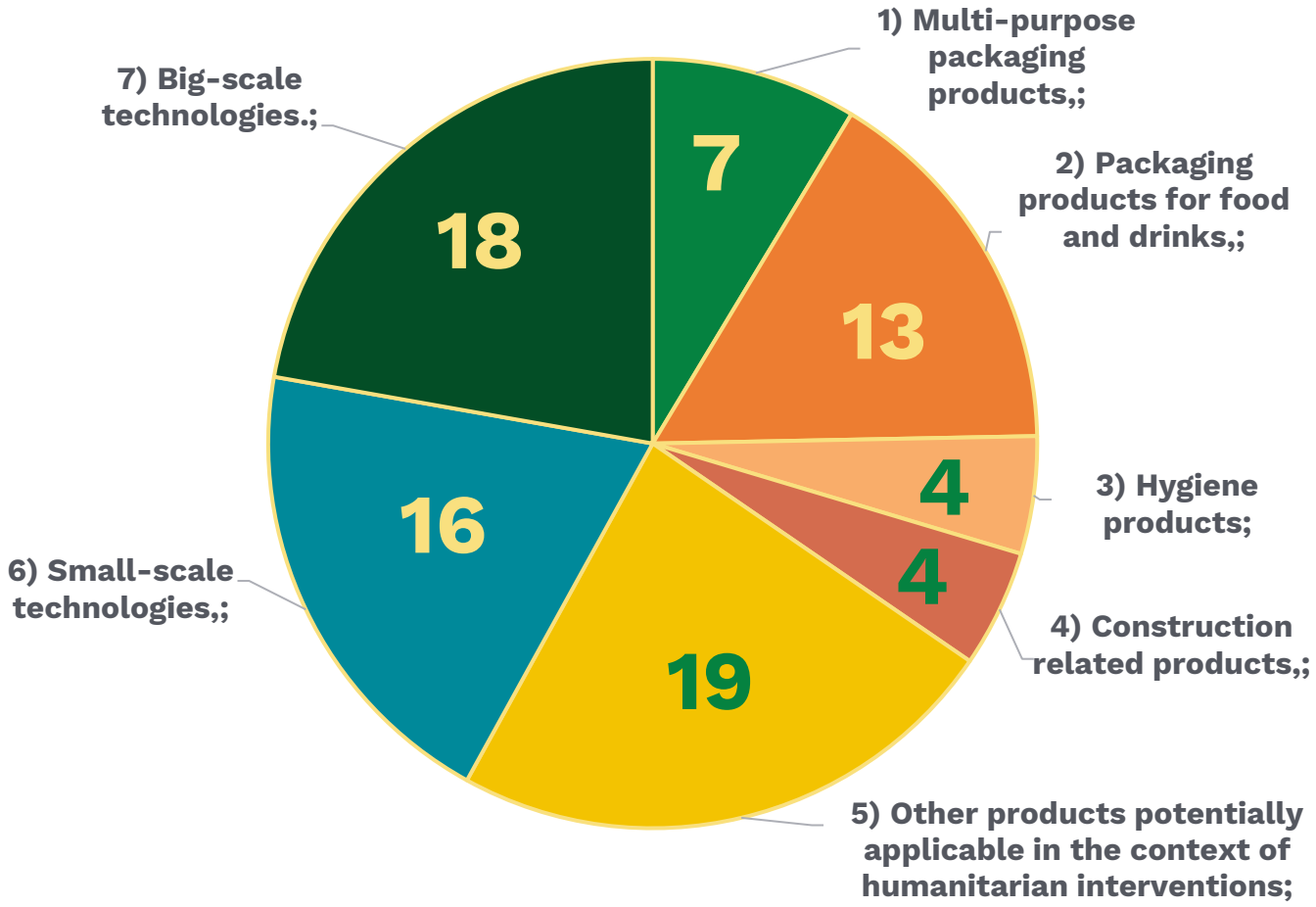

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Examples of the bio-based solutions with potential application in the humanitarian settings

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Multi-purpose packaging products

Packaging utilizing Notpla Seaweed

A by-product from seaweed processing, formerly considered waste, gives Notpla Seaweed Paper its unique veining quality while closing the loop on the seaweed industry. Notpla Seaweed Paper's full potential allows for delivering boxes of different sizes and functions. The product is targeted at food applications; packaging of medical or sanitary products to be considered.

Hygiene products

Anandi 100% Compostable Sanitary Pads

Jute, bagasse, banana fibre and water hyacinth are used to produce the sanitary pads in order to utilize agricultural plant waste materials. In a compost environment, at least 90 % of the pad are biodegraded within 180 days. The pads can be disposed easily in the backyard mud pit and will create bio-manure for agriculture.

Small – scale technologies

Black Soldier Fly (BSF) opportunities

Black soldier fly to transform local organic waste into high-protein animal feed and fertilizer. The technology is targeting all three organic fractions of solid waste, industrial and agri residues.
The Project developing this BSF technology has been initiated in Uganda, Ethiopia, and Ivory Coast.

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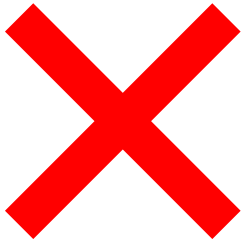
WHY SOLUTIONS WERE REJECTED?



- applicability and efficacy in the humanitarian context
- facing potentially cultural or societal barriers, when being implemented in the humanitarian intervention
- feasibility of the technological implementation and operation
- transferability of the technology to humanitarian destinations
- potential of human capital that could ensure smooth operations
- attribute of the technology to form part of a development component to the humanitarian intervention

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The features of the final selected bio-based solutions

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Products:

- utilising renewable raw materials,
- combining bio-based feedstock and waste,
- utilizing bio-plastics,
- combining biobased
- feedstock with recycled materials,
- utilizing polysaccharides obtained from renewable sources.

Most of the products are compostable and / or biodegradable.

Technology:

- able to utilize fibrous and non-fibrous
- feedstock, including vegetable waste and animal excrements,
- offering the possibility of recycling plastic waste.

The technologies are mostly suitable for rural and remote areas, with some of them adaptable also to the needs of urban communities.

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Waste awareness campaigns

Damian Kuznowicz, PRO CIVIS Foundation

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SWM challenges in case study locations and other humanitarian settings

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DRC and South Sudan

- Lack of (official) SWM infrastructure and services
- Lack of SWM awareness
- Low perception of responsibility
- Protracted armed conflict
- Regulatory problems and political instability
- Inadequate segregation systems
- Bio-based barriers (high costs, limited availability, unreliable performance, and inadequate processing infrastructure)

Humanitarian settings in general

- Awareness of waste generated, and quantity generated
- Education/Awareness/Limited knowledge on waste handling, separation, and disposal
- Limited knowledge on waste generated in supply chains
- Mentality and priorities (aid delivery over environmental responsibility)

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Setting key objectives of the waste awareness campagins

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Enhance Stakeholder Coordination	Facilitate collaboration among HOs, governments, private sector actors, informal waste pickers, local communities, and other partners to pool resources and align efforts.
Raise Awareness	Educate all supply chain actors—HO staff, beneficiaries, local suppliers, and communities—on SWM practices, benefits, and responsibilities to improve participation and reduce environmental risks.
Strengthen Organizational Integration	Ensure SWM action plans are embedded within HOs operational frameworks and communicated across all supply chain stages, from needs identification to final distribution.
Support Local Engagement	Leverage local knowledge, capacities, and market actors to tailor communication strategies and enhance the relevance of SWM initiatives.

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Setting key principles of the waste awareness campagins

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Clarity and Simplicity	Use accessible language and formats to ensure all partners, regardless of technical expertise, can understand and act on the plans.
Context-Specific Adaptation	Tailor communication methods to local socio-cultural, logistical, and crisis-specific factors
Inclusivity	Engage all relevant actors, including often-overlooked groups like informal waste pickers and local communities
Two-Way Communication	Encourage feedback to refine action plans and address gaps collaboratively

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Feasibility evaluation process in DRC and South Sudan

Importance of **taking ownership** by the future users of the solutions and the necessity of always adding the 'soft components' such as awareness raising campaigns, training, choosing a focal point in the community when introducing a new solution.

- Waste awareness as part of the Feasibility evaluation processes of Bio4HUMAN
- Humanitarian partners will verify if solutions fit the purpose of key stakeholders and possibility to accept them for implementation (**accepted by the community**, **local businesses, and local authorities**)
- Engaging with local communities, including stakeholders like waste pickers, municipality, and landfill operators, operational humanitarian partners to gather feedback on the solution, understand their preferences and concerns, and incorporate that into the development of final recommendations and guidelines
- A set of surveys to conduct focus group discussions, key informant interviews, and individual consultations and group workshops
- Feeding **Bio4HUMAN Replication roadmap**

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