

worm

**Waste in humanitarian Operations:
Reduction and Minimisation**

D3.2 Circularity and innovative waste
management business models in
humanitarian response

Date of delivery: 20/12/2024

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**Funded by the
European Union**

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DOCUMENT TRACK INFORMATION

PROJECT INFORMATION	
Project acronym	WORM
Project title	Waste in humanitarian Operations: Reduction and Minimisation
Starting date	01/01/2024
Duration	24 months
Call identifier	HORIZON-CL6-2023-CIRCBIO-01
Grant Agreement No	101135392

DELIVERABLE INFORMATION	
Deliverable number	D3.2
Work Package number	WP3
Deliverable title	Circularity and innovative waste management business models in humanitarian response
Authors	Mellem, Nadine (Innovation Norway) Nauste, Ragnhild (Innovation Norway) Pankratov, Therese Marie Uppstrøm (Innovation Norway)
Due date	31/12/2024
Submission date	20/12/2024
Type of deliverable	R
Dissemination level	PU



REVISION TABLE

VERSION	CONTRIBUTORS	DATE	DESCRIPTION
V0.1	Nadine Mellem, Ragnhild Nauste, Therese Marie Uppstrøm Pankratov (IN)	04/12/2024	First draft
V0.2	Sarah Joseph (KLU)	12/12/2024	Updated draft after contribution
V0.3	Therese Marie Uppstrøm Pankratov (IN)	19/12/2024	Updated draft after contribution
V1	Gyöngyi Kovács (Hanken)	20/12/2024	Final version for submission

LIST OF ACRONYMS

ACRONYM	FULL NAME
EC	European Commission
EPR	Extended producer responsibility
ICRC	The International Committee of the Red Cross
IOM	International Organisation for Migration
JI	Joint Initiative for Sustainable Humanitarian Assistance Packaging Waste Management
NFIs	Non-Food Items
PP	Polypropylene
UN OCHA	United Nations Office for the Coordination of Humanitarian Affairs
UNHCR	The United Nations High Commissioner for Refugees
UNOPS	United Nations Office for Project Services
WASH	Water, sanitation and hygiene
WFP	The World Food Programme
WHO	The World Health Organisation
WMBM	Circular waste management business model



WPs	Work Packages
WREC	Waste management measuring, Reverse logistics, Environmentally sustainable procurement and transport, and Circular economy



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BACKGROUND ABOUT WORM

WORM aims to design guidelines and support actions for circular economy practices in the humanitarian sector. It integrates bio-based technological solutions, leverages procurement for waste reduction, improves waste management (WM) methods and prioritises the sustainable livelihoods of waste pickers. WORM focuses on two selected settings: field hospital deployments and humanitarian livelihood programmes with a waste picking component. Following a collaborative and multi-actor approach, WORM brings together medical and humanitarian organisations, procurement service providers, logistics providers, waste management services and academic partners.

EXECUTIVE SUMMARY

This document is a deliverable of the WORM Project, funded under the European Union's Horizon Europe research and innovation programme under the grant agreement No 101135392.

The aim of this document is to provide an overview of existing, innovative waste management business models in humanitarian response and explores the potential for further developing new and more innovative models. It includes research findings from focus groups and interviews with humanitarian practitioners, highlighting the key challenges they face in implementing waste management processes and systems. The report provides guidance for humanitarian practitioners when aiming to introduce and scale circular economy waste management business models, as well as policy advice for next steps for the sector.

The transition to a circular economy (CE) can incur longer term savings, improve livelihoods, prevent harm and deliver better, more environmentally responsible, humanitarian operations. However, setting up and maintaining CE business models in humanitarian contexts takes partnership across multiple humanitarian actors, collaboration across budget lines and participatory procedures. To realise CE at scale in the humanitarian sector, it is important to focus on agile ways to finance up-front costs, identify and focus on high impact interventions that actively include people affected by crises and set up supporting procedures and frameworks. Based on the finding of the report, it is recommended that:

- Donors consider financing the up-front costs associated with the transition to CE business models to achieve higher cost-efficiency and increase long-term impact.
- Humanitarian actors should map costs and benefits related to transitioning to CE waste management.
- Humanitarian actors should think outside the box and draw from multiple financial tools to unlock the potential of circular economy in humanitarian contexts.
- Humanitarian organisations should leverage the potential in innovation friendly procurement to redeem both upstream and downstream CE impact.
- Comprehensive multicriteria assessments should be designed and implemented, to identify the interventions that will have high impact
- Parties apply systems-thinking in their planning: Implementing circular models requires systems-thinking; this includes considering whole supply chains, local markets, user behaviour, demand, and innovative financing.
- Parties apply a user centric design: Initiatives will fail if the user perspective is not represented, as interventions that are environmentally beneficial could have unintended consequences when implemented in humanitarian responses, i.e. compromising efficient aid delivery.
- Comprehensive training is an included component of the transition phase: Transitioning to CE models requires behavioural change across an entire supply chain. Focused trainings and capacity building initiatives should be developed to support this effort.



- Partner with the private sector: To efficiently respond to user demands and engender the necessary behavioural changes, humanitarian actors should leverage the capacities of the private sector capacities of observing user behaviour, tracking feedback, offering customer service and understanding market demands

NON-TECHNICAL SUMMARY

The **WORM Project** aims to design guidelines and support actions for implementing circular economy strategies in the humanitarian sector. The focus is on reducing waste and improving waste management methods in humanitarian settings, such as field hospital deployments and livelihood programs involving waste pickers. The project brings together various stakeholders, including medical and humanitarian organizations, procurement service providers, logistics providers, waste management services, and academic partners.

This report provides an overview of existing, innovative waste management business models in humanitarian response and explores the potential for further developing new and more innovative models. It includes research findings from focus groups and interviews with humanitarian practitioners, highlighting the key challenges they face in implementing waste management processes and systems. The report provides guidance for humanitarian practitioners when aiming to introduce and scale circular economy waste management business models, as well as policy advice for next steps for the sector.

Overall, the WORM Project aims to enhance the sustainability of humanitarian operations by integrating circular economy principles and improving waste management practices.



INTRODUCTION

A circular business model refers to the re-application of used resources in such a way as to minimize the need to extract and use more resources. This is an important strategy to reduce the environmental impact of humanitarian response and efficiently use all available resources (McClure and Reichardt 2024). Though this has always been a strategy applied by people affected by crises, it has not been systematically and strategically applied by humanitarian responders.

Assistance delivered to affected communities during a humanitarian crisis has a significant environmental footprint. This may also have longer-term implications for the recovery of the affected community, as well as broader environmental costs. In addition to having limited access to resources, humanitarian contexts also commonly lack reliable infrastructure, such as established waste management infrastructure, either because it is lacking to begin with or because it has been affected by the crisis. Circular economy strategies are therefore important both for the affected community's access to resources and the impact of aid-funded programming (McClure and Reichardt 2024).

Over the past few years, we have seen an increase in global policy commitments to address the environmental impact of humanitarian response, such as Greening the Blue, the Humanitarian-Development-Peace Nexus and the Sustainable Development Goals, as well as the establishment of humanitarian collaborations like the WREC Coalition, working on greening the impact of humanitarian logistics, and the Joint Initiative for Sustainable Humanitarian Assistance Packaging Waste Management programme.

Though there is no comprehensive overview of waste generated from humanitarian response, individual studies give us an indication of the challenge:

- A joint study found that across 13 humanitarian organisations, 6.77 million metric tons of food and non-food items had been packaged and distributed in 2021, equalling approximately 33,000 metric tons of primary and 35,600 metric tons of secondary packaging. The type of packaging used matters, both for the quality of the initial response, and for the waste management once items have been distributed (Joint Initiative for Sustainable Humanitarian Assistance Packaging Waste Management (JI), 2023).
- A UNHCR study covering five refugee camps in Tindouf (Algerie) showed that approximately 8.1 million tons of waste is generated in these refugee camps annually. A significant amount of this waste is plastic, estimated at 1,716 tons per year, representing a threat to livestock and the environment at large (UNHCR, 2018).
- A recent study by IOM and Solvoz conducted in Northeast Nigeria found that ashes from the burning of waste is being used as thickening agent in food due to poverty amongst people affected by crises (Abe-Soulier & Chiroma 2024).

Waste is an ecosystem challenge that requires ecosystem-based solutions. In this context ecosystem means all the actors that come together and form the humanitarian ecosystem; people affected by crises, humanitarian responders, governments, donors, local and global private sector etc., as well as the processes and services that connect them and create impact.

The traditional humanitarian business model is free distribution of aid conducted by a humanitarian organisation and paid for by a donor. In addition, in most humanitarian contexts, there are local, smaller scale business models that help people affected by crises access the goods and services they need. When planning a circular approach to waste management, it can be helpful to think about business models in systems, rather than singular business models, because most often it takes a combination of actors, solutions and processes to make circularity work.



Humanitarian responders cluster challenges when it comes to adopting and scaling circular business models around certain core links in the circular chain. This paper will present a variety of circular waste management business models applicable to humanitarian response, the challenges in making them thrive in humanitarian contexts and guidance and policy recommendations for a way forward for increased circularity in humanitarian waste management. It builds on research and findings from focus groups and interviews with humanitarian practitioners, including water, sanitation and hygiene (WASH) experts, medical, and procurement experts, regarding the key challenges they encounter in implementing waste management processes and systems in humanitarian response.

1. CIRCULAR ECONOMY WASTE MANAGEMENT BUSINESS MODELS IN HUMANITARIAN RESPONSE

Applying the concept of circularity depends on the design and implementation of complicated systems with multiple parts, and multiple actors that all need to do their part. While some emerging business models are built with circularity at their core, it is more common to see circular elements integrated into traditional business models.

1.1. Business model definition

While various definitions and descriptions exist for business models, Dan McClure and Hannah Reichardt (2024) simplify the concept, stating that "A *business model* is the system you use to operate in the real world so that you can create value over time". If we delve further, Osterwalder and Pigneur (2010) define a business model as "the rationale of how an organisation creates, delivers, and captures value," a conceptualisation encompassing three key aspects (Osterwalder & Pigneur, 2010):

1. How key components and functions are integrated to deliver value to the customer.
2. How these components interconnect within the organisation and throughout its supply chain and stakeholder networks.
3. How the organisation generates value, or creates profit, through these interconnections.

McClure and Reichardt (2024) describe business models as intricate systems, meaning that each model requires a holistic approach that considers how people, resources, technology, and practices come together to maintain ongoing operations.

This systems-thinking approach is well-suited to our research objective of understanding how circular waste management business models can be successfully implemented and scaled across different geographies in humanitarian contexts.

1.2. Circular economy strategies and innovative business models

The European Parliament defines the circular economy as "a model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing, and recycling existing materials and products as long as possible" (European Parliament, 2023). This is opposed to the linear economy model, often referred to as the "Take, make, use, and dispose" model, as shown in figure 1 below (WREC).

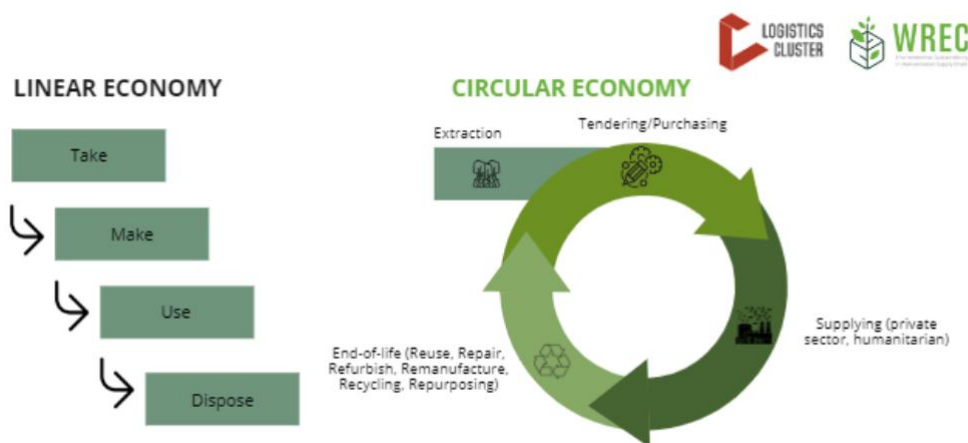


Figure 1 Linear versus circular economy

In practice, the circular economy model translates into strategies aimed at reducing the environmental impact of production and consumption by minimising waste and pollution, keeping materials and products in use, and helping to regenerate natural systems (McClure & Reichardt, 2024). These strategies foster innovative business models that promote sustainable practices across various sectors, including the humanitarian sector.

Innovative business models refer to new and alternative approaches for sustaining a business or organisation. These can involve minor or major changes to a product, supply chain, service, or revenue model. Such models may include upstream innovation, which involves rethinking products and services at the design stage, or downstream innovation, which entails making changes to extend a product's lifespan, or both (Ellen MacArthur Foundation, 2021).

In humanitarian operations, innovative business models focus on implementing sustainable funding alternatives to traditional donor-based funding. Given the challenges associated with finding alternative funding sources, including the risk of breaching the "do no harm" principle, many humanitarian actors find it difficult to explore complementary business models. Nonetheless, the growing gap between available traditional donor funding and humanitarian needs is increasingly at odds with the sector's ability to assist all affected by crises, necessitating new approaches (Global Humanitarian Overview, 2024). The following subsections will elaborate on upstream and downstream innovation and provide practical examples of innovative business models in humanitarian operations.

1.2.1 Downstream – Innovative business models aiming to reuse, recycle and repurpose waste

Downstream innovation refers to new approaches, methods, and solutions addressing products after their initial use (Ellen MacArthur Foundation, 2020). This can involve discovering new technologies, practices, and business models that focus on recycling, reuse, repair, or repurposing products to extend their lifespan or optimise resource efficiency. Such processes may include developing new products from waste materials, repairing used items to lease or sell as second-hand products, and improving methods for the collection, treatment, and recycling of materials to support a sustainable circular economy.

The examples below illustrate various downstream innovative business models aiming to extend product lifespans by implementing new or existing methods, processes, and technologies for reuse, repair, and recycling. The final example focuses particularly on medical waste management in field hospital settings, providing alternatives to the current practices of incineration and pit burning.

Recycle and repurpose: CARE international's CAMP+ project in Kyangwali Refugee Settlement

Project: The CAMP+ project aims to create a sustainable, climate-positive refugee settlement that will improve livelihoods for refugees and host communities while minimizing environmental impact.

One key intervention was the Plastic+ recycling initiative, designed to increase plastic waste collection and repurpose the waste into marketable products, thus creating income opportunities for the community and addressing the environmental issue of waste management. By the end of the project in March 2024, 45.93 tonnes of plastic waste had been collected and repurposed.

Interventions:

- **Recycling:** The project established a plastic recycling unit, creating 150 jobs for collectors and 14 jobs for recycling unit administrators.
- **Volume Reduction:** Two balers were piloted to reduce the volume of plastic, facilitating easier transportation.
- **Capacity Building:** Training in plastic waste recycling was provided to 150 individuals, with an additional 120 receiving business development training, including financial management, marketing strategies, operational efficiencies, and strategic planning.
- **WastePay Platform:** Approximately 300 people registered for an app incentivising waste collection by reimbursing individuals for collected plastic.
- **Resale:** Plastic waste was cleaned, stored, and resold to local recycling companies.

Business model: The initial plastic recycling concept aimed to establish a sustainable, self-sufficient model centred around a production unit equipped to receive, sort, handle, and process collected plastic into new products for sale within the settlement. This approach sought to retain economic benefits locally, fostering community development and long-term sustainability.

However, finding the right balance between cost of operation and income at the sale that was available locally was challenging. Consequently, the project shifted to a partnership with a private sector partner, who managed plastic collection and repurposing off-site while employing and training people from the refugee settlement. The private partner also contributed by designing and setting up the WastePay platform, which significantly enhanced plastic collection and attracted younger participants to the initiative.

Repair, refurbish and reuse: Greening humanitarian response through recovery, repair and recycling of solar products in displacement settings

Project: This IOM led e-waste project aims to address the issue of poorly managed solar product disposal in displacement settings by finding cost-effective solutions for repair, reuse, and recycling through a circular economy.

Research identified solar lanterns and batteries as common e-waste generated among displaced populations (pilot project in Uganda). These products were most disposed of by burning or sent to landfills. Through partnerships with private-sector manufacturers, evidence was presented to encourage improved reparability of solar lanterns. Additionally, a "Batlab" repair shop was established to recycle batteries, and technical training, spare parts, and tools were provided to employees.

Interventions:



- Awareness Raising: Communication materials were created to inform the community about the dangers of improper e-waste handling.
- Technical Training: Private partners provided technical training in battery recycling and lantern repair to the local refugee population.
- Collection Points: Established for collecting and transporting lanterns and batteries.
- Repair Shops: Set up BatLab for battery recycling and a lantern repair shop.
- Refurbishment: Spare parts for lanterns were made available through an open-access procurement platform, enabling refurbishment of broken lanterns.
- Job Creation: The project created 22 jobs, including roles such as project officer, security staff, repair technicians, community mobilisers, and storekeepers.

Business model: The initial approach combined in-house repair and refurbishment with private-humanitarian partnerships for technical training and an open-access procurement portal. IOM and partners are further developing the business model by addressing key components like willingness to pay for repair services, and distance to repair points. The project team is exploring various income streams to ensure sustainability, including local sales of repaired products, carbon credit income, hybrid models, revolving funds, and raw material buy-back agreements with large tech companies.

Microwaving technologies: *Sterilisation of medical waste through microwave technologies*

Project: ICRC has piloted the Sterilwave technology. The Sterilwave technology is a microwave technology that treats infectious and hazardous waste in a way that is harmless for the environment and for its operators. Sterilwave 100 is easy to operate and based on a 100% electric processing method combining shredding and microwave sterilisation in one single vessel with a 100L capacity. The solution is particularly adapted to small medical facilities such as vaccination centres, Sterilwave 100 treats biomedical waste with a bacterial inactivation up to 6log10.

The processing time of 30 minutes provides the following results:

- No waste segregation by medical staff is required.
- The Sterilwave process leaves a product of dry and harmless waste base that is safe to dispose with household waste.
- The processing provides an 85% volume reduction and 25 % weight reduction

Applied in field hospital deployments in humanitarian responses, this technology brings forward the following benefits:

- No time spent on waste segregation by field hospital staff
- Lower risk of cross contamination (environmental and for staff)
- Less waste storage is needed (85% volume reduction provides opportunities for longer periods of time storing waste on site)
- Less cost and logistics required from waste operators (transportation)

Website: [Sterilwave 100 - Bertin Technologies](#)

1.2.2 Upstream – Innovative business models that minimise waste

Upstream innovation focuses on identifying and addressing the root causes of challenges, aiming to solve problems at their source rather than merely reacting to symptoms (Ellen MacArthur Foundation, 2020). This approach involves examining the initial stages of the supply chain to discover ways to prevent waste generation and disposal. In practice, upstream innovation in waste management may include solutions such as product design improvements, alternative packaging methods, transportation cost and emissions reduction, advocacy and information campaigns, new procurement guidelines and policies, quality standards and sustainability criteria for products and services, or promoting changes in consumer habits.

The examples below demonstrate various upstream innovative business models addressing structural, financial, and practical root causes of waste generation. While some models aim to limit waste streams on a practical level, others tackle structural challenges at the policy or strategic level.

Minimisation of waste by design: *UNICEF – Humanitarian Kits that Fit*

The project: The Humanitarian Kits that Fit project, piloted by UNICEF in Ukraine, Palestine, Kenya, and Turkey, seeks to minimise waste by optimising emergency kits to meet the needs of people affected by crises. UNICEF developed mechanisms to ensure effective feedback from affected communities, using this information to guide production, procurement cycles, and the sustainable distribution of emergency items.

This mechanism has become a powerful strategy for customization of the emergency kits as UNICEF can use the market analysis, based on results from the feedback mechanism. Feedback is collected via phone-based surveys and questionnaires, then anonymised and shared with local businesses and partners to inform the customized manufacturing of products for a better and more localised humanitarian response.

Interventions:

- **Digital Feedback Channels:** New and existing digital tools were developed to provide multiple feedback options for people in crisis.
- **Feedback Dashboards:** Anonymised feedback is shared with local businesses and private sector partners to inform product manufacturing.
- **Local Procurement and Capacity Building:** UNICEF shares data and provides guidance to local businesses on procurement standards and regulations.

Business Model: By customising products in large quantities, manufacturers achieve economies of scale while offering customer-friendly flexibility in product design. Although widely adopted in consumer markets, the benefits of mass customisation have yet to be fully realised in the humanitarian sector.

Product as-a-service: *Laerdal Global Health - Leasing to extend product lifetime and minimise waste*



Product: Laerdal Global Health, a not-for-profit organisation, develops products to help save lives in low-resource countries, with a focus on healthcare training and medical equipment. Laerdal is committed to sustainability, incorporating recycled materials and reducing packaging and transportation.

Partnering with a financing company, Laerdal introduced a leasing programme to make their training equipment more accessible. This model promotes a circular economy by ensuring that products are returned, maintained, and re-leased to new customers. Ultimately, this model minimises waste by ensuring proper technical maintenance of their products (EPR), avoids the risk of mismanagement of waste in the supply chain, and reduces the chances of repairable products being discarded as waste.

Interventions:

- Leasing Programme: Provides clients with flexible options for simulation technology and educational equipment.
- Customised Solutions: Flexible leasing agreements tailored to individual client needs.
- Online Platform: An application platform and payment calculator were developed to support clients.

Business model: A partnership with Blue Street Capital utilises a mixed approach, incorporating cross-sector partnerships and extended producer responsibility (EPR). This model increases customer access to Laerdal’s products through affordable leasing, promoting a circular economy by retaining responsibility for maintenance and quality, thus reducing waste. Financial sustainability is achieved through revenue from leasing agreements.

Finding Sustainable Packaging Alternatives – *The Experience of ICRC, UNHCR & WFP*

Product: Polypropylene (PP) woven bags is the most common packaging material in humanitarian response because of their versatility, durability, strength, and low cost. In 2018, the International Committee of the Red Cross (ICRC) shipped 150 metric tons of these bags globally, the World Food Programme (WFP) 6,500 metric tons for food distribution and the United Nations High Commissioner for Refugees (UNHCR) used nearly 150 metric tons of PP bags for non-food items.

These plastic bags are nonbiodegradable. They eventually break down into harmful microplastics. While people affected by crises often reuse the bags, there are normally no collection systems, leading to their eventual disposal by burning or open dumping, which harms both the environment and human health.

Interventions: ICRC, UNHCR, and WFP set up a project aiming to design and develop a sustainable alternative to these bags. They explored new options (using more environmentally sustainable materials or technology to produce the bags) as well as incremental improvements or modifications to existing bags and production methods to make them more environmentally sustainable.

Performance criteria for alternatives were developed using a lifecycle approach to assess material impacts. The partners defined the technical specifications, including optional criteria (e.g. no fumigation needed) and mandatory criteria (e.g. food and non-food grades, durability, and a minimum 24-month lifespan). Additionally, the cost of alternatives should not exceed 110% of PP woven bags.

Various materials were *analysed*, including bamboo, bioplastics, lyocell, jute, organic cotton, paper-based solutions, and both virgin and recycled PP. The top performers were jute and recycled PP, while bioplastics were the least effective. Three materials were shortlisted—jute, recycled PP (non-food

application only), and virgin PP—and evaluated using a multi criteria assessment: economy (price), social acceptance (reusability), environment (plastic leakage, carbon and water impact, recyclability), and technology (industrial scalability and time to market).

Based on the above, four alternatives to PP woven bags were researched and developed, in partnership with academia and the private sector. The four options were then compared to conventional PP woven bags and tested in field trials in real-life humanitarian conditions in global and regional supply chain scenarios. None of the tested solutions outperformed the PP bag in the field trial.

Business model: While no ideal solution has emerged from this project yet, this case study highlights the complexity of assessing the climate and environmental impacts of various humanitarian interventions and the importance of a sound multi criteria assessment to ensure that interventions intending to reduce the environmental impact of the relief efforts, indeed actually do so. Key lessons learned from the project included:

- *Assessing the environmental sustainability of packaging requires more than just analysing its components and manufacturing.*
- *Material and technology availability is crucial for scaling solutions industrially*
- *Identifying sustainable packaging solutions involves trade-offs that might ultimately increase the environmental impact*

Source: Joint Initiative for Sustainable Humanitarian Packaging Waste Management, 2024

1.2.3 Unpacking Circular Economy Models

The concept of a circular economy can be further illustrated through the "Ten R's"—a framework outlining the key components that make the case for a circular economy approach. The European Parliament defines the concept of a circular economy as *"a model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing, and recycling existing materials and products for as long as possible"* (European Parliament, 2023).

The framework describes stages of resource utilisation by showcasing methods and processes that increase resource efficiency, avoid or minimise waste, or extend the lifespan of a particular product or material within a circular economy (Malooly, 2023). The R-framework is divided into loops describing the upstream and downstream methods and processes that contribute to the circular economy. As shown in Table 1 below, the R-framework is carefully divided into three loops:

- **Loop 1:** The first, short loop consists of three R's: refuse, rethink, and reduce. It focuses on upstream preventive measures aimed at solving challenges by addressing root causes. The emphasis is on consumer awareness and empowerment, the supply chain's capacity to innovate and strengthen circular practices and policies, and reducing the impact, carbon footprint, and use of raw materials.
- **Loop 2:** The second, medium loop consists of five R's: reuse, repair, refurbish, remanufacture, and repurpose. This downstream loop focuses on extending the lifespan of products through reuse. Achieving product reusability involves developing effective methods and practical guidelines for repairing or repurposing products or providing incentives to refurbish and remanufacture goods rather than purchasing new ones. Various tools and business models can be applied to support this medium loop, including Life Cycle Assessment (LCA), Product as a Service (PaaS), and product quality requirements.
- **Loop 3:** The third, long loop consists of the final two R's: recycle and recover. This loop is the most common approach to waste management; however, in the circular economy model, it is



viewed as a last resort. This is because the goal is to design out waste and pollution, and to keep products in use for as long as possible. Still, recycling is becoming an increasingly significant aspect of waste management policies worldwide, and the recovery of products and by-products from energy generation is an emerging industry.

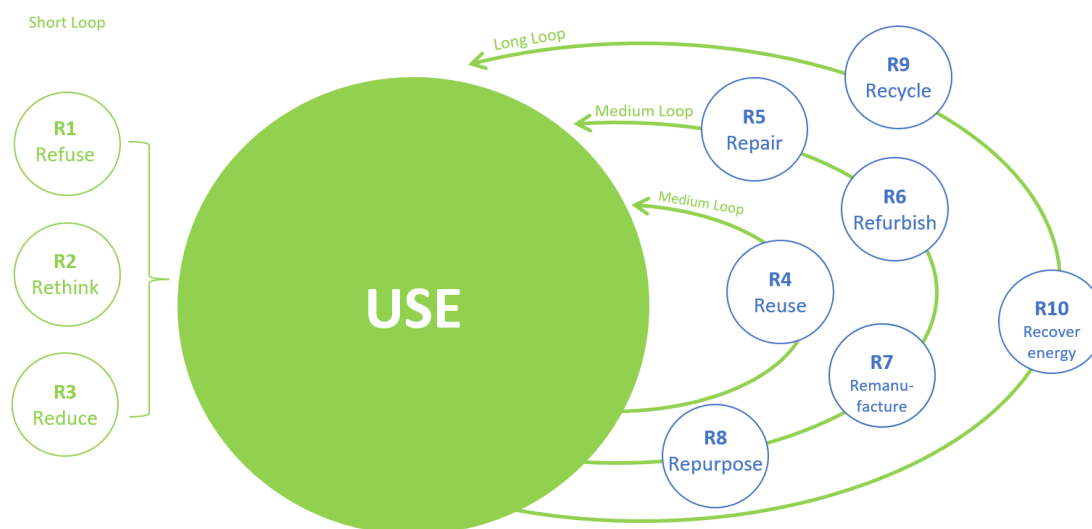


Figure 2: The loops of the 10-R strategy explained

1.2.3.1 The short loop

A. Refusing

The case for refusing is to encourage the disruption of the status quo by raising standards. This may involve new guidelines, bans on the use of harmful materials, and disrupting the flow of short-lived products and unsustainable materials, even if they are favourably priced.

B. Rethinking

Rethinking how we design, produce, procure, supply, transport, and use goods is transformative. However, for rethinking to be impactful, many stakeholders need to rethink in the same way and at the same time. For this to happen, designers, engineers, industry experts, and innovators must share their ideas, plans, and innovations with one another.

C. Reducing

Reducing demand and consumption is crucial not only to avoid the depletion of scarce natural resources but also to minimise the total amount of waste and lessen its negative impact on the environment and public health.

1.2.3.2 The medium loop

A. Reusing

In the model above, reuse is placed in a separate loop that marks the transition from the short loop to the medium loop. This logic is based on the view that reusing materials and products is driven by actions and policies enforced in the short loop. Examples may include, but are not limited to, implementing

procurement specifications on product lifespan, sustainability guidelines for materials, or new product designs that reduce packaging and potential waste.

The case for reusing products and materials is one of the most common circular strategies, widely employed in various parts of the supply chain. Reusing materials such as plastic, metal, and wood enhances resource efficiency while reducing the demand for raw materials in the manufacturing of new products. Reusing products, such as second-hand clothing, furniture, and electronic devices, contributes to circularity by decreasing the need for new supply.

B. Repairing

Repairing broken products supports the strategy of reuse. However, repair is not only vital for extending the lifespan of products and services but also provides new revenue streams through income-generating activities for both unskilled and skilled labour. The repair industry, however, depends heavily on consumers' willingness and ability to use repair services as a viable alternative to purchasing new products. Raising awareness and lowering repair costs are key components in making the business case for repair.

C. Refurbishing

Refurbishing a product may involve updating software or modernising a product's features. Updating a product to ensure optimal use is a common method of refurbishment. As the world becomes increasingly dependent on digital tools and services, refurbishment is becoming an essential service with significant impact, given the growing demand for resource-intensive digital tools. Extending the lifespan of digital tools and electronics thus plays a crucial role in the circular economy.

D. Remanufacturing

Remanufacturing is a key component of the circular economy model, involving the replacement of broken products, either partially or fully. The goal is to extend the lifespan of products and goods, not only by reusing and replacing broken parts instead of purchasing new items, but also by making better use of scarce and non-renewable materials such as gold, silver, and copper. In manufacturing goods, ensuring the optimal utilisation of metals and materials by returning them to the value chain is essential.

E. Repurposing

Circular strategies focusing on repurposing products and goods involve finding new or different uses beyond their original purpose. Repurposing is often viewed as an innovative and creative process, potentially leading to the creation of entirely new products. In humanitarian contexts, where access to specific products may be poor or limited, creative solutions often emerge through repurposing.

1.2.3.3 The long loop

A. Recycling

Recycling is one of the most widely used circular approaches for processing solid waste globally, with numerous business models based on recycling valuable materials such as plastic, metal, paper, and glass. These models often involve a mix of formal and informal waste management actors, offering alternative revenue streams and opportunities for enhanced collaboration. While recycling primarily optimises resource efficiency, it is also used in upcycling to create high-quality products. Recycling plays a crucial role in many downstream waste management business models in humanitarian contexts.

B. Recovery

Recovering energy or other resources from waste disposal is considered the last resort and final stage in this circular economy model. Energy recovery may involve processes such as incineration or other high-temperature treatments of waste, generating electricity, heat, or natural gas from organic waste

materials, or electricity produced from water turbines. This may include composting organic waste for biogas production, incineration to generate electricity, or using wastewater to power turbines.

2. RESEARCH APPROACH AND DESIGN

To achieve the objectives of this study, a qualitative research approach has been adopted. This approach provides deeper insights into the implementation, diffusion, and scaling of waste management business models in humanitarian response. Using a multi-method qualitative approach, the research incorporates both interviews and focus groups with key stakeholders involved in humanitarian response. These stakeholder groups comprise staff in both international and local humanitarian organisations, as well as representatives from public and private sector companies supplying products and services for humanitarian response. A brief explanation of the methodological approach and a thematic analysis of the focus group discussions, which informed this deliverable, are outlined below.

2.1 Focus groups

Four separate focus group discussions were conducted digitally to ensure a diverse representation of international and local humanitarian practitioners worldwide. These sessions also included administrative and medical staff with expertise in procurement, manufacturing, supply chain management, WASH, and clinical fields. The thematic scope of the discussions was carefully selected to reflect relevant research areas: (a) Downstream innovation in waste management processes in humanitarian response; (b) Circularity in waste management processes during field hospital deployments; (c) Innovative financing – leveraging new approaches to support and incentivise the adoption of circular waste management business models; and (d) Innovative business models supporting circularity in waste management in humanitarian response, specifically in the context of Vietnam.

Each discussion lasted 60-90 minutes, with 12-18 participants per group. Three of the four focus groups were conducted using the interactive collaboration tool MURAL, which facilitated the documentation of participants' input during the discussions. The fourth focus group took place physically at the WORM General Assembly meeting in Vietnam in October 2024. Innovation Norway facilitated each session, guiding participants through a series of pre-prepared business model examples, exercises, and questions to be answered individually. Open discussions related to each business model example were also conducted.

2.2 Semi-structured interviews

Seven semi-structured interviews were conducted with a selected group of stakeholders. The interviews aimed to: (a) gather specific information about relevant examples of innovative business models used in humanitarian response, and (b) gain detailed insights into the existing challenges and opportunities for improving waste management practices in humanitarian settings. Each interview lasted 45-60 minutes and was conducted digitally via Microsoft Teams.

3. CHALLENGES OF IMPLEMENTING CIRCULAR BUSINESS MODELS IN HUMANITARIAN RESPONSE

The following section provides a summary of the four focus group discussions, and the bilateral interviews conducted with selected participants to supplement the plenary discussions. This section is divided into two subsections:



Subsection one (3.1) presents a summary of each focus group's thematic area, the participants involved, and the business models that were discussed.

Subsection two (3.2) offers an overview of the challenges identified within each business model discussed across all three focus groups. By listing these challenges, we can gain a better understanding of why existing waste management processes and practices in humanitarian response are insufficient or ineffective. The focus groups also provided valuable input from humanitarian practitioners, including WASH experts, procurement staff, and other relevant stakeholder groups, on how current systems and practices can be improved.

3.1 Focus group structure

Focus group 1: Downstream innovation in waste management processes in humanitarian response

- **Objective:** The objective of the focus group was to identify; (a) what existing approaches to recycle, repair, reuse and repurpose look like in humanitarian response today; (b) the main challenges preventing these approaches from being effective; (c) the circular elements that are being, or could be, introduced into existing approaches to waste management.
- **Participants:** The focus group discussion was comprised of 15 participants, including several WORM consortium partners, international and local NGOs, UN agencies, and a private sector partner.
- **Business models:** The business models presented and discussed in the first focus group included (a) recycling of waste into the production of new products needed in local communities, (b) repair and reuse of defect or damaged products, and (c) upcycling of waste to create new products.

Focus group 2: Circularity in waste management processes in field hospital deployments

- **Objective:** The objective of the focus group was to identify; (a) the risks associated with safe disposal of medical waste in emergencies; (b) the current waste management processes in field hospital deployments; (c) the circular elements currently being or might be introduced into these processes.
- **Participants:** The focus group discussion comprised 18 participants, including several WORM consortium partners, international and local NGO, UN agencies, academia, and private sector partners.
- **Business models:** The business models presented and discussed in the second focus group included (a) safe disposal and minimisation of waste through methods of incineration; (b) minimising packaging material and potential waste; and (c) disinfecting non-hazardous waste to enhance recycling and reuse efforts.

Focus group 3: Leveraging innovative financing mechanisms to strengthen and incentivise circularity in waste management in humanitarian response

- **Objective:** The objective of the focus group was to identify; (a) which financial tools and models are currently for this purpose; (b) what donors, humanitarian organisations, private sector entities, governments and people affected by crises can do to develop, implement and scale financial mechanisms to unlock sustainable waste management in humanitarian response.
- **Participants:** The focus group discussion comprised 12 participants, including several WORM consortium partners, international and local NGO, UN agencies, and private sector partners.
- **Business models:** The discussion in this focus group differed from the previous two, focused on the typical life cycle and supply chain of humanitarian products and waste. Topics included: (a)

planning of response; (b) procurement specifications and processes in humanitarian organisations; (c) production and supply chain; and (d) waste management.

Focus group 4: Innovative business models supporting circularity in waste management in humanitarian response (in the context of Vietnam)

- **Objective:** The fourth focus group aimed to identify; (a) the risks related to safe disposal of waste in humanitarian responses in Vietnam; (b) the current waste management processes in sudden onset disasters in Vietnam; and (c) the circular elements that are being or might be introduced in waste management processes in Vietnam today.
- **Participants:** This focus group discussion was conducted in-person during the WORM consortium General Assembly meeting on 8th October, comprising 10-12 participants, including several WORM consortium partners, local NGOs and humanitarian first responders in Vietnam, academia and private sector partners.
- **Business models:** As this focus group was conducted physically, the discussion had a different layout than the previous three. The focus centred around potential business models that might support circular waste management systems in humanitarian response in Vietnam, including (a) recycling of plastic waste; (b) leasing agreement models; and (c) financial models involving establishing waste currencies.

3.2 Focus Group Outcomes

This section presents four downstream circular business models and four upstream circular business models currently being piloted in or developed for humanitarian settings. They serve to showcase as examples of the pioneering work that is being conducted in this space today. Based on lessons learnt from these efforts, we can further strengthen efforts of guarding a circular economy in humanitarian response.

These eight business models were presented in the four focus groups. Participants were asked to identify challenges and opportunities along each business model and propose recommendations for how we can strengthen their implementation and impact.

Downstream:

- **Business model 1:** Recycling of local waste
- **Business model 2:** Repair for reuse of products
- **Business model 3:** Minimisation of waste streams by incineration
- **Business model 4:** Disinfection of waste to strengthen recyclability

Upstream:

- **Business model 5:** Minimisation of packaging material and potential waste
- **Business model 6:** Procurement as a tool to minimise potential waste
- **Business model 7:** Leasing agreements models based on product-as-a-service approaches
- **Business model 8:** Establishment of waste currencies incentivising waste management

Business model 1: Recycling of local plastic waste in humanitarian settings

Recycling remains one of the most frequently tested circular business models in humanitarian contexts to date. In focus group 1, discussing downstream innovation, a business model for effective waste disposal was presented through a use case for recycling of plastic waste (see figure 3).

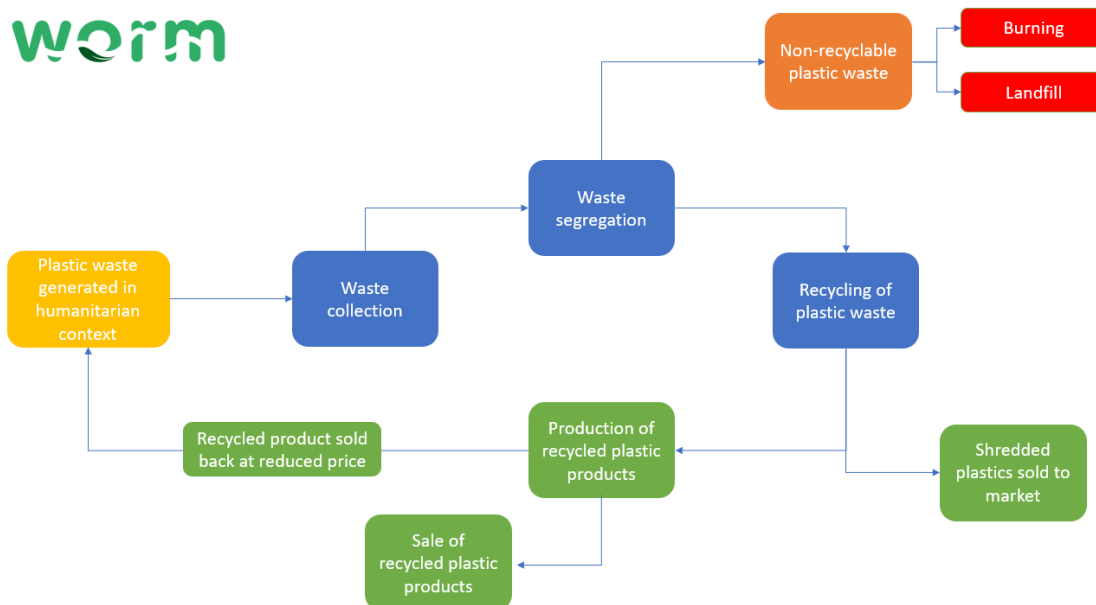


Figure 3: Example business model -plastic recycling

During the discussion in Focus Group 1, participants were asked to identify the challenges encountered in the business model related to the recycling of plastic waste and to explain their nature. The identified challenges are categorised by process stages: (a) collection, (b) segregation, (c) recycling, (d) production from recycled materials, and (e) sale of recycled products.

Table 1: Challenges when it comes to local recycling of plastic waste in humanitarian settings

PROCESS	CHALLENGES
Waste collection	<ul style="list-style-type: none"> • Insufficient knowledge and lack of awareness about waste value and waste management among people affected by crisis • Lack of incentives to collect waste for local populations • Risk of exploitation of vulnerable groups, including women and children • Risk of infectious and hazardous waste
Waste segregation	<ul style="list-style-type: none"> • Lack of knowledge of waste segregation categories (what waste is valuable?) • Risk of cross contamination in segregation process • Breakdown of waste transportation services in emergencies
Recycling of waste	<ul style="list-style-type: none"> • Poor infrastructure and recycling sites • Costly to establish recycling sites • Lack of technical expertise in local community to safely run recycling site • Lack of financially viable models supporting recycling of products • Negative perceptions of recycling in local communities
Production from recycled materials	<ul style="list-style-type: none"> • Insufficient knowledge of waste and segregation categories (what waste is valuable and what is recyclable?) • Health and safety risk associated with segregation of e-waste parts • Lack of evidence that the process of recycling (segregation, treatment, recycling of materials, and processing of new product) is more environmentally friendly

Sale of recycled products	<ul style="list-style-type: none"> • Lack of buy-in from humanitarian organisations regarding procurement of locally sourced products • Negative perception of recycled products (quality and health) in local communities • Lack of access to market for recycled products
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Business model 2: Repair for reuse of products in humanitarian settings

Repairing products is a sensible approach within circular downstream business models in humanitarian contexts, enabling the extension of product lifetimes through the provision of repair services for damaged or defective items. In Focus Group 1, a business model for repairing e-waste (such as lamps/lanterns) was presented (see Figure 4).

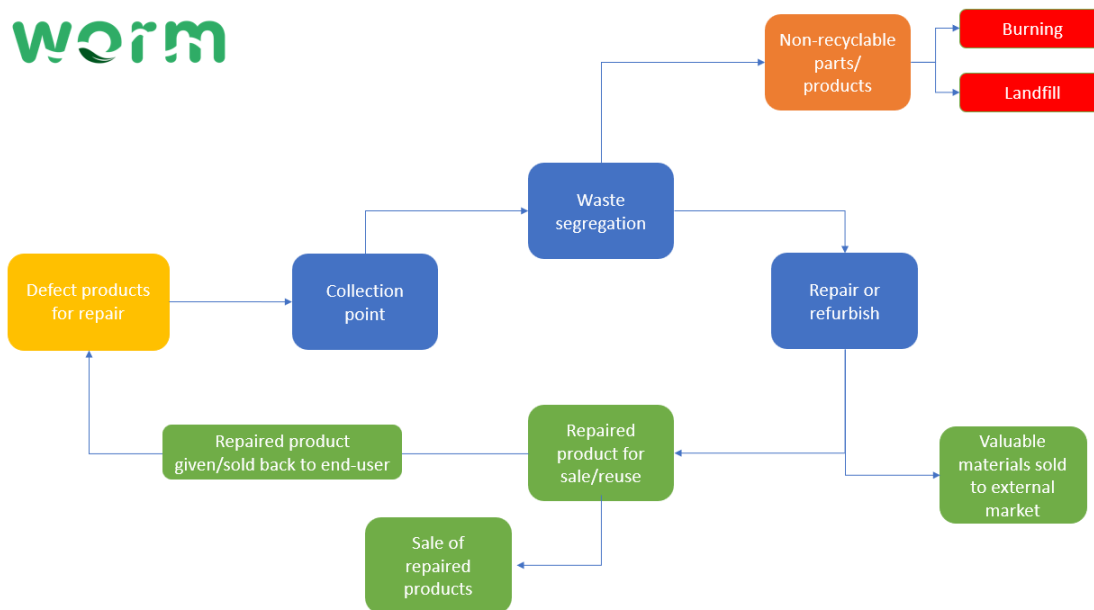


Figure 4: Example business model -Repair of defect products

Participants in Focus Group 1 discussed the challenges encountered in the business model related to the repair and refurbishment of waste. These challenges are categorised by process stages: (a) collection, (b) segregation, (c) handling of non-repairable or recyclable products, (d) repair/refurbishment, and (e) sale of repaired products.

Table 2: Challenges when it comes to setting up repair services for reuse of products in humanitarian settings

PROCESS	CHALLENGES
Collection point	<ul style="list-style-type: none"> • Lack of awareness and knowledge of product repairability • Lack of incentives to collect waste for local population • Insufficient knowledge of health risk associated with collection and treatment of waste, especially electronic waste (e-waste) • Risk of exploitation of vulnerable groups, including women and children
Waste segregation	<ul style="list-style-type: none"> • Insufficient knowledge of waste and segregation categories (what waste is valuable?)

	<ul style="list-style-type: none"> • Health and safety risk associated with segregation of e-waste parts • Risk of exploitation of vulnerable groups
Non-repairable or recyclable parts/products	<ul style="list-style-type: none"> • Health risks associated with segregation and burning of e-waste • Pollution of air, soil and waterways • Cheap electronics often lack repairability options • Limited options for recyclable materials available
Repair and/or refurbish	<ul style="list-style-type: none"> • Lack of repair shops and storage space • Lack of technical expertise and handling of waste/e-waste parts • Lack of spare parts for refurbishment of defect/damaged products • Cost of repair shops and spare parts • Health and safety concerns regarding repair or products
Sale of repaired products	<ul style="list-style-type: none"> • Lack of buy-in from humanitarian organisations procurement of repaired products • Lack of access to market for repaired/refurbished products • Limited financial incentives when repair is often more expensive than purchase of new product

Business model 3: Minimisation of waste streams by incineration in humanitarian settings (field hospital deployments)

Incinerating medical and non-medical waste is perhaps the common disposal method in humanitarian response, especially in field hospital deployments, due to the risk of spreading infectious diseases and regulations for safe waste disposal. In Focus Group 2, participants discussed the use of incineration to minimise waste in field hospitals (see Figure 5).

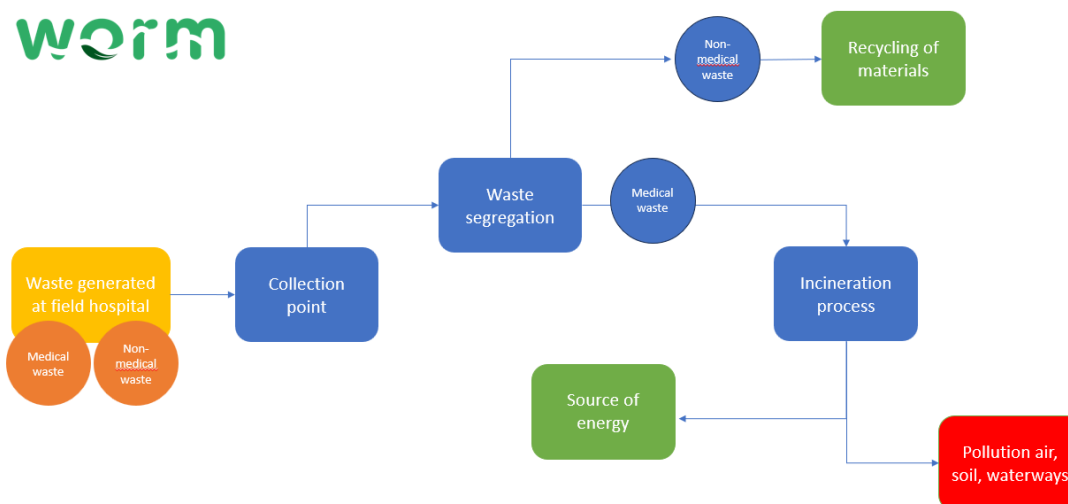


Figure 5: Example use case – Incineration of medical and non-medical waste

The challenges identified with incineration are categorised by process stages: (a) collection, (b) segregation, (c) incineration, (d) energy sourcing, and (e) potential for recycling materials.

Table 3: Challenges to minimisation of waste streams by incineration in humanitarian settings (field hospital deployments)

PROCESS	CHALLENGES
Collection point	<ul style="list-style-type: none"> • Lack of training and knowledge of waste categories among medical staff • Lack of time and incentives to properly segregate waste on site • Lack of knowledge of health risk associated with collection of medical waste
Waste segregation	<ul style="list-style-type: none"> • Lack of training and knowledge of waste segregation among medical staff • Limited guidelines and focus on waste management systems in field hospitals • Lack of time and incentives to properly segregate waste on site • Health and safety risk associated with segregation of medical waste • Risk of infectious and hazardous waste
Incineration process	<ul style="list-style-type: none"> • Lack of incinerators fit for purpose in humanitarian contexts • Considerable variety in quality. Best options are too costly for hum actors • Lack of technical expertise and R&D to develop locally sourced and procured incinerators • Risk of polluted air, soil and waterways • Risk of unsafe treatment of sharps
Source of energy	<ul style="list-style-type: none"> • Low quality incinerators not efficient source of energy • Lack of technical expertise to convert heat to power • Business model potential not reached
Potential for recycling of materials	<ul style="list-style-type: none"> • Lack of focus on non-medical and non-infectious waste materials (single-use-plastic products in particular) • Lack of technical expertise of safe treatment methods of non-hazardous and non-medical waste in field hospital settings • Risk of unsafe treatment of sharps

Business model 4: Disinfection of waste to strengthen recyclability (field hospital deployments)

Disinfecting non-medical waste can support recycling efforts by ensuring safe disposal of potentially hazardous materials in humanitarian response. This is especially relevant in field hospitals, where single-use plastics generate significant waste. In Focus Group 2, it was highlighted that 70-80% of plastic waste could be recycled if appropriate disinfection methods were implemented (see Figure 6).

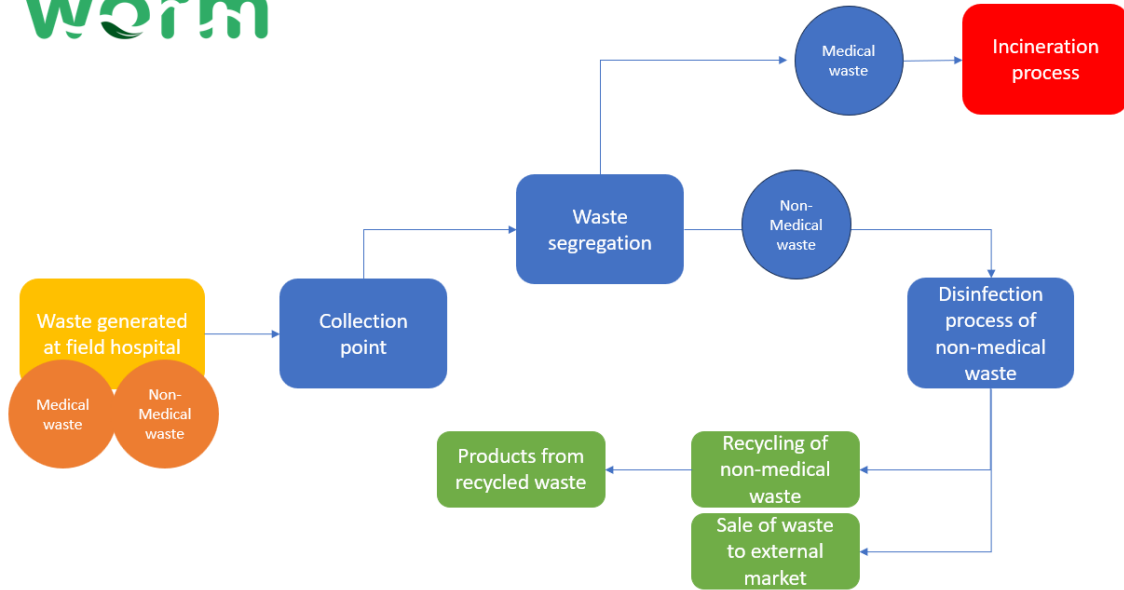


Figure 6: Example use case – disinfection of waste streams to strengthen recyclability

Business model 5: Minimisation of packaging material and potential waste in humanitarian settings (field hospital deployments)

This upstream business model focuses on minimising waste in humanitarian response by reducing packaging materials. In Focus Group 2, participants discussed the benefits of waste reduction, including financial, logistical, and environmental advantages (see Figure 7).

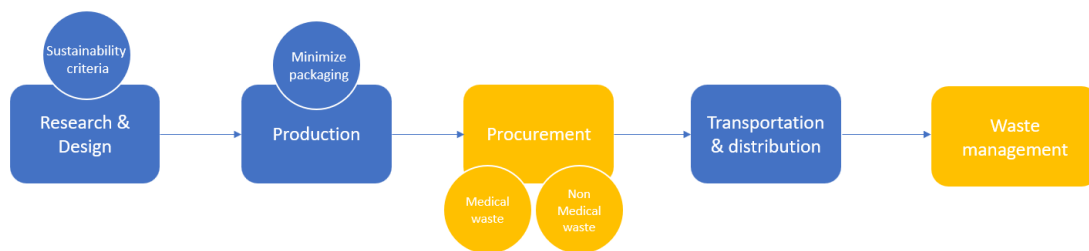


Figure 7: Example use case – Minimisation of packaging materials and potential waste

Challenges in this model are categorised by process stages: (a) research and design, (b) production, (c) procurement, (d) transportation and distribution, and (e) waste management.

Table 4: Challenges of minimisation of packaging material and potential waste in humanitarian settings (field hospital deployments)

PROCESS	CHALLENGES
Research & design	<ul style="list-style-type: none"> • Lack of awareness and knowledge of design to support efforts of minimisation of or alternatives to packaging of products • Lack of demand and willingness to pay for alternative solutions in the market to minimise packaging
Production	<ul style="list-style-type: none"> • Lack of focus on minimisation of waste in production and/or packaging of products
Procurement	<ul style="list-style-type: none"> • Lack of procurement regulations supporting minimisation of waste and/or packaging • No sustainability criteria related to waste management and/or packaging • No financial incentives to procure products with less packaging
Transportation and distribution	<ul style="list-style-type: none"> • Risk of compromising quality of product with less packaging • Risk of destruction (product) during transportation and distribution
Waste management	<ul style="list-style-type: none"> • Lack of storage for packaging waste • Lack of effective waste management processes, including recycling, for packaging materials (cardboard, paper, plastics, pallets, ect.)

Business model 6: Procurement as a tool to reduce waste in humanitarian settings

An innovative approach to procurement in humanitarian organisations can promote waste reduction by incorporating sustainability criteria. In Focus Group 3, this procurement-based innovation was discussed (see Figure 8).

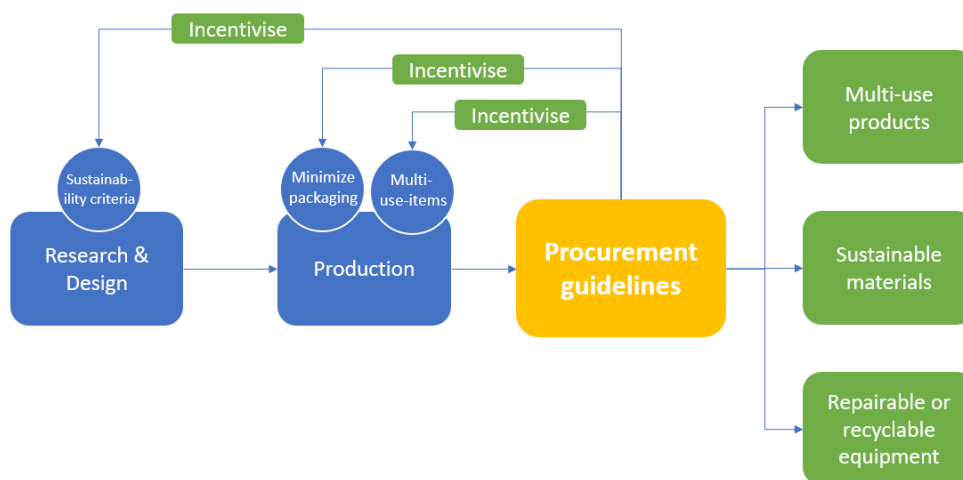


Figure 8: Example use case – Procurement incentivising upstream innovation, minimisation and reduction of waste

The challenges identified in this business model was divided in the following categories; (a) research & design; (b) production; (c) procurement guidelines; (d) multi-use-products; (e) sustainable materials; and (f) repairable or recyclable equipment.

Table 5: Challenges to using procurement as a tool to reduce waste in humanitarian settings

PROCESS	CHALLENGES
Research, design and planning	<ul style="list-style-type: none"> • Lack of financial incentives to design and produce sustainable products when price-per-unit remains default procurement specification • Waste management not considered in these early stages of supply chain • Anticipatory planning does not include considerations of waste management
Production	<ul style="list-style-type: none"> • Environmental impact of production or product is not requested in procurement guidelines, nor by donors • Lack of demand for sustainable and durable solutions/products prevent innovation in production
Procurement guidelines	<ul style="list-style-type: none"> • Low awareness and knowledge of sustainability among procurement staff • Procurement guidelines and specifications often outdated and lack considerations of sustainability criteria • Lack of financial incentives to procure products with less packaging • Donor reporting lack focus on sustainability generally and waste management particularly
Multi-use products	<ul style="list-style-type: none"> • General perception that multi-use products are risky (hazardous waste) • Requires time consuming processing (disinfection, segregation etc.) to be reused safely • Lack of training of staff on safe use of multi-use products
Sustainable materials (focus on bio-based materials)	<ul style="list-style-type: none"> • Lack of competitive solutions and products in market • Lack of viable bio-based products and high risk of compromising product quality • Risk of short shelf-time • Ethical considerations regarding LCA and total sustainability criteria • Ethical considerations regarding food security
Repairable or recyclable equipment	<ul style="list-style-type: none"> • Lack of access to spare parts • Increased price tag • Lack of repair services within reasonable distance

Business model 7: Leasing agreements model with return and repair policy

Leasing products instead of selling them encourages producers to minimise waste through return and repair policies. In Focus Group 4, this approach was presented as a means to strengthen circular waste management (see Figure 9). This model also highlights the potential for leveraging financial benefits embedded in an extended producer responsibility approach.



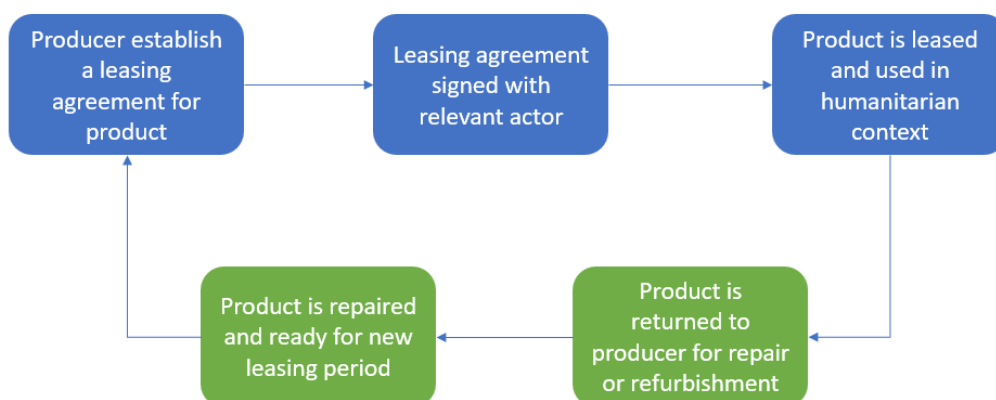


Figure 9: Example use case – Leasing agreement model with return and repair policy

During the focus group discussion in focus group 4, the participants were asked to identify where in the business model challenges may arise. The challenges identified in the business model relating to the leasing agreement model can be viewed in the list below. The list is divided by categories (a) extended producer responsibility (b) reparability and (c) procurement guidelines.

Table 6: Challenges to using the leasing agreements model with return and repair policy

PROCESS	CHALLENGES
Extended producer responsibility	<ul style="list-style-type: none"> • Lack of local presence of relevant private sector • Leasing and service purchase agreements (e.g. power purchase agreements) hard to set up for humanitarian organisations
Repairability	<ul style="list-style-type: none"> • Challenging access to spare parts • Need to explore various ways to create financial sustainable repair services
Procurement guidelines	<ul style="list-style-type: none"> • Limited to no dialogue between private sector and humanitarian technical experts • Detailed and closed procurement specifications • Up front cost of product weighing heavier than lifecycle cost

Business model 8: Giving waste value by establishing waste currencies

Creating value for waste incentivises its collection and segregation. In Focus Group 4, the concept of waste currencies was discussed as a method to promote effective waste management (see Figure 10). Introducing a currency on waste may not only incentivise improved efforts to collect and segregate waste, but also allow tracking of waste materials through the circular supply chain. This model also incentivises collaboration between the various actors within the formal and informal waste management systems to optimise resource efficiency and financial benefits.



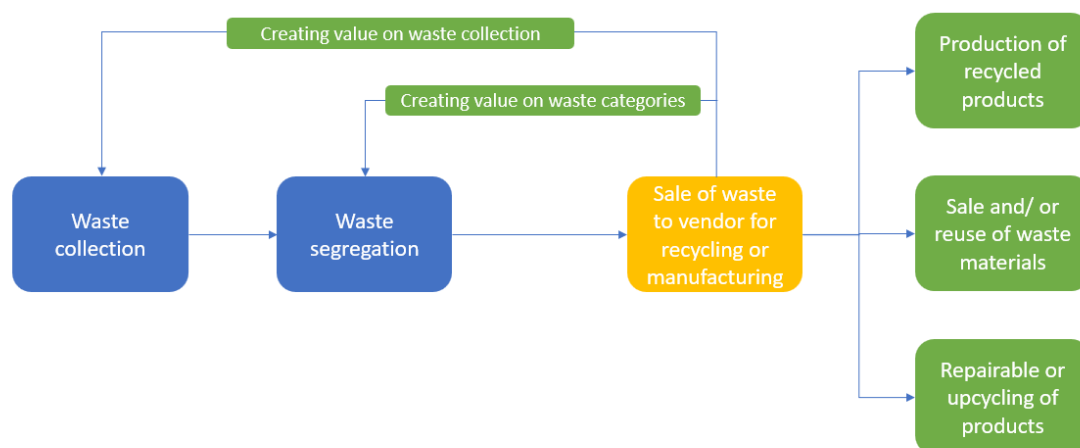


Figure 10: Example use case – Establishing waste currencies to incentivise the waste management process

In focus group 4, participants were asked to pinpoint the potential challenges that might emerge within such a business model. The identified challenges are outlined below, categorized into four areas: (a) waste collection, (b) waste segregation, and (c) determining the value of waste.

Table 7: Challenges to giving waste value by establishing waste currencies

PROCESS	CHALLENGES
Waste collection	<ul style="list-style-type: none"> • Important to ensure safe working conditions for frontline waste pickers, including safety from harmful substances and safe payment solutions • Lack of storage facilities so plastics do not deteriorate in the sun before sold on
Waste segregation	<ul style="list-style-type: none"> • Lack of training on various types of plastics amongst frontline waste pickers
Determining value of waste	<ul style="list-style-type: none"> • Lack of established standards for the value of waste

Discussions on bio-based solutions in all four focus groups

Within the wider context of research conducted by the WORM consortium partners, attempts to identify and integrate appropriate bio-based technological solutions for humanitarian contexts are made (WORM deliverable D1.1 Scoping exercise). Focusing on high priority product groups from a scoping exercise. Particular attention is paid to bio-based alternatives to single-use items such as packaging materials, plastic film, and PPEs as well as items that have previously been incinerated. WORM recognises trade-offs between biodegradability and durability for preparedness, hygiene requirements in health and humanitarian operations, as well as the opportunity costs of raw material choices with regards to food security (for e.g. starch-based bioplastics) and deforestation (for cellulose-based bioplastics), and potential implications of changes in materials on the livelihoods of waste pickers.

In multiple focus group discussions, participants addressed the potential use of bio-based solutions in humanitarian response. Some participants mentioned early efforts to explore innovative alternatives aimed at reducing waste, including small pilot projects testing bio-based materials for surgical gloves, pill cases, and various packaging solutions for medical supplies. However, the general perception of bio-based solutions remains cautious, with some participants expressing moderate to negative views on their feasibility and effectiveness in humanitarian contexts.

These concerns and views correlate well with the study made by WORMs sister research project, Bio4Human, conducting a research study among national and international humanitarian organisations on their views of bio-based products and systems as a solution for sustainable solid waste management (Bio4Human, 2024). This study showed generally low focus and knowledge about bio-based solutions by international humanitarian organisations and that there is a general scepticism towards procuring and adapting such solutions in humanitarian response.

Some of the issues raised in the focus group discussions included:

- **Ethical considerations:** Many participants voiced concerns about the ethical implications of using bio-based solutions—made from food or plant-based materials—in humanitarian responses to crises such as natural disasters, famine, drought, or conflict-related food shortages.
- **Short shelf life:** Several participants noted that many bio-based solutions currently on the market have limited shelf life, often around one year. Given that humanitarian organizations typically purchase large quantities of emergency items (both food and non-food) for response and preparedness, with an estimated timeline of about nine months from purchase to storage, this short shelf life poses challenges. Procurement experts raised concerns that such products would likely not meet the procurement criteria in most UN and humanitarian agencies.
- **Health and security risk:** the risk of contamination and standards for medical equipment and products were identified in the second focus group discussion focused on field hospital deployments. Strictly regulated procurement guidelines and minimum quality standards on medical supplies were among the aspects discussed in this focus group.
- **Lack of evidence:** Several participants highlighted the risks of procuring large quantities of bio-based solutions from what remains an emerging market, compared to established products proven effective in humanitarian contexts. The discussion also raised concerns about the life cycle of bio-based products, questioning whether certain bio-based solutions truly have a lower environmental footprint than conventional alternatives.

3.3 Summary of stakeholder interviews

The following section summarises the semi-structured interviews conducted with relevant stakeholders following the focus group discussion. The main objective was to gain a more nuanced understanding of the key challenges in waste management in field hospital deployments. These interviews also provided an opportunity to explore where humanitarian responders perceive potential and opportunities for improved waste management business models in such settings.

This summary highlights some of the key challenges and opportunities identified across several interviews. Therefore, the points below do not represent the views of a single individual or organisation but rather reflect the general perspectives and experiences of humanitarian practitioners, international NGOs, UN agencies, and organisations or companies involved in the humanitarian supply chain. While many of the challenges and opportunities identified related directly to the waste management systems and practices in field hospital settings, several of the challenges should also be viewed as relevant to the broader context of humanitarian response in emergencies

3.3.1 Segregation of waste in field hospitals and broader humanitarian response

The issue of ill-managed or complete absence of routines and practical feasibility of proper segregation of waste came out as one of the most prominent challenges to waste management in humanitarian response in general. In the context of field hospital deployments, this was highlighted as a particular challenge due to the risk of hazardous waste and lack of safe disposal methods, combined with the emergency context and high pressure on staff. Seen from a circular economy perspective, unsegregated waste is a key bottleneck preventing reusable materials and products from being repaired, recycled or reused.

In several interviews it was pointed out that despite of available guidelines and minimum standards on solid and medical waste management, including best practice for waste segregation systems (WHO, WREC, UNCHR), it is challenging to set up and sustain such segregation systems in practice. Several reasons were mentioned, including:

- **Setting up:** The early stages of a humanitarian response, and particularly in the initial phase of setting up and running a field hospital, were described by many as chaotic in nature. In addition, the geographical location of the operation, the type of humanitarian response and access to local waste management systems, and the functionality of these services, were mentioned as key factors influencing waste segregation.
- **Expertise and training:** Lack of expertise and training of staff in field hospitals was highlighted as a key reason for poor waste segregation routines at field hospitals. Guidelines and best practice on management and segregation of waste can be de-prioritised topic among medical staff whose primary mandate and concern is immediate patient care, especially in acute emergencies.
- **Storage and transport:** If waste is segregated to be recycled or reused it needs to be stored and transported for further treatment off site. This requires waste storage which, in many field hospital settings, is seen as a strained resource. Firstly, because this storage could be used for medical purposes, secondly, due to risk of cross contamination.
- **Risk of health and safety:** If waste is not segregated in the first round of disposal it is nearly impossible; the health and safety risks associated with waste segregation, particularly when dealing with medical, and potentially hazardous waste. While several small-scale innovations were mentioned, that could for example disinfect hazardous waste, many were limited in scope to particular locations, type of waste, or on the type of humanitarian response or emergency. Thus, reaching scale would be difficult to reach.

3.3.2 Extended use of single-use plastic in field hospital deployments

Linked to the issue of ill-managed or lack of waste segregation practices the use of single-use plastic in field hospitals and humanitarian emergency response is prevalent. While this was a clearly communicated concern in several interviews, the issue of replacing single-use plastics with multi-use plastics or other alternative solutions remains debated. Key arguments included:

- **Efficiency:** Medical single-use equipment and general single-use items are efficient and easy to use in emergencies. It is also effective in limiting health and contamination risks and requires minimal training of field hospital staff. Multi-use equipment and products requires training of staff in how to safely sterilize and store the equipment in between use.
- **Waste volume:** The volume of waste from single-use plastic is extensive and requires frequent disposal or processing to abide by health and safety regulations. To avoid logistics and transportation costs in an ongoing emergency the solution is too often that all waste is processed by incineration on site.



- **Compromising core mandate:** Most humanitarian organisations and UN-agencies with a mandate to carry out life-saving activities find it challenging to balance the environmental, social and economic impacts of their activities. With a growing focus on the environmental footprint of humanitarian operations, many interviewed expressed a strong willingness to seek out more sustainable and durable solutions to improve current waste management systems and practices, however many also expressed concerns regarding risk of compromising their primary mandate.

3.3.3 Lack of awareness, training and capacity building for field hospital staff

For waste management systems and practices to be improved, core competencies and awareness raising on the topic of waste management was addressed as a key area of improvement. While some pointed to capacity constraints on medical staff, lack of infrastructure for proper systems to be set up, others pointed at time constraints among medical staff and little focus on training and capacity building.

4. IMPLEMENTING, ENHANCING AND SCALING CIRCULAR ECONOMY BUSINESS MODELS IN HUMANITARIAN RESPONSE – GUIDANCE FOR HUMANITARIANS

Humanitarian responders cluster the challenges connected to implementing and scaling circular economy business models in humanitarian response around a few key pain points along the circular journey:

- Developing a joint understanding of the true cost of waste in humanitarian operations and the opportunities that circularity represents
- Financing and budgeting,
- Training and employing the right expertise,
- Managing downstream circular business models,
- Humanitarian procurement procedures
- Making the entire system work
- Scaling the circular business models
- Creating a complete CE system

The following guidance is designed to help CE innovators in the humanitarian sector address challenges connected to these pain points.

When designing a business model, it is always helpful to use a business model canvas. The business model canvas is a strategic tool that provides a visual framework for developing, describing, and analysing business models. The original Business Model Canvas was designed by Alexander Osterwalder, a Swiss business theorist, and entrepreneur. The canvas became famous through Osterwalder's book, *Business Model Generation*, published in 2010, where he presented the business model canvas as "a shared language for describing, visualizing, addressing, and changing business models" (Osterwalder & Pigneur, 2010). Osterwalder's canvas is composed of nine building blocks that represent key elements of a business: Customer segments, the value proposition, channels (how the business delivers the value to its end-users), customer relationships, revenue streams, key resources, key activities, key partnerships, and cost structure. Building on this, others have further developed the model, in particular with sustainability in mind, adding space for reflections on the social and ecological consequences of your business model.

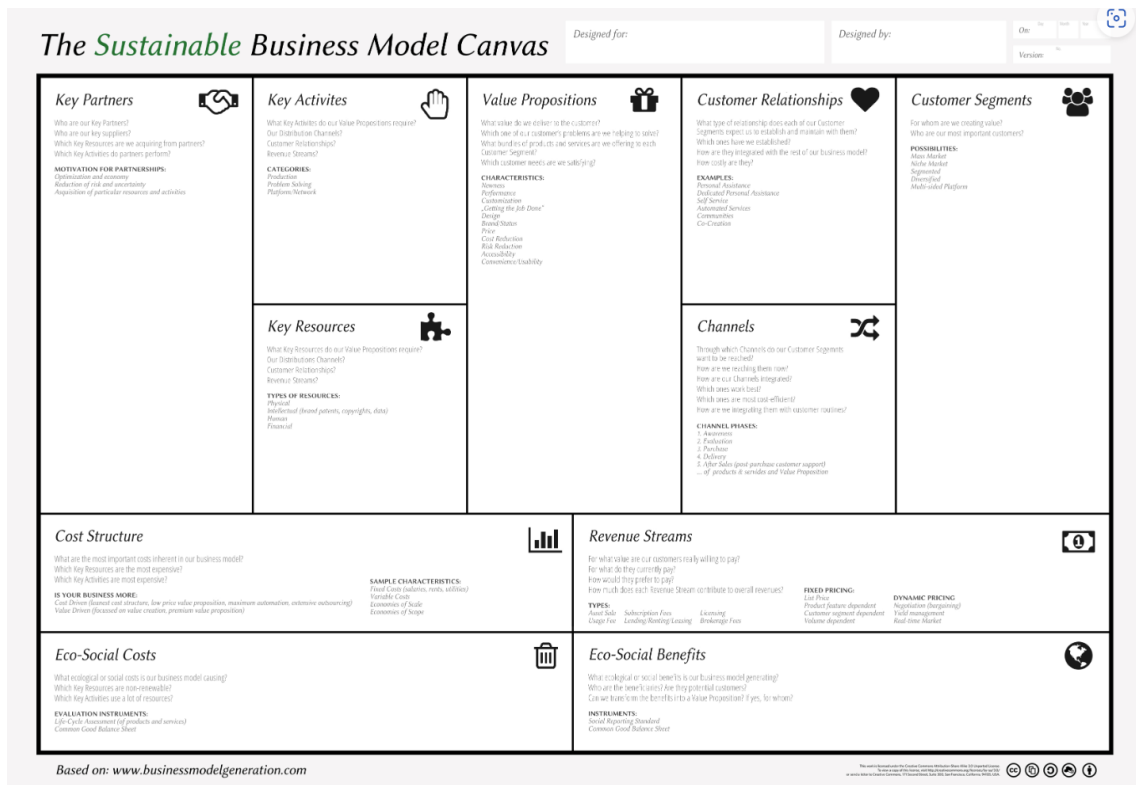


Figure 11: A business model canvas

4.1 Enabling change and recognizing the full cost of alternative waste disposal business models

One of the key factors for a business model’s success is that it needs to be seen as better than the alternatives and be chosen over other business models (McClure and Reichard 2024). If only direct costs are considered when choosing a waste management approach, upfront costs of CE development and implementation are likely to exclude them from being an option in humanitarian response. The low price of e.g. open pit burning can become a barrier to most other alternatives. To make the case for CE business models it is often necessary to make the effort to uncover and quantify the financial, health and environmental costs associated with otherwise cheap waste disposal systems and design a comprehensive advocacy strategy. This will require collaboration across sectors and budget lines.

It is also important to remember that existing systems will have stakeholders who are invested in their continued operation. This may include a wide variation of actors, from those that might have a difference of opinion about where scarce resources should be invested, to informal workers and frontline waste pickers that have a suboptimal waste management system as their sole source of income. It is important to develop a holistic understanding of the status quo, before designing a CE strategy, ensuring that all stakeholders are well understood and that strategies to address the needs of those that might have benefitted from the old system are part of the development moving forward.

Therefore:

- Conduct a thorough needs assessment that explores the holistic consequences of the current waste management systems, maps stakeholders in the current system and explores the potential of circular business models.
- Design a communication and advocacy strategy that include all stakeholders and helps the CE innovator communicate the outcomes of the needs assessment, ensure that decision-makers at

various levels of the value chain are connected to the issue and that helps the CE innovator leverage needed capacity.

4.2 Financing the up front and management costs of circular waste management business model(s)

Introducing a new system normally has upfront costs as well as new and perhaps additional types of running costs compared to the old system. For CE approaches this can be the cost of machines that are needed to recycle, upcycle or repair things and staff costs related to maintaining the new waste management procedures.

Some of the needed equipment may be quite costly, such as plastic shredders, spare parts for electric appliances and incinerators. These capital funding needs can be approached through a variety of strategies, e.g., grants, loans and/or investments. Often, a combination of different sources might be needed as the business model development progresses.

- **Grants:** Grants are the most common source of funding in the humanitarian sector. Grants have the benefit of not being linked to an expectation of repayment. However, grant funding can be challenging to obtain and unpredictable. At a global level, humanitarian needs exceed available funding by approximately 50%. None the less, this funding can be an important option for capital funding in areas of low resources, high risk, or disruptive conflict. Humanitarian donors recognise the importance of sound WM in humanitarian response and the opportunities that CE WM provides.
- **Investments:** Investors look for projects that will reap future benefits, mostly financially, however a growing community of investors are also looking for investments with a social and environmental impact. These investors are typically willing to accept a lower financial return compared to traditional investors. They place emphasis on the many added values of CE, e.g. reduced waste, increased availability of energy and fertilizer, improved health for people affected by crises etc.
- **Loans:** Because CE programs often have the potential to generate revenue, there may be an opportunity to meet a lender's requirements. However, humanitarian operations are characterized by a high risk of disruption of operation, increasing the risk of losing the invested capital and future interest payments. Humanitarian organisations are also unable to take up loans. One way to encourage the participation of a lender is to shift the equation of profit and risk by innovative measures like guarantees. If a third party is able to provide loan guarantees, assuring the lender that they won't lose all their funds, then additional lenders may be willing to offer loans in challenging aid environments.
- **Blended finance:** In most cases when developing new business models in humanitarian response, blended finance is the most viable financing option. The groundwork laid by humanitarian organizations and development agencies often serves to de-risk innovative projects such as those utilizing CE strategies, and so attracts other sources of co-financing from philanthropic actors or private sector actors. Though funding for CE in humanitarian response can be hard to come by, there are positive developments and new stakeholders entering the scene (Ellen MacArthur Foundation 2021).

The following graph provides an overview of how various sources can come in and support the business model development at various stages of business model development.

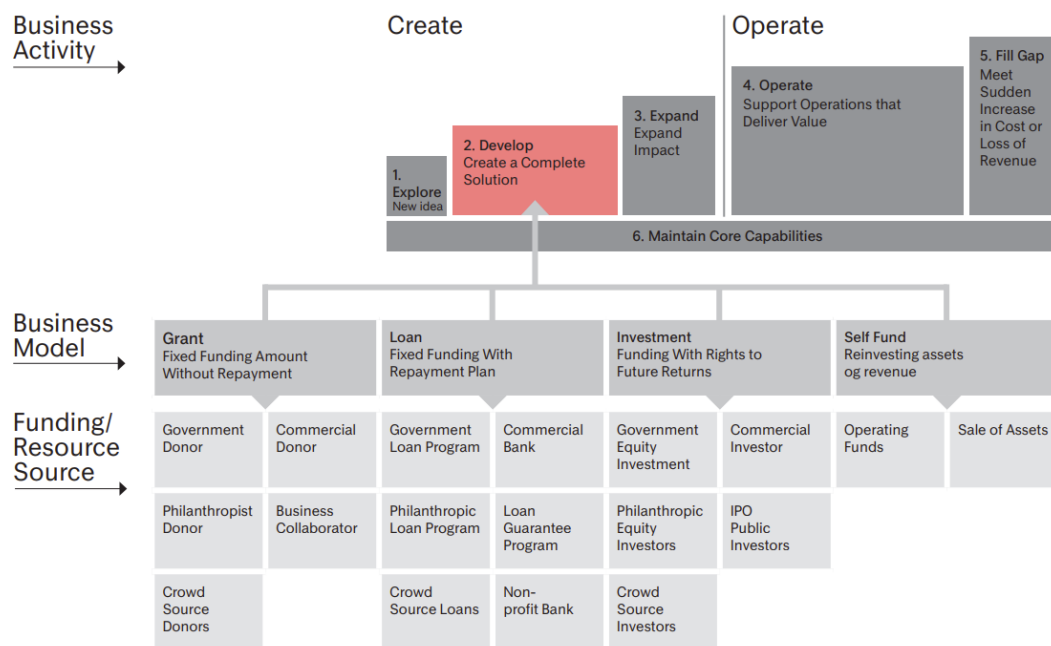


Figure 12: Business model financing (Innovation Norway 2022)

Moving on from the initial investments, it is important to develop a sound balance of costs and income for the CE business model to become sustainable. There must be enough regular income, to make the business model financially sustainable. Most CE business models produce products or services that can be sold. There has been a lot of hope connected to a CE approach where revenue is generated by selling a product made locally of recycled material to people affected by a humanitarian crisis. This approach has been faced with multiple challenges such as competition with free distribution of aid, global procurement by humanitarian organizations, and competitors trying to meet the same need. The CE innovator must design a business model where the price paid for the product or service is sufficient to cover costs and the total volume of sales is large enough to generate the needed revenue.

It is also important to uncover all potential sources of financial gains by introducing a circular business model. In addition to revenue through sale of recycled products or collected waste, a CE approach to WM can lead to reduction in cost for other components of a humanitarian response or have ripple effects that can lead to added livelihood opportunities and other savings. Thus, the financial equation must be designed to include costs from a broad spectre of humanitarian budgets lines from access to energy to livelihood opportunities and reduced need for procuring new NFIs.

CE innovators in the humanitarian space are currently working hard to crack this challenge. Approaches currently under development include:

- **A strategy to create demand for CE products and services by requiring aid initiatives to take ownership of the waste they produce:** With this model humanitarian actors are required to purchase end of life services in the same way that they must pay for supply chain transportation or storage. If fully implemented this would create a market for waste management services and CE programs whenever products are brought into a humanitarian context. This is already done for some relief items, such as:
 - Syringes are normally bought together with a solution to dispose of them safely.

- Emergency Response Units are required to bring all waste from their response with them when they leave, thus the cost of this is factored in when the response is planned.
- **A mechanism similar to carbon credits:** Enterprises with a programme for corporate social responsibility as well as traditional and philanthropic donors wish to support CE efforts, particularly in areas where resources are limited. One way to do that is to create a verifiable market for waste handling that draws international funds to a local CE program, much like carbon credits do for efforts to enhance access to clean cooking solutions and combat deforestation in humanitarian contexts.
- **Waste currencies:** The monetization of waste is seen as a great opportunity to stimulate waste collection at the same time as it provides a small amount of income for the waste collector. This idea is being scaled through various digital tools that use a blockchain certificate that frontline waste pickers can use to trade 'plastic waste coins' for cash or vouchers with.

4.3 User centric design, capacity building and hiring the right expertise

When we ask innovators what the key components of a successful innovation process is, they always highlight capacity building, training, and having the right person in the right place as essential. Employing the right experts and capacity building of all stakeholders are therefore key components of any project looking at introducing CE business models in humanitarian response. Expert staff and training can ensure that the project builds on:

- **Operational Best Practices:** Throughout the process of collection, processing and transport there are best practices that help enable high volume and quality with low costs. Professional managers with expertise in the field can help identify and act on these opportunities for performance improvement.
- **Market Access:** Familiarity with the participants and requirements of markets can help the program successfully navigate the demands of selling their product and addressing disputes or problems that may arise.
- **Operational Oversight:** As the scale of operations grow, the need for clear leadership and oversight increases.

It is also essential that the end-users are involved throughout the whole process of designing the CE model. Initiatives will fail if the user perspective is not present and heard.

4.4 Managing downstream circular economy business models

To leverage the economic and environmental value of collected waste, the collection must be coupled with a downstream production system that can accept and use the materials. This can be a local initiative, like the repair of solar lanterns, or a larger commercial initiative like a plastic recycling centre. Since the collected materials are used as feedstock, there will be specific requirements that either buyers demand or that make the local service feasible. It is critical that the CE program understands these needs and builds their operation around them. A few key areas to focus on:

- **Transportation:** This is often highlighted as a key challenge in establishing CE models in remote humanitarian operations. Because recycling of plastics normally takes place close to urban centres some distance away from where the humanitarian waste is generated, local storage capabilities and transportation to market become key links in the end-to-end process. A crucial element here is the volume of the collected plastics. Mobile units that can compress plastic close to the initial collection point have become valuable elements of successful CE in humanitarian response because it addresses the key pain points of local storage and transportation.

- **Standards and quality control:** Because materials can be inputs to industrial product production, there are minimum quality requirements driven by the downstream industrial process. These are engineering requirements and are often non-negotiable. This demand for consistent quality at scale means that downstream CE business models must build in effective quality control processes and checks. It also means that a portion of the collected waste is likely to fail to meet the quality standard, and so will need its own path to either other uses or waste disposal.
- **Meeting local regulations:** When larger quantities of waste are collected, processed and stored, there is a greater chance that local regulations will impact operations. This needs to be managed proactively so that it does not cause unanticipated and difficult to navigate challenges.

If opting to design a business model with the aim to sell recycled products locally, a key challenge when developing your business model is identifying a market that will purchase the products. It is not enough to develop a product that works, creates value, and that “should” be bought by the target customer. Attention must also be given to engaging with the prospective buyer, ensuring that the CE initiative meets their needs and convincing them that the product is the best solution for them.

In the humanitarian sector, many products are sold to governments, NGO’s or International Agencies that provide aid. Selling into these large organizations often requires rigorous testing and evidence of the product’s safety and effectiveness to make it through their procurement policies and processes. Getting your product into an agency’s catalogue might also require convincing an international agency to change its global procurement catalogue or spend more on a product that can be repaired and is more durable, thus has a lower total lifecycle cost, however, still has a higher initial purchase cost. Addressing these elements of the CE model can take a long time and so should be incorporated early in the CE initiative’s plans. For products that are sold directly to members of the community, the required evidence can be quite different.

4.5 Innovation friendly procurement as a key tool to enable CE

Many products quickly end up as waste because they have not been designed for durability, reuse, or repairability. If a product cannot be economically repaired or be dismantled for recycling, it will never become part of a CE system even if the services are setup and ready. When suppliers to humanitarian organisations are asked directly today, if they can offer their most sustainable solutions to humanitarian organisations, the most common answer is either, “no” or “sometimes”. It follows that setting sustainability criteria for all procurements and ensuring that all calls feature specifications of durability, reuse, and repairability is key. This does not need to be a high-priced luxury, especially when you factor in the longer lifespan of the product.

Transitioning from linear to circular models requires frameworks within humanitarian organisations that can support innovation. *“Procurement is more than an operational function; it can be a powerful force for change”*, if managed holistically and strategically (The Future of Public Spending, UNOPS 2020). Innovation-friendly procurement helps organisations and companies identify and procure new or improved solutions available in the market, following a structured approach. It is a procurement approach that can help humanitarian actors balance the need to safeguard against corruption, tight budgets, maximise the impact of the procurement, and manage sustainability considerations. The process lends itself particularly well for a strategically important procurement connected to an organisation’s core business, where there is little competition in the market and a buyer wants to stimulate market growth, and in areas or markets that evolve quickly. The difference between an ordinary procurement and an innovation friendly procurement lies in the:

- Approach to the needs assessment, with an increased focus on the outcome that is sought with the procurement and less on the input,

- Introduction of an open and transparent dialogue between the buyer and the private sector, an element that is often prevented by humanitarian organisations' procurement regulations today, and
- Formulation of the specifications in the request for proposals. These should be formulated around the performance and impact sought, not on technical specifications describing a solution



Figure 13 The three main steps in an innovation friendly procurement process

The process can lead to the procurement of a solution, making it an innovation friendly procurement, or it can lead to the procurement of an innovation process, making it an innovative procurement (Innovation Norway, 2021). This approach can be useful in implementing circular models, as it allows for more iterative and collaborative partnerships with suppliers in addressing complex challenges, compared to conventional procurement.

For more information and tools to support your innovation-friendly procurement process, access Innovation Norway's website [here](#).

4.6 Making the entire supply chain work

The CE WM system must work from end-to-end (McClure and Reichardt 2024). All the parts must be in place and work together as a whole. This can be challenging to manage since in humanitarian settings, many of the elements that businesses depend on to complete their end-to-end systems are either missing or have limited capacity. The CE system must be adapted to the context, the environment, culture, regulations, ecosystem of actors etc. and may include processes such as:

- Training
- Advocacy
- Waste Collection/Preparation
- Manufacturing
- Distribution
- Affordability
- Operational Management
- Customizing full ecosystem to new contexts

It is helpful to think of it in terms of systems innovation. If one component is missing or performing poorly, it is likely that the effort will fail or join the rank of yet another pilot that did not scale. It is therefore important to identify and realise all the components and partnerships needed to support the business model from end to end.

4.7 Scaling operations to increase the financial sustainability of the CE business model

For a CE business model to be financially sustainable, it normally needs to reach a certain level of scale. The initial investments might have been considerable and the balance between costs and income often such that the model becomes self-sustainable only after a certain level of scale. Feedstocks for recycling can vary widely, ranging from low value materials such as shredded plastic to rare metals harvested from electronics. While the value of each material may be different, in general there will be a need to process a large volume of waste to achieve the level of scale that will ensure that maintaining the operations makes financial sense.

Key issues to consider include:

- **Sufficient supply:** There must be a significant, reliable and steady source of waste material to feed the operation. This might be achieved by tapping a large single source of waste, or by combining the outputs of multiple waste collection operations.
- **Sufficient storage:** Higher rates of through-put may require storage capacity to accumulate production and to assure product quality prior to shipment. The storage facility must meet any minimum standards to ensure that the waste does not reduce in quality, e.g. protecting collected plastic from the sun.
- **Skilled staffing arrangements:** Operating at scale while meeting quality requirements require consistent support from trained staff. To assure this you need to establish a working financial business operation where revenues from product sales can be used to train and compensate both professional management and operating staff. This is a livelihoods opportunity for people affected by crises.

Essential to successful scaling of an innovation is ensuring that the prospect of taking the solution to scale has been present already at the initial innovation phase. In this phase, humanitarian responders will not only define the relevant waste management issues, but also prototype different solutions, and validate their effectiveness with a view of how to bring a viable solution to scale. This involves identifying the specific needs and constraints in humanitarian settings, such as limited infrastructure or various displacement scenarios. Including perspectives of scale from the start of the process will help avoid decision-making that can make scale difficult at a later stage in the process.

Scale can be reached through growing one large operation in the same context, or by implementing the same business model in several contexts. When implementing a business model in a new context, it is important to carefully consider any adaptations that might be needed to fit the new context, and to do so in a humancentric and participatory way.

Scale can also be obtained by extending the value proposition. For example, the CE initiative might:

- Develop additional products that use their existing production capabilities.
- Collect new materials and add new equipment, making it possible to design more products.

By embracing a workshop model where multiple products are produced and new opportunities are intentionally explored, the CE program can make a strong case for being a source of livelihoods.

4.8 Creating a complete CE system

CE business model systems are often woven together or can strengthen each other if seen as a whole. Some examples of what this might look like:

- A larger portion of the waste stream can find productive use when more types of materials and material quality can be productively used. For example, a product might be developed with

greater durability so that less waste is produced and collected. When the product finally reaches end of life, portions of it may be used to create other new products, while other parts are burned in an incinerator designed to produce energy from the excess heat.

- The core capability of waste collection and disposal is likely to be part of every business model. For example, with industrial feedstock recycling there will be some materials that cannot be recycled because of quality issues. When creating new products transformed waste there will still likely be some scrap and other unused waste from the production process.
- Multiple business models working together can help address challenges that would be difficult to solve with just one solution. For example, a program that designs the initial product for durability and easy disassembly, may make it easier to recover materials later in a recycling operation. Or a workshop that is upcycling waste to make valuable products for the community, could get supplemental funding from a recycling operation that sold bulk waste to industrial buyers.

A system that combines multiple processes of circularity may look something like in Figure 14.

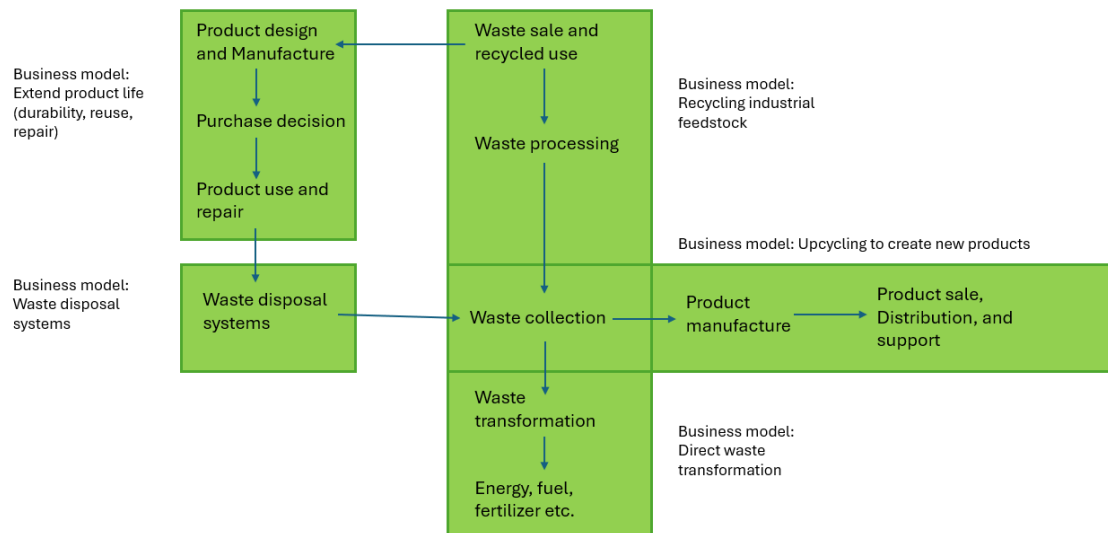


Figure 14: How circular business models may connect (McClure and Reichardt 2024)

In conclusion, there are many considerations to take when designing, implementing and scaling a CE system. They can be summarised in these three guiding questions:

- Is the system complete?
- Are there rewards for all the participants?
- Will the system be chosen in competition with other systems?

5. ENABLING CIRCULAR ECONOMY IN HUMANITARIAN RESPONSE AND DELIVERING IMPACTFUL BUSINESS MODELS – POLICY RECOMMENDATIONS

The transition to a CE can incur longer term savings, improve livelihoods, prevent harm and deliver better, more environmentally responsible, humanitarian operations. However, setting up and maintaining CE business models in humanitarian contexts takes partnership across multiple humanitarian actors, collaboration across budget lines and participatory procedures. To realise CE at scale in the humanitarian sector, it is important to focus on agile ways to finance up-front costs, identify and focus on high impact interventions that actively include people affected by crises and set up supporting procedures and frameworks.

A. Financing up-front costs

Transitioning from linear to circular economy business models will incur higher upfront costs (e.g., due to the higher initial cost of purchasing products that are ultimately more durable or repairable etc., and the costs of investing in the proper capacity and resources required in innovative programming)

- Donors should consider financing the up-front costs associated with this transition to achieve higher cost-efficiency and increase long-term impact.
- Humanitarian actors should map costs and benefits related to transitioning to CE waste management. This will better inform advocacy efforts to incentivise CE investments from philanthropic and traditional donors (e.g., long-term saving, improved outcomes).
- Humanitarian actors should think outside the box and draw from multiple financial tools to unlock the potential of circular economy in humanitarian contexts. Setting up a CE business model requires innovation, creativity and iteration. Access to patient and flexible funding is needed.
- Humanitarian organisations should leverage the potential in innovation friendly procurement to redeem both upstream and downstream CE impact.

B. Identifying high-impact interventions; weighing humanitarian and environmental outcomes

- The environmental impact of an intervention must be assessed together with the overall impact on users, including people affected by crises, host communities, and humanitarian responders to identify the overall impact the intervention would have. Pilot projects have developed sound multicriteria assessments that can be adapted to new contexts and challenges and can be used by others.
- Interventions that demonstrate a high potential both for improved environmental and humanitarian impact should be prioritised over interventions where the environmental outcome is limited and the risk of creating inefficiencies in humanitarian response is higher. The impact and risks across these two dimensions need to be considered when determining whether to implement an intervention, and throughout the implementation.
- The financial and operational sustainability of any intervention must be considered from the outset and developed throughout the implementation of new, circular modalities. Parties will need to understand and be able to implement blended models incorporating both public and



private financing. Failing to consider this aspect risks investing resources inefficiently in short-lived projects.

- Implementing circular models requires systems-thinking; this includes considering whole supply chains, local markets, user behaviour, demand, and financing.

C. Innovating behaviour

- Successful implementation requires end-user involvement in designing CE models. Initiatives will fail if the user perspective is not represented, as interventions that are environmentally beneficial could have unintended consequences when implemented in humanitarian responses, i.e. compromising efficient aid delivery.
- Transitioning to CE models requires behavioural change across an entire supply chain. Successful implementation will require expertise on user-centred design and behavioural change strategies as integral components of any CE project. Focused trainings and capacity building initiatives should be developed to support this effort.
- To efficiently respond to user demands and engender the necessary behavioural changes, humanitarian actors should leverage the capacities of the private sector. Private sector actors rely on offering user-friendly products and services that respond to market demands. Observing user behaviour, tracking feedback, offering customer service and understanding market demands are all inputs that allow private companies to consistently improve their solutions. These are crucial capacities that private partners can offer in CE projects in humanitarian contexts to ensure successful outcomes.

Conclusion

There is an untapped potential in integrating circular economy business models in waste management strategies in humanitarian response. Doing so will reap benefits for the environmental impact of humanitarian response and is therefore fully in line with the humanitarian principle of doing no harm. It will also have added impact for the affected community's access to resources and livelihoods and for the humanitarian responders' ability to stretch budgets further. A comprehensive approach will not only address current challenges but also pave the way for a more sustainable future.



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ANNEX 1 WASTE MANAGEMENT GUIDELINES AND TOOLS

The following guidelines and tools are informing current practices and policy frameworks on waste management in the humanitarian sector today. Circular waste management business models should at all times adhere to current standards.

Table 8: Waste management guidelines and tools

Name	Sector	The guideline/tool	Read more
The Sphere standards 2018 Handbook	Humanitarian sector	<p>The Sphere Project, now known as Sphere, was created in 1997 by a group of humanitarian NGOs and the Red Cross and Red Crescent Movement. Its aim was to improve the quality of their humanitarian responses and to be accountable for their actions. The principal users of The Sphere Standards and Handbook are practitioners involved in planning, managing or implementing a humanitarian response. The Handbook is also used for humanitarian advocacy to improve the quality and accountability of assistance and protection in line with humanitarian principles. It is increasingly used by governments, donors, military or the private sector to guide their own actions and allow them to work constructively with the humanitarian organisations applying the standards. The Sphere standards are qualitative outcome statements which are universally applicable and represent general expressions of rights. The standards are divided into four technical chapters, including WASH, Food, Shelter and Health.</p> <p>The Sphere Handbook 2018: The technical chapter WASH includes standard 5) Solid waste management (<i>Sphere Handbook 2018, WASH, principle 5: p 126- 130</i>) and 6) WASH in disease outbreaks and healthcare settings (<i>Principle 6: p 131-138</i>)</p>	Link to website
Joint Initiative for Sustainable Humanitarian Assistance Packaging Waste Management (JI)	Humanitarian sector	<p>The JI is a project, bringing together a consortium of 23 humanitarian stakeholders — including donors, NGOs, members of ICRC/IFRC and UN agencies — to reduce the negative environmental impact of humanitarian action, particularly by tackling the issue of packaging waste.</p> <p>The initiative supports the humanitarian community by addressing the problem of packaging waste holistically, both upstream (e.g., guidance on how to reduce packaging) and downstream (e.g., guidance on secondary use or</p>	Link to JI report

		"repurposing" of packaging waste, using a circular economy approach). The JI aims to promote greater coordination and standardization within the humanitarian community on packaging sustainability and supply chains.	
Global Plastic Laws	Humanitarian sector	<p>Global Plastic Laws (GPL) is a collaborative project and a database managed by Plastic Pollution Coalition, with key partners Break Free From Plastic Europe, Environmental Law Alliance Worldwide, and Surfrider Foundation U.S.</p> <p>The database is a global portal and resource library for policymakers, organizations, and advocates focused on policy addressing the full life cycle of plastics.</p> <p>This important tool is also useful for businesses and banks to find and understand current plastic regulation in the areas they work; educators, students, and researchers studying plastic policy; humanitarian organizations planning disaster response; and journalists covering plastic pollution and policy.</p>	Link to the website
Safe Management of wastes from health-care activities	WHO (UN guidelines)	<p>The document highlights the key aspects of safe health-care waste management in order to guide policy-makers, practitioners and facility managers to improve such services in health-care facilities.</p> <p>It is based on the comprehensive and detailed WHO handbook Safe management of wastes from health-care activities (WHO, 2014), and also takes into consideration relevant World Health Assembly (WHA) resolutions, other UN documents and emerging global and national developments on WASH and IPC.</p>	Link to guideline
Compendium of WHO and other UN guidance on health and environment	WHO	Guidance on managing solid waste.	Link to report
The Logistics Cluster	Humanitarian sector	The Logistics Cluster is part of the Cluster system and was established by the IASC and led by the WFP as UN Logistics Cluster Lead. The Logistics Cluster provides coordination and information management to support operational decision-making and improve the predictability, timeliness, and efficiency of the humanitarian emergency response. When necessary, the Logistics Cluster also facilitates access to common logistics services, when there is an identified gap and need by humanitarian responders during an emergency.	Link to website

<p>UN Sustainable Procurement Indicators</p>	<p>Humanitarian and development sector</p>	<p>The Sustainable Procurement (SP) working group of the HLCM Procurement Network has developed twelve indicators that allow to systematically monitor, measure and report on sustainable procurement within the UN system. Additionally, the SP working group agreed on the methodology for identifying sustainable tenders as those that include at least three SP criteria - one in each pillar of sustainable development: environmental, social and economic.</p>	<p>Link to website</p>
<p>UNHCR Waste Management</p>	<p>Humanitarian sector</p>	<p>The objective of the UNHCR Waste Management concept note is to establish a comprehensive strategy for the management of diverse waste streams generated by these items, while also ensuring their consistent and sustainable life-cycle management. The expected outcome is to incorporate a waste management system to support operations as a standardized activity in Country Operations (full loads, recycling, repurposing, safe disposal)¹ to ensure that goods that have reached the end of their lifecycle are properly managed.</p>	<p>Link to Concept note</p>
<p>Guidelines for the Safe Disposal of Solid Waste in Humanitarian Contexts</p>	<p>UNHCR</p>	<p>These guidelines aim to support practitioners on the ground in making decisions regarding the sound disposal of domestic solid waste in refugee camps/settlements as recommended by UNHCR in its Operational Strategy for Climate Resilience and Environmental Sustainability. The overarching objective is to mitigate the impact of waste on the environment and public health, in harmony with the Sustainable Development Goals (SDGs) adopted by all United Nations Member States in 2015</p>	<p>Link to guidelines</p>
<p>Plastics Europe (The Global Plastics Treaty)</p>	<p>EU guidelines</p>	<p>Plastics Europe is the pan-European association of plastics manufacturers with offices across Europe. It is catalyst for the plastic industry with a responsibility to openly engage with stakeholders and deliver solutions which are safe, circular and sustainable. We are committed to implementing long-lasting positive change. Plastics Europe has developed guidelines and policy recommendations for the industry.</p>	<p>Link to website</p>
<p>Medical Waste Management</p>	<p>ICRC</p>	<p>This manual is intended as a practical and pragmatic tool for the routine management of dangerous hospital wastes. It does not under any circumstances. Replace any existing national waste management legislation and plans. Hospitals are responsible for the waste they produce. They must ensure that the handling, treatment and disposal of that waste will not have harmful consequences for public health or the environment. It deals mainly with so-called hazardous or special medical waste except for genotoxic waste such as cytotoxic substances or radioactive material, which are wastes that ICRC health care activities generally do not produce.</p>	<p>Link to website</p>

This project is funded by the European Union.

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Waste in humanitarian Operations:
Reduction and Minimisation



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