# OPTIONS FOR HUMANITARIAN PACKAGING REUSE, REPURPOSING, AND RECYCLING

July 2023


Metal vegetable oil container repurposed as a basin in the Central African Republic. Photo credit: Magnus Lindsjö

This document was prepared by the Joint Initiative's secretariat as part of its ongoing commitment to promoting more responsible and sustainable packaging practices. This document does not purport to reflect the opinions or views of the Joint Initiative partners.

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# AIM OF THE DOCUMENT

This document aims to foster collaboration among humanitarian organizations by sharing best practices and innovations in packaging waste management in humanitarian operations. By working together, the sector can develop effective strategies and overcome common challenges.

Part of the solution is to look at waste differently, avoiding the paradox of "wasting waste" by keeping these materials in circulation as long as possible. Packaging waste can become a resource for other productive use. This document lists initiatives of humanitarian packaging reusing, repurposing, and recycling. These initiatives may not be applicable in or suitable for all contexts, and further assessment based on the country context, environmental impact, organizational and local capacity is needed to plan the appropriate waste-management method.

# DOCUMENT OVERVIEW

The document presents a comprehensive compilation of 14 initiatives implemented by humanitarian organizations, aimed at effectively managing packaging waste. These initiatives are organized based on the specific type of packaging material they handle. Each initiative is succinctly summarized, offering essential details about the lead organization, project duration, geographical location, operational processes, resulting end-products, encountered challenges, and the designated contact person. Where applicable, additional information is provided regarding the machinery employed and potential environmental risks.

Section 8 of the document comprises concise descriptions of supplementary initiatives that employ innovative approaches for packaging waste reuse, repurposing, and recycling. Furthermore, it highlights a valuable tool kit developed by WasteAid UK, focusing on the establishment of small-scale community recycling and waste management schemes within lower- and middle-income countries.

# 1. POLYPROPYLENE WOVEN BAGS

## 1.1. SUSTAINABLE SOLUTION FOR SURPLUS POLYPROPYLENE WOVEN BAGS, PALLETS, AND METAL TINS

**LEAD ORGANIZATION:** The World Food Programme (WFP)

**PROJECT PERIOD:** 2019–2023

**LOCATION:** Kenya

**PROCESS:** WFP kenya sold 66 tons of waste Polypropylene (PP) woven bags and other type of packaging waste to a recycling company that recycles them into useful products.

**END PRODUCT:**

- Polypropylene (PP) bags were turned into 600,000 new bags used for multiple non-food purposes.

- Pallets were recycled into basins (Figure 1).
- Metal tins were melted to make cooker grills, sink equipment and cooking pans (Figure 2).

Figure 1: Pallets are recycled into basins.

**PROJECT STATUS:** To date, WFP Kenya has recycled approximately 176 tons of PP bags through a local recycling company, Texplast. Additionally, the recycling program has since been expanded to include other waste items, such as metal tins, generated in different locations across Kenya, through the establishment of Long-Term Agreements with local recyclers. Cumulatively, WFP has recycled the following items (approximately).

- 80 tons of high-density polyethylene (HDPE) pallets
- 500 jerry cans
- 12 jumbo bags[1] of metal tins


Figure 2: Metal tins loaded into jumbo bags (for recycling).

**CHALLENGES:**

- Few recycling service providers are available. Therefore, in-depth research is needed to identify local recyclers and consistent follow-up is required to maintain positive relationships between WFP and recycling service providers.
- Recyclers are often located in urban areas; therefore, coordinated logistics are required to transport waste to the recyclers from remote areas where WFP has ongoing operations. This generates significant logistical costs.

**ENVIRONMENTAL RISKS:** Products made from recycled materials must be assessed to ensure the safety of their use in food storage. This can be done by conducting quality tests based on international or national legislation for food-grade packaging.

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Click here to see the project video.

[1] Jumbo bags are industrial containers made of flexible fabric that is designed for storing and transporting 1 ton of product.

### 1.2. TRASH INTO CASH

**LEAD ORGANIZATIONS:** The United Nations High Commissioner for Refugees (UNHCR), Norwegian Research Council, Engineers Without Borders (EWB), Norwegian Geotechnical Institute (NGI).

**PROJECT PERIOD:** 2019–2021

**LOCATION:** Melkadida, Ethiopia

**PROCESS:** This project aimed to set up a pilot plastic recycling facility in the Melkadida refugee camp, focusing on developing machines that can be built, operated, and repaired locally, with low power demand. According to the plans made in cooperation with the local population, plastic waste would be collected, sorted, shredded, washed, melted, and remolded into new plastic products that would be sold locally.

**END PRODUCT:** Small plates to replace wood on a steel-frame stool since wood was hard to come by and hence expensive.

**SCALE-UP OPPORTUNITIES:** The following concepts were developed/tested:

- Bicycle shredder to crush plastic with limited power.
- A water-sedimentation tank to reuse water after washing.
- Pyrolysis oven using mixed waste to heat and melt PP plastics into new products.

**CHALLENGES:**

- Concluding what to produce is a vast process where variables such as the local market needs, plastic types, and technical and infrastructural limitations are to be considered.
- Technical and infrastructural limitations greatly restricted production.
- The project was terminated early due to political instability in the country. Hence, the entire facility could not be built, and operations never started as planned. The remaining funds were allocated to another project in Uganda (see 1.3.).

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Click here to learn more about the project.

### 1.3. SUSTAINABLE AND COMPLETE WASTE MANAGEMENT SOLUTIONS FOR RURAL AND SEMI-URBAN ENVIRONMENTS IN UGANDA

**LEAD ORGANIZATIONS:** Strømmestiftelsen, the Norwegian Retailers' Environment Fund (HMF), Engineers Without Borders (EWB) Norway, Human Brights, Schippert Consulting, the Norwegian Geotechnical Institute (NGI)

**PROJECT PERIOD:** 2021–2024

**LOCATION:** Mityana district, Uganda

**PROCESS:** The project was designed to fit in with the already existing plastic collection efforts in Mityana, Uganda, close to Kampala. It aims to increase the value of plastic in Mityana, by giving local recyclers access to plastic waste processing. A plastic processing facility with a shredder and washing unit has been set up. All machines and installments have been produced and/or sourced in Uganda only as a means of capacity building. A core focus is to develop a sustainable business, which can process the plastic without future support from the project-implementing organization. This will 1) increase the value of the plastic when selling, and 2) reduce the transportation costs and greenhouse gas emissions for the plastic recycling system as a whole.

**END PRODUCT:** Sorted, clean, shredded plastic that can be used in new plastic products.

**SCALE-UP OPPORTUNITIES:** The concepts from the Trash into Cash project are being further considered and developed under this project:

- A water-sedimentation tank to reuse water after washing.
- Pyrolysis oven using mixed waste to generate heat.
- Shredding machine specifically designed to be produced and sourced in Uganda.

**CHALLENGES:**

- Pyrolysis: Although it was planned in the initial stages of the project that the pyrolysis oven would use low-grade plastic and other residues to create heat that could be used directly for high-grade plastic molding, temperature control has proven to be a challenge for implementing this concept. Without expensive emissions-measuring equipment, it is also challenging to assess which improvements/changes are needed. The learnings from the prototype are applied to the construction of the second prototype being built in Q2 2023.
- Shredding: It has been challenging to construct the machinery locally, with the proper specifications and quality required for the shredding unit.

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Click here to learn more about the project.

### 1.4. FROM WASTE TO VALUE

**LEAD ORGANIZATIONS:** UNHCR, Precious Plastic, NGI

**PROJECT PERIOD:** 2019–2021

**LOCATION:** Tindouf, Algeria

**PROCESS:** The project aimed to set up a recycling facility, use HDPE and PP plastic waste generated in and around the Rabouni camp, and make this waste into sellable products. A fully operational facility was put in place during the project period, enabling a viable business to blossom, giving an income to those who live in the area, and decreasing the amount of plastic ending up in nature. The project team sorted plastic waste and compressed it in a baler to produce baled plastic waste that can be sold to recycling facilities. Alternately after sorting, plastic waste was shredded, washed, dried, and recycled using several Precious Plastic machines.

**PRECIOUS PLASTIC MACHINERY:** Precious Plastics has developed several types of machinery to recycle HDPE and PP plastics:

- **Injection machine**. Used to produce small household objects. Not recommended for large quantities.
- **Extrusion machine**. Used to produce building beams. It can take plastic waste that is not well cleaned.
- **Sheet press**. Used to produce tables and chairs. It requires plastic waste to be well cleaned before treatment.

**END PRODUCT:** Household small items, decorative panels, and furniture (chairs, tables, etc.)

**CHALLENGES:**

- Hot weather and fine sand proved to be a challenge for machinery.
- Sustaining market relevance and continually developing products in demand was challenging.
- Access to spare parts and maintenance capabilities can be limited as Rabouni camp was quite remote. Response times may be long, potentially halting production.

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Click here to learn more about the project. | Click here to learn more about Precious Plastic.

### 1.5. WASTE FOR WARMTH PROJECT: TRANSFORMING PP PLASTIC WASTE INTO INSULATION MATERIALS

**LEAD ORGANIZATIONS:** Engineers without Boarders Norway (EWB), in partnership with Field Ready Turkey and the Polyfloss Factory

**PROJECT PERIOD:** 2022–2023

**LOCATION:** Gaziantep, Turkey

**PROCESS:** The project recycles PP plastic bags to make insulation products for warm and safe shelters and provide work opportunities for displaced people. Plastic PP waste is collected, sorted, shredded, cleaned, and transformed using the Polyfloss machine.

**END PRODUCT:** The project creates two main products:

- Insulation panels: Sorted, cleaned, and recycled plastic granules from local suppliers are fed into the Polyfloss machine that has a rotating oven that fiberizes molten plastic waste. The machine turns the pellets into fibers that are filled in foil panels used for insulations. The panels show a positive impact in summer, by reducing the heat inside the shelter and in winter, by reducing the need for heating (Figure 3).

Figure 3: Recycled PP plastic waste encapsulated in tarpaulin panels for insulation.

- Floor insulation tiles: Various types of plastic waste are collected from local suppliers without being sorted or processed. Then, using the plastic injection machine with a mold, floor tiles are injected and manufactured. The floor tiles are then assembled on the ground of the shelters, and cellophane is put on the surface of the insulating floor tiles (Figure 4).

Figure 4: PP plastic waste is recycled into floor tiles.

**POLYFLOSS MACHINE DESCRIPTION:** Small-scale machines transform plastic waste into wool, inspired by the cotton-candy process. The recycled fibers can be used for insulation, packaging, textiles, mono-material composites, and more. The company provides a set of services along the machines, ranging from installation, training, product design, and context analysis, to long-term maintenance.

**MACHINE POWER REQUIREMENT:** 600 watts

**MACHINE CAPACITY:** The machine turned 1 ton of PP plastic waste taken out of the landfill into floss in 4 weeks.

**MACHINE THROUGHPUT:** 10 kilograms per hour

**CHALLENGES:**

- Creating an insulation panel for transitional shelters or tents is not likely to be adopted by non-

governmental organizations because of hesitancy to change the shelter specifications.

- Creating floor tiles using recycled plastics appeared to generate a lot more interest.
- Availability of clean plastics—the machine accepts clean and shredded plastics only.

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Click here to see the Polyfloss Machine. | Click here to see the project video.

# 2. HIGH-DENSITY POLYETHYLENE

## 2.1. INNOVATIVE PLASTIC RECYCLING HELPS IMPROVE ROHINGYAS' HEALTH AND ENVIRONMENT IN COX'S BAZAR

**LEAD ORGANIZATION:** The International Organization for Migration (IOM) – UN Migration

**PROJECT PERIOD:** 2019–Ongoing

**LOCATION:** Cox's Bazar, Bangladesh

**PROCESS:** In April 2019, refugees in the camp started a waste-collection volunteer group in coordination with the International Organization for Migration (IOM) and its partner Dushtha Shasthya Kendra (DSK). With support from the European Civil Protection and Humanitarian Aid Operations (ECHO), a functional waste-collection system was established.

Daily, the volunteers move around the camps blowing their whistles to alert the refugee households to hand over their waste, including plastics. Each household is provided with two color-coded waste bins, one red, and one green, which serve as a visual reminder of the importance of waste segregation. Organic waste, such as kitchen scraps and garden trimmings, goes into the green bin, while non-biodegradable waste such as high-density Polyethylene (HDPE) goes into the red bin. Within weeks, this simple but very effective system empowered the community, fostering a sense of pride and responsibility in keeping their environment clean.

IOM, DSK, and the Rohingya volunteers' activities extended far beyond waste collection. A recycling plant was eventually set up where the PP bags were transformed into useful products through innovative recycling methods. The recycling plant is part of the IOM Water, Sanitation, and Hygiene (WASH) programme strategy in Cox's Bazar to optimize the reduction, reuse, and recycling of waste produced by refugees.

The recycling process requires camp volunteers to wash and dry the plastic waste (Figure 5). After that, the dry plastic waste is shredded into very small pieces, which are then fed into a granulating plastic machine. This machine melts the small pieces of plastic into a type of "noodle", which are again processed to obtain some small pellets. These small pellets are put in the molding machine at the end to get the final product.

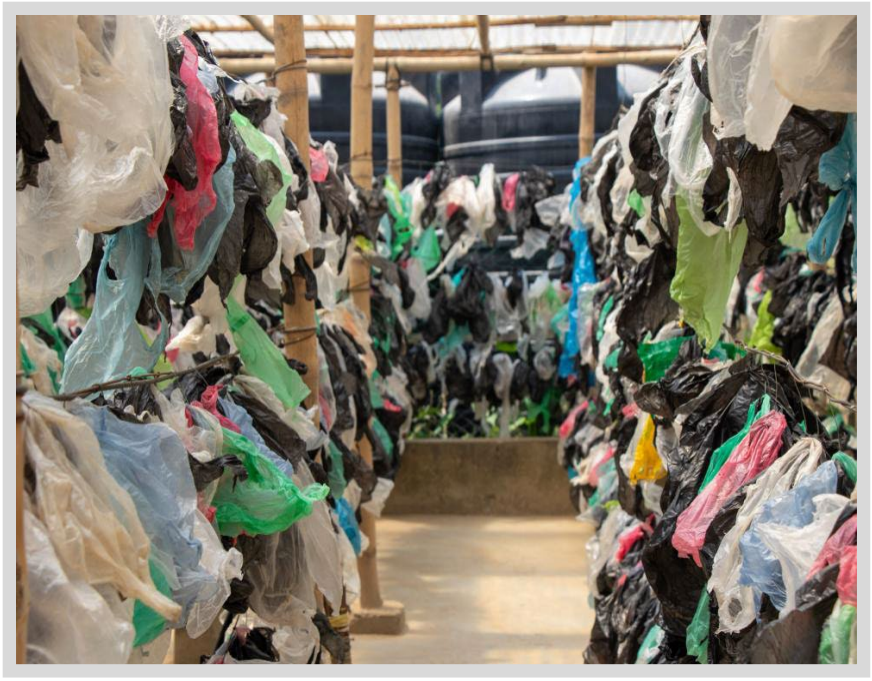

Figure 5: A view of the drying unit where washed plastic waste is kept for drying and then recycled into various useful objects. Photo: IOM/Tarek Mahmud.

**END PRODUCT:** Current products are being used in camps for different purposes like alphabet blocks for children-learning, plastic slabs used as pavement, solid stabilization materials, pit-ring slabs for covering the latrine pits, and small plastic slabs for covering the latrine pit opening (Figure 6).

In 2021, 20 kilograms of plastic per day were recycled, representing the waste production of 2,613 households.

**SCALE UP:** In 2022, the capacity for recycling was significantly increased by implementing solar technology to power the shredding and molding equipment. As a result, the daily amount of plastic waste that can be recycled has doubled, reaching 40 kilograms per day, which covers camps 24 and 25 and benefits around 35,000 people. To power the recycling unit, 105 solar panels, with a combined capacity of 48 kilowatts, have been installed. Additionally, batteries have been incorporated to ensure a consistent power supply during the day.

Figure 6: After a mechanical process, the harmful plastic waste is turned into learning materials and other useful objects. Photo: IOM/Abdullah Al Mashrif.

**ENVIRONMENTAL RISKS:** Global Environment Consultants Limited, a Bangladesh Accreditation Board (BAB)-accredited environmental consultant organization, was engaged by the IOM, Bangladesh in 2020–2021 to carry out an environmental assessment and prepare a prevention/reduction exposure plan to mitigate the adverse effect from hazardous substances produced during plastic waste recycling process. The assessment included:

- Indoor Workplace Air Quality Monitoring and Work Exposure Limit
- Ambient Air Quality Monitoring
- Particulate Matter Assessment (indoor and outdoor)
- Assessment of Stack Emission/presence of Dioxins, Furans, and Polychlorinated Biphenyls
- Air Pollutants by Peak Expiratory Flow Meter Test
- Indoor Workplace Noise/Ambient Noise
- Final Product Test
- Recommendations and Environment, Health, and Safety (EHS) measures

Figure 7: Broken pallets that have been molded into beverage crates.

The assessment showed that the project complies with local, national, and international legislation (in compliance with Bangladeshi legislation and international agreements (IFC/World Bank), as well as Occupational Safety and Health Administration (OSHA) standards to which Bangladesh is a party). Additional measures were taken by DSK to improve the indoor environment for workers (noise protection, extra ventilation, etc.).

**CHALLENGES:**

- The environmental assessment should be carried out at an early stage of project implementation to define a prevention/reduction exposure plan to mitigate adverse effects from hazardous substances produced during the plastic waste recycling process.
- Collection and recycling processes must be taken with care by trained workers following the defined EHS measures.

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Click here for more details about the project.

## 2.2. RECYCLING PALLETS INTO BEVERAGE CRATES

**LEAD ORGANIZATION:** WFP

**PROJECT PERIOD:** 2018–Ongoing

**LOCATION:** Ethiopia

**PROCESS:** Broken pallets are collected from WFP warehouses in Adama and sent to Addis for recycling. The broken pallets are crushed, mixed with virgin material, and molded into beverage crates. The plastic is high quality, so the crates are durable and have a long life span. The recycled pallets can be recycled again when broken (Figure 7).

**END PRODUCT:** Beverage crates.

**SCALE UP:**

- The recycling of plastic pallets is ongoing. locations are timely communicated to bring disposal materials and delivered to the recycling companies. The project team collects pallets not only from Adama but from different locations like Gambella, Dire Dawa, and Jijiga offices.
- In 2023, 1,454 pallets, amounting to 20120 kilograms were recycled.
- In previous years (2018,2 019, 2020, 2021, and 2022), 229,172 pallets amounting to 427,346.5 kilograms were disposed of.

**CHALLENGES:**

- The recycling industry is not very developed in Ethiopia, and it is very hard to get a legitimate company that does recycling in an environmentally sustainable way.
- Transportation: Comparing the cost WFP incurs to transport pallets across the country with the revenue generated was significant.
- Warehouse space: Recycling companies do not always have space to receive more pallets.
- **Delay of payment**: The company used to delay payment to WFP, especially during COVID-19 because they were not selling the crates as well.

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Click here for more details about the project. | Click here to see the project video.

### 2.3. FROM FLEXIBLE PLASTIC TO BRICKS FOR SCHOOLS

**LEAD ORGANIZATION:** UNICEF

**PROJECT PERIOD:** 2020–Ongoing

**LOCATION:** Yopougon Sogefiha, Abidjan, Cote d'Ivoire

**PROCESS:** UNICEF Cote d'Ivoire and the social enterprise Conceptos Plasticos (CP) partnered to implement an innovative construction system transforming plastic waste into sustainable classrooms for children. In 2018, a pilot phase was launched with imported plastic bricks from Colombia to prove the concept to beneficiaries and the government. With a successful pilot and interest

Figure 8: Building blocks produced from recycled plastic used to build schools.

from national authorities, UNICEF committed, along with the Ministry of Education, to build 528 innovative classrooms. In 2020, a factory was built in Cote d'Ivoire and local production of bricks was started along with further efforts to develop a local recycling sector.
UNICEF is supporting more efficient plastic waste collection while capitalizing on existing initiatives. This has contributed to the formalization of women collector systems, improving working conditions, and increased the volume of quality plastic waste (including minimum resale quotas in favor of recycling initiatives favoring women's employment).

Plastic waste is collected from local dump sites by trained local female waste collectors and transported to a collection center managed by women, where the waste is weighed, sorted, cleaned, and compacted. After compacting, the women sell the plastics directly to a recycling factory where it they are shredded and melted into molds to shape the end products that are used to build schools (Figure 8).

Plastics unsuitable for the process such as polyvinyl chloride (PVC) and polyethylene terephthalate (PET) are not collected by the women because these types of plastics are not suitable for this recycling process. PVC poses risks of chemical leaching to its surrounding at high temperatures, while PET is collected separately and recycled by specific manufacturers that use it to produce new PET bottles.

**END PRODUCT:** Building bricks, columns, and beams to build schools.

**SCALE UP:** A recycling factory is now operational in Cote d'Ivoire. Following the success of this project, there are plans to increase the collection of plastic waste in Grand Bassam and Bonoua. There are 109 classrooms in construction and 116 are planned for 2023.

**CHALLENGES:**
Plastic supply represented an initial challenge—adapting an innovative project to an entirely new context required additional efforts, particularly in a country with no formal plastic collection sector. This represented a barrier at the beginning of the project, which has been overcome by encouraging CP to adopt a diversified sourcing strategy (combining women with local sellers, administration, and industrial agencies).

Because of climate change impacts in the country, the design of schools developed at the beginning of the project has been adapted to be a climate change-resistant structure. The structure was reinforced by adding more columns and modifying the design of the roof to resist high-speed winds.

In addition to the lack of infrastructure in the country, transportation of produced products (e.g., building bricks) is challenging because of the rural location of the site.

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Click here for more details about the project. | Click here to see the project video.

# 3. POLYETHYLENE TEREPHTHALATE

## 3.1. CAN A REFUGEE CAMP RECYCLING PROJECT IMPROVE LIVELIHOODS?

Figure 9: Baled PET bottles.

**LEAD ORGANIZATION:** The International Committee of the Red Cross (ICRC) and the Kenyan Red Cross Society (KRCS)

**PROJECT PERIOD:** 2016–2019

**LOCATION:** Dadaab refugee camp, Kenya

**PROCESS:** In November 2016, the International Committee of the Red Cross (ICRC), together with KRCS, launched a pilot project—an innovative and simple community-based plastic waste recycling system. By working with the host and refugee communities, the project aimed at turning plastic waste management's unique challenges into an opportunity to address pressing environmental and socioeconomic needs. The recycling system was later expanded to other types of waste such as metal cans, PET bottles, and paper. By showing how the recycling system worked in Dadaab and being transparent about its challenges, the project aimed to inspire interested parties, be they internal or external, to ICRC, to implement their systems and learn from this experience. The recycling channels are unlikely to be the same, but the parties can nevertheless gain an understanding of the methodology and learn from some of the practical aspects.

The recycling system functioned as follows.

- A small-scale preprocessing plant (mainly, one shredder and one baler) was financed by ICRC and set up in the KRCS compound in the Dadaab refugee camp.
- Plastic (including PET) was gathered, sorted, preprocessed, and then sold to recycling companies in Nairobi by workers from the camp and host community. The preprocessed waste, shredded into granules or baled, became raw material reused by industrial agencies (Figure 9). As a second step, decentralized waste-collection points were set up to buy the waste from the camp population.
- Income generated from the sales of preprocessed waste was put back into the project to pay the workers.
- Education and awareness campaigns were important pillars to influence behavioral change toward waste and engage refugees and host community members in plastic waste collection and clean-up exercises.

**PROJECT SUCCESSES:** The main successes of the project were as follows.

- **Contributing to better living conditions and a healthier environment.** More than 56 tons of plastic were collected for recycling and the project team earned around 300 U.S. dollars for each ton delivered.

- Implementing an innovative solution for plastic challenges in Kenya.
- **Finding a functioning recycling model:** The recycling model was revised several times throughout the project, to improve its financial self-sufficiency. The waste treated was extended from jerry cans to paper, tin cans, and PET bottles.
- **Ensuring project acceptance:** The expansion and piloting of collection points to other camps, schools, and humanitarian agencies' compounds that require the project services has also been a key indicator of project acceptance.
- **Building capacity:** The project involved capacity-building through technical and entrepreneurial training that was provided to the workers, to equip them with the skills to run the recycling plant.

**CHALLENGES:** Over the 3 years of the project, several waste-collection schemes were tested and have gradually increased the amount of waste that the project could collect and preprocess. However, full financial sustainability was not achieved due to a range of factors.

- **Technical:** limited technical capacity in Dadaab imposed a high maintenance and reparation cost on the project. Preventative maintenance could take place once a year, accompanied by low-level technical training, but it was not sufficient to prevent machine breakdowns and costly reparations.
- **Legislative and political:** Refugees are not allowed to own and run a business in Dadaab, which imposed support from humanitarian actors. This, in turn, imposed a high cost on the project because this support was not voluntary.
- **Geographical:** Dadaab is located almost 500 kilometers from Nairobi, and the roads are in poor condition. Transport of waste, materials, or technical workers was challenging.
- **Economic:** The price for preprocessed plastic is low, as the market is still unstable and fluctuating.

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Click here for more details about the project.

# 4. STEEL/ALUMINUM CANS

## 4.1. COMMUNITIES REPURPOSING AND RECYCLING TIN CANS

**LEAD ORGANIZATION:** WFP

**PROJECT PERIOD:** 2019–Ongoing

**LOCATION:** Bangui and Bria, Central African Republic

**PROCESS:**

- **Process 1**. Tin cans are collected by community volunteers and then transferred using elementary tools, such as scissors and hammers into a flat surface, which can be reshaped to form useful products such as buckets.
- **Process 2**. After collection, tin cans are melted in a furnace and then put into a mold to make useful products, such as cooking and eating utensils.

**SCALE UP:** Potentially, this work could be scaled up by building larger facilities and training the local community to safely recycle tin cans.

**CHALLENGES:** Inconsistency of waste volume and challenges in the availability of energy to power the furnace.

**ENVIRONMENTAL RISKS:** Hazardous emissions from melting the material in the furnace, risk of injury by sharp tools, and the generation of scrap metal that could leak into the environment.

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# 5. METALLIZED LAMINATED SACHETS

## 5.1. UPCYCLING SOLID WASTE

**LEAD ORGANIZATION:** WFP

**PROJECT PERIOD:** 2020–Ongoing

**LOCATION:** Cox's Bazar, Bangladesh

**PROCESS:** The project creates income-generating opportunities for Rohingya refugees while upcycling WFP's food packaging. This project involves Rohingya refugees, including women and persons with disabilities, who collect packaging of WFP food products such as Super Cereal, ready-to-use therapeutic food (RUTF), Ready-to-Use Supplementary Food (RUSF), and fortified biscuits (Figure 10). The collected materials are then sorted, washed, cut, heat pressed and finally made into various products through sewing and crafting (Figure 11). The project empowers the Rohingya refugees by providing them with both technical training and practical experience in designing, production, and solid waste management, as well as a much-needed income for the refugees and their families.

Figure 10: Camp volunteers collect and sort plastic waste.

Figure 11: Plastic waste is made into useful products.

**END-PRODUCT:** Tote bags, wallets, school bags, shopping bags, trash bins, baskets, pen holders, floormats, and various handicrafts (Figure 12).

Trash Bin

Tote bag

Carry bag

Pen holder

Wallet

Shopping bag

Baskets

Pouch bag

Purse

Earrings

Bracelets

Diary cover

Figure 12: Examples of useful end products.

**PARTICIPANTS:** 779 participants including 121 participants with disabilities in 2022.

**SCALE UP:** Initially funded by the SPRINT programme under WFP's Innovation Accelerator in 2020, the project has been scaled up to cover the entire camp for waste collection in 2023. In 2022, more than 760,000 pieces of waste material were collected and upcycled into 8,300 products.

**CHALLENGES:**

- Ensuring the consistent quality of the products produced with short-term beneficiary engagement. The Government of Bangladesh restricts engaging beneficiaries for more than 90 days, which has resulted in training new participants every 3 months.
- Creating demand in the local market for these recycled products has been another challenge. The team is now exploring the option to access global markets through private-sector engagement.

**PROBABLE HEALTH RISKS:** Laminated sachets must be professionally cleaned, and the temperature must be carefully monitored when heating plastic to avoid toxic emissions and material burn.

**BENEFICIARY FEEDBACK:** Rofiqua (25) remembers the worst days of her life a at WFP's upcycling centre in Camp 15. In Myanmar, her husband used to earn a good income by selling wood. When they arrived in Cox's Bazar, Bangladesh, they were exhausted, hungry, and in shock. Her daughter was sick, and she tried desperately to find money to pay for her treatment.
As the family settled in the camp, they had no income and could barely afford food or medicine for their daughter. The situation changed after Rofiqua was selected as a participant in WFP's upcycling project. Rofiqua learned tailoring and hoped that she could use this skill to earn an income.

"My dream came true when I started working at the upcycling centre," she said. After the training, she started sewing while still enrolled in the project and became very good at it (Figure 13). She was appointed as a 'master trainer' and started to train other Rohingya refugee women. Rofiqua is very proud of her achievement and is clearing her debt with the income she is earning. With the knowledge she gained in the management of waste and pollution, she is also raising awareness about this issue in her community.

Figure 13: Plastic waste is made into beautiful products through sewing and crafting.

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Click here for more details about the project.

# 6. CARDBOARD BOXES

## 6.1. REPLACING PLASTICS BUBBLE WRAP WITH CARDBOARD

**LEAD ORGANIZATION:** OXFAM

**PROJECT PERIOD:** 2021–Ongoing

**LOCATION:** OXFAM supply center in Bicester, United Kingdom

**PROCESS:** Cardboard boxes are fed into the cardboard desktop shredder/perforator and then used as infill for air freight purposes (Figure 14).

Figure 14: Cardboard boxes are shredded and used as infill for air freight.

**SAVINGS:** Savings made on cutting out bubble wrap purchases and reduced chargeable waste collections gave a return on investment oof 3 years on a 3-year lease agreement with a buy-out option at the end of the lease (2% of the purchase value).

**CHALLENGES:** Only unbleached cardboard boxes with noncolored printing can be used. PVC tape on the cardboard must be removed before presenting it to the shredder.

**POWER CONSUMPTION:** 1.2 kilowatts.

**WATER CONSUMPTION:** No water is used.

**CONTACT:** Rod Hogg, Supply Centre Operations Manager, Oxfam Supply Centre, rhogg@oxfam.org.uk

## 6.2. PROJECT PLAY: REPURPOSING PACKAGING INTO TOYS FOR PLAY STIMULATION

**LEAD ORGANIZATION:** UNICEF

**PROJECT PERIOD:** 2022–Ongoing

**LOCATION:** Uganda, Sierra Leone, and Pakistan

**PROCESS:** Every year, UNICEF, delivers thousands of tons of RUTF a fortified, peanut paste for treating malnutrition in children under 5 years old. In 2022, UNICEF placed orders for 120,000 million tons of RUTF, equivalent to approximately 8.7 million cardboard boxes dispersed across the globe. There is an opportunity to repurpose these boxes into relevant and fun toys.

Inspired by a supplier initiative, UNICEF is broadening the concept of printing and precutting toys in corrugated cardboard cartons, to enable repurposing boxes into toys to aid in malnutrition recovery and promote learning through play.

**END PRODUCT:** UNICEF offers a diverse catalog of cardboard toys that help develop cognitive, motor, and social skills in children aged 6 months to 5 years. The toys are inclusive, designed with contrasting colors, tactile features, and easy grip, ensuring all children with and without disabilities can play with them. How-to-use guides are also be included for caretakers, and UNICEF programming emphasizes positive parenting and nurturing care (Figure 15).

Figure 15: Children at the Mulago National Referral Hospital in Kampala, Uganda, are exploring the cardboard toys made from the Ready-to-Use Therapeutic Food (RUTF) packaging. ©UNICEF/Uganda/2023/Nabisere.

**PROJECT STATUS:** Project Play is currently implemented for "proof of concept" testing in emergency settings in three countries: Pakistan, Uganda, and Sierra Leone. Qualitative research is conducted on using the RUTF supply chain for play stimulation products; program delivery and platforms, parent engagement, and acceptability and durability of toys.

**SCALE-UP OPPORTUNITIES:** If scaled, this project has the potential to reach up to 7.3 million children per year—the number of children who received UNICEF-supported malnutrition treatment and care in 2022. If toy designs are added to the packaging of other supplies, UNICEF could reach tens of millions of children per year.

**CHALLENGES:**

- Cardboard boxes must maintain structural integrity and hence not be wet, dirty, or damaged either on the exterior or interior.
- Models of application must be made into samples for suppliers to opt-in at no extra/marginal cost while ensuring playability for several children in the packaging.

**CONTACTS:**

- For general information: innovateforchildren@unicef.org
- Margit Bach Project Manager, Nutrition Innovation Specialist, Product Innovation Centre, UNICEF Supply Division, mbach@unicef.org

Click here for more details about the project. | Click here to learn more about Product Innovation at UNICEF

# 7. OTHER TYPES OF HUMANITARIAN PACKAGING

**LEAD ORGANIZATION:** CARE

**LOCATION:** Mozambique

**PROCESS:** The warehouse team, led by Samira Mendoça, offloaded the containers and kept all the packaging to one side. The team found innovative ways to reuse items like tarpaulin packages, bale sling/straps, and metal supports for pallets, giving them a second life that they would not have had otherwise.

**END PRODUCT:** Tarpaulin packaging has been used by families from surrounding communities, their use ranging from using the tarpaulin packaging as a sleeping mat or to providing roof/shade for informal sellers in the markets (Figure 16).
Metal stands that carried wooden pallets have been used to construct kitchen shelves for storage space in households. Recycled wooden pieces were used to provide support (Figure 17).

Plastic straps that come in the bales of mosquito nets and blankets were used to create shopping baskets, sleeping mats, and baskets/trays (Figure 18).

**CONTACT:** Lorena Dossantos, CARE Mozambique, lorena.dossantos@care.org

Figure 16: A family using tarpaulin as a sleeping mat and floor cover.

Figure 17: Kitchen shelves made of metal stands and wooden pieces.

Figure 18: Baskets made of plastic straps.

# 8. OTHER OPTIONS FOR PACKAGING REUSE, REPURPOSING, AND RECYCLING

- **Innovative portable solar cooker using the packaging waste of humanitarian supplies.** A study by the University of Bologna in 2016. https://www.researchgate.net/publication/291014174_Innovative_portable_solar_cooker_using_the_packaging_waste_of_humanitarian_supplies
- **Making Waste Work: A Toolkit.** WasteAid UK produced a toolkit designed for community and civil society leaders, non-governmental organizations, and waste and resource managers who want to understand how to set up small-scale community recycling and waste management schemes in lower- and middle-income countries. https://wasteaid.org/wp-content/uploads/2022/06/CIWM_WAUK_CWM-Toolkit_Exec-Summary_FINAL-151017.pdf
- **Examples of reuse of WFP packaging.** Steel cans used to build shelters in refugee camps in Ethiopia; cardboard from boxes turned into a toy plane in South Sudan, and cooking oil jerrycans used to wash hands before school meals in Benin. https://www.wfp.org/stories/rethinking-packaging-reducing-waste
- **Develop and pilot packaging end-of-life management technology.** In 2022, the USAID Bureau for Humanitarian Assistance (BHA), Catholic Relief Services, and MIT's Lincoln Laboratories codesigned a pilot program to incorporate recycling equipment and collection schemes into operations in south Madagascar. With the aim of managing discarded packaging materials from both CRS programming and the surrounding community, a baler unit will be deployed to Beloha in 2023. This technology was selected to support the densification, storage, and transportation of recyclable materials as collected packaging is aggregated, sorted, and preprocessed. USAID's Bureau for Humanitarian Assistance (BHA) is still assessing use cases in other geographies and invites all partners to observe and connect with this pilot as observations and learnings will be shared throughout the process.

**JOINT INITIATIVE**
FOR SUSTAINABLE HUMANITARIAN ASSISTANCE PACKAGING WASTE MANAGEMENT

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