# Applying Life Cycle Assessments in the Humanitarian Sector

## *WREC Global Info Session*

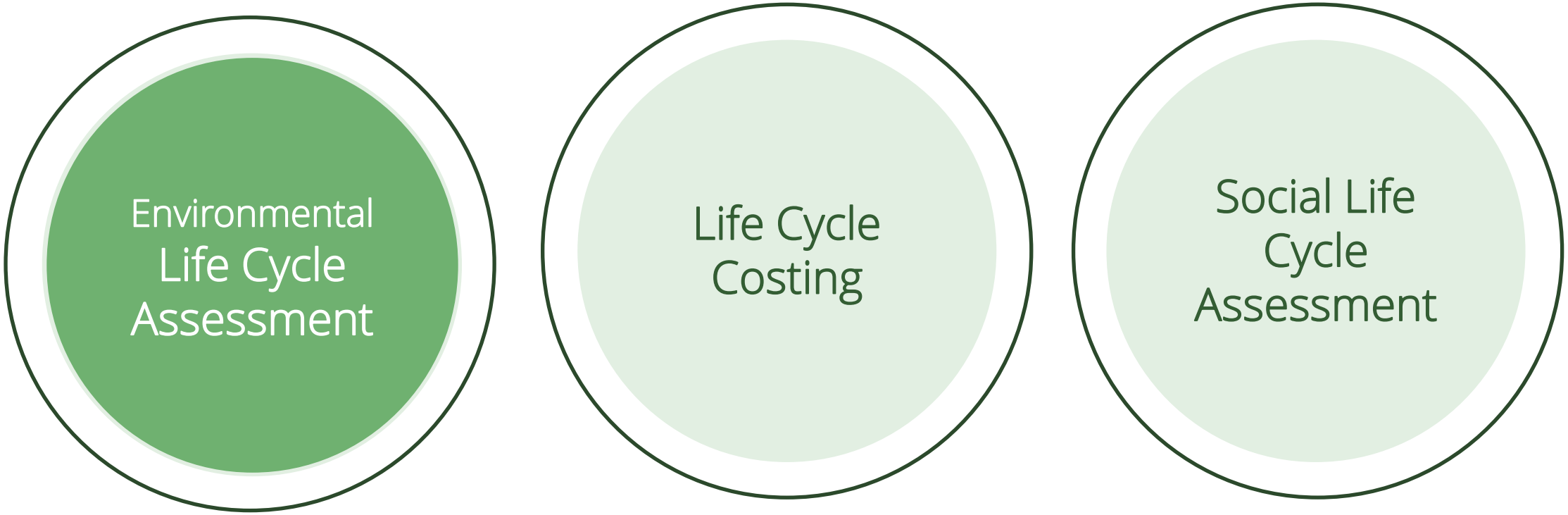
*September 11, 2025*

LOGISTICS CLUSTER · DRC DANISH REFUGEE COUNCIL · IFRC · Save the Children · WFP

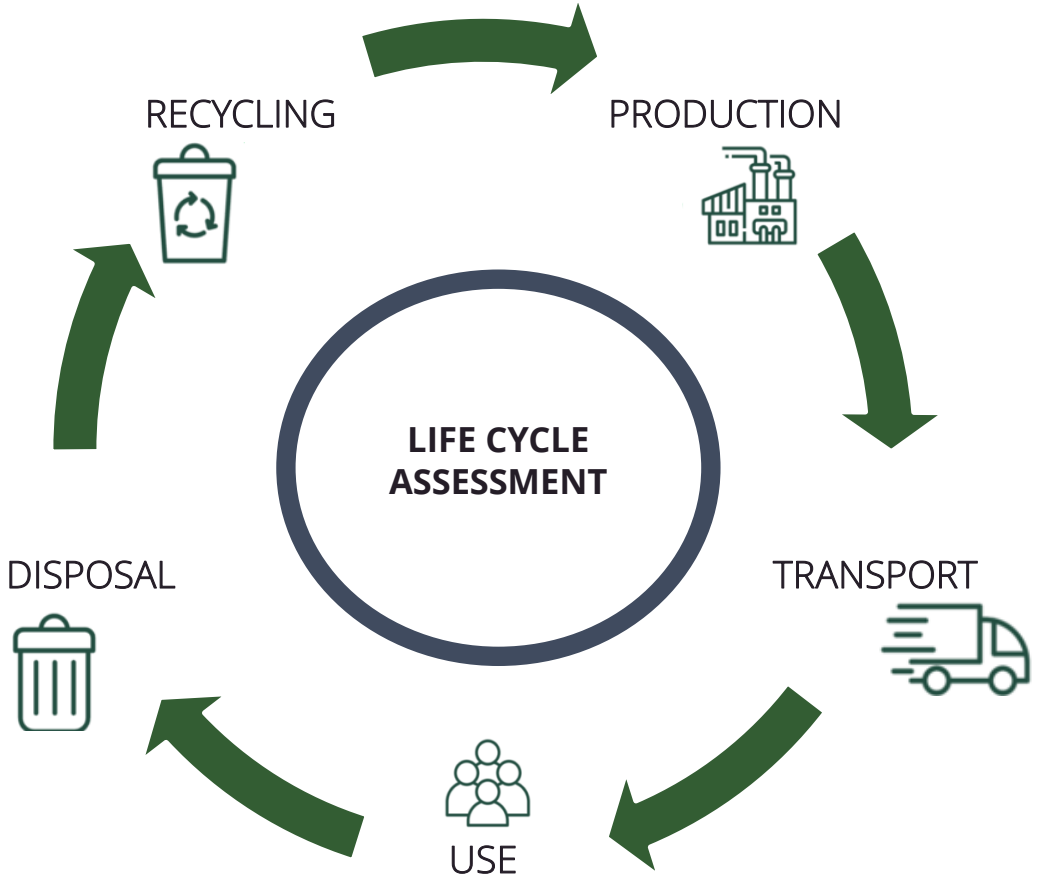
# Agenda

- Fundamentals of LCA
  - What is LCA? And why is valuable for Humanitarian organization?
  - Which are the phases of LCA?
  - Which are the challenges of LCAs for humanitarian worker?
- Applying LCA in the Humanitarian Context
- Getting started with LCAs and building on existing work
- Qualitative findings on LCA Assessment
- Q&A

# Life Cycle Assessments



# Fundamentals of LCA




Life cycle assessment, or LCA, is a methodology for assessing the environmental impacts associated with the entire life cycle of a particular product or process.

# Why LCA Is Valuable for Humanitarian Organizations

**Informed Decision-Making**

1. Choose lower-impact products or services.
2. Design product or services with reduced environmental footprints.

**Identifying Improvement Opportunities**

1. Target high-impact areas (e.g., raw materials extraction, sourcing, disposal).
2. Improve sustainability without compromising effectiveness.

**Regulatory & Donor Compliance**

1. Align with environmental standards and donor expectations.
2. Demonstrate accountability and transparency.

# The Four Phases of LCA

## Goal & Scope Definition

- Define purpose (e.g., comparing packaging options for relief kits).
- Set boundaries (e.g., cradle-to-grave or cradle-to-gate).

## Inventory Analysis

- Collect data on materials, energy, emissions, and waste.

## Impact Assessment

- Evaluate impacts: climate change, water use, human health.
- Use models to quantify and compare.

## Interpretation

Analyze results and make recommendations. Communicate findings to donors, partners, and field teams.

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## IMPACT CATEGORIES

CARBON EMISSIONS

CO2

ACIDIFICATION

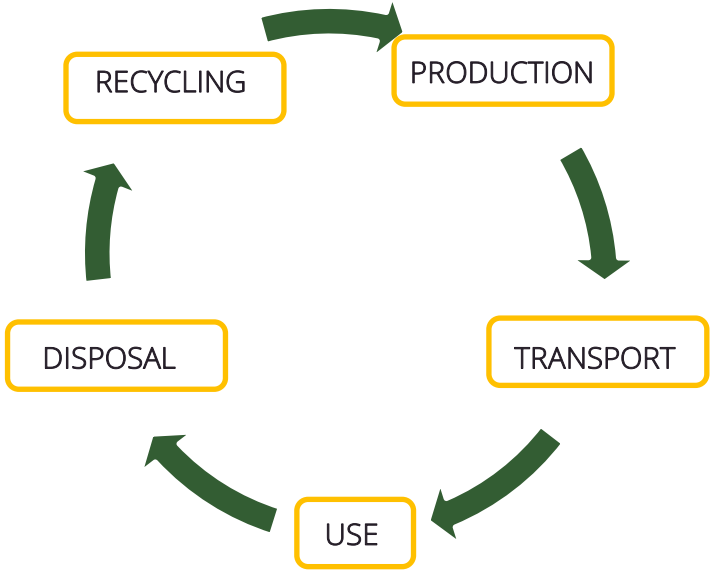
RESOURCE CONSUMPTION

WATER USE

LAND USE

HUMAN TOXICITY

## SYSTEM BOUNDARIES



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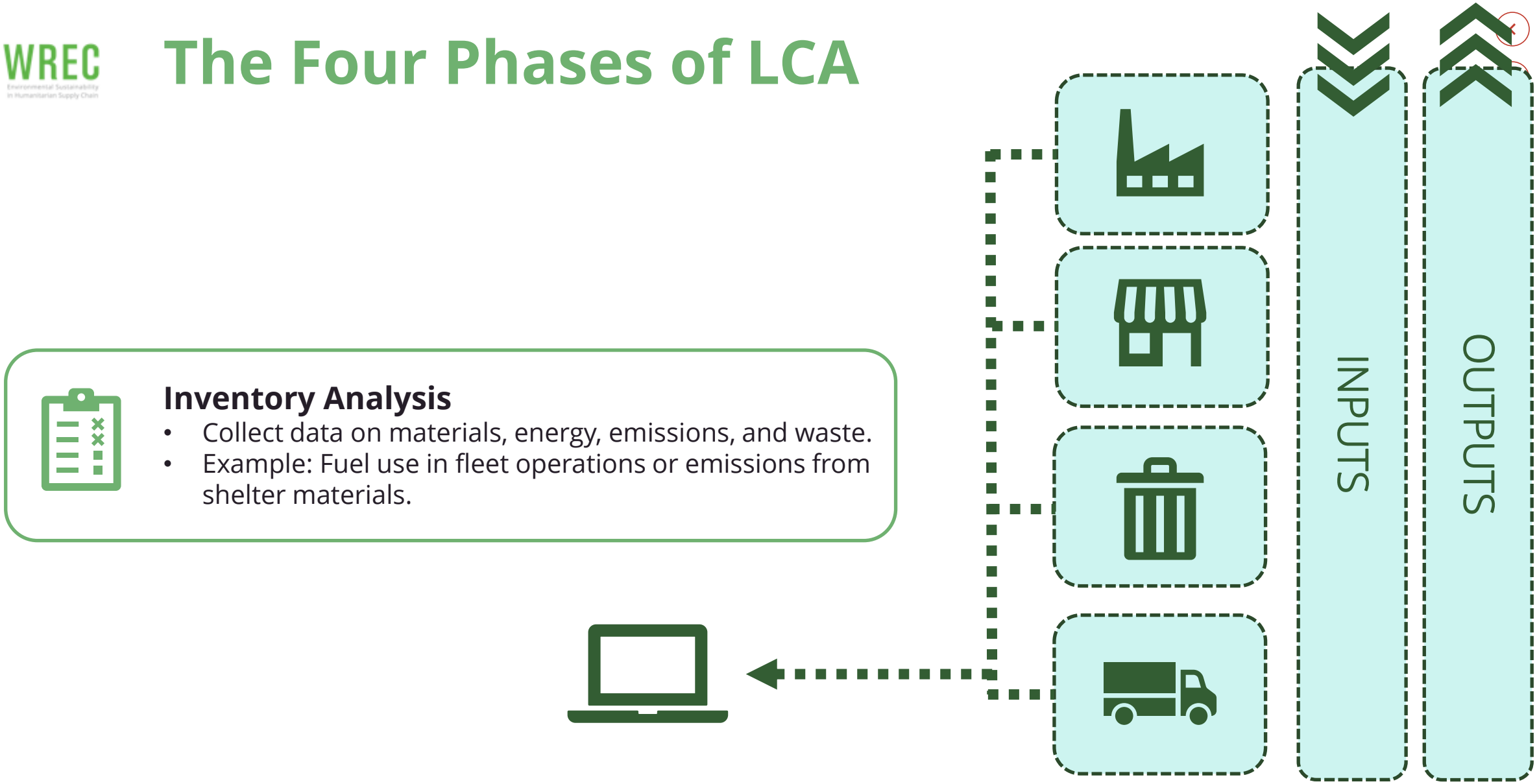


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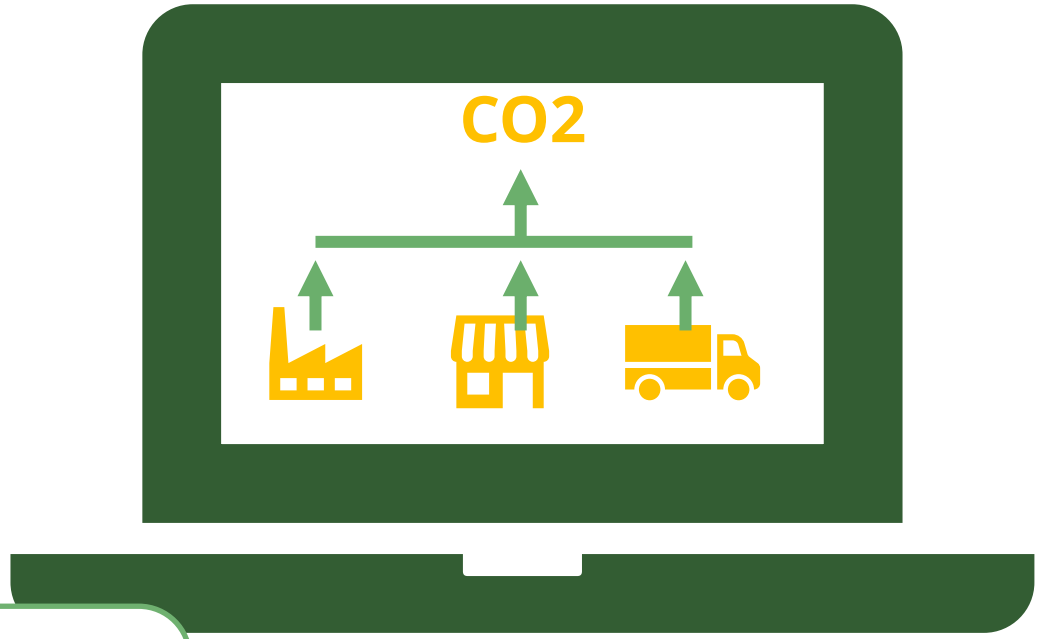


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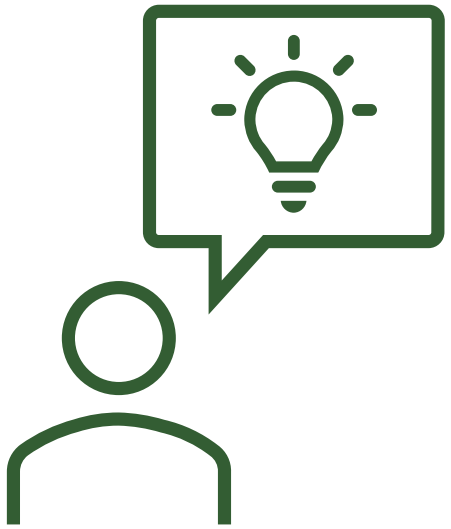


**Interpretation**

Analyze results and make recommendations. Communicate findings to donors, partners, and field teams.

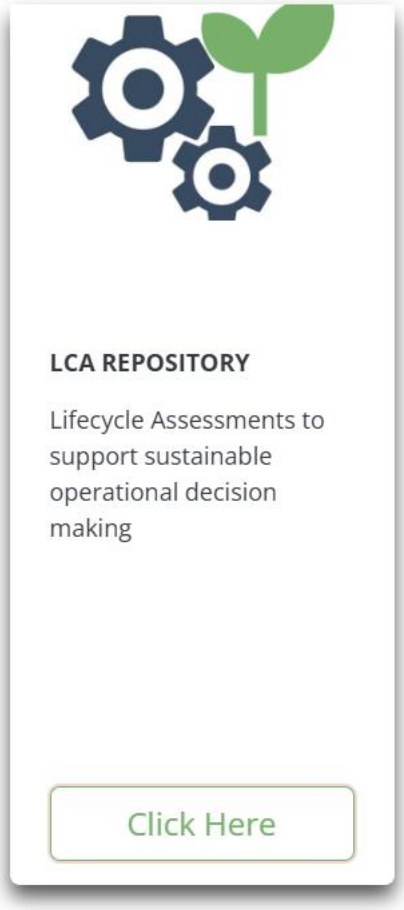
# Challenges & Considerations

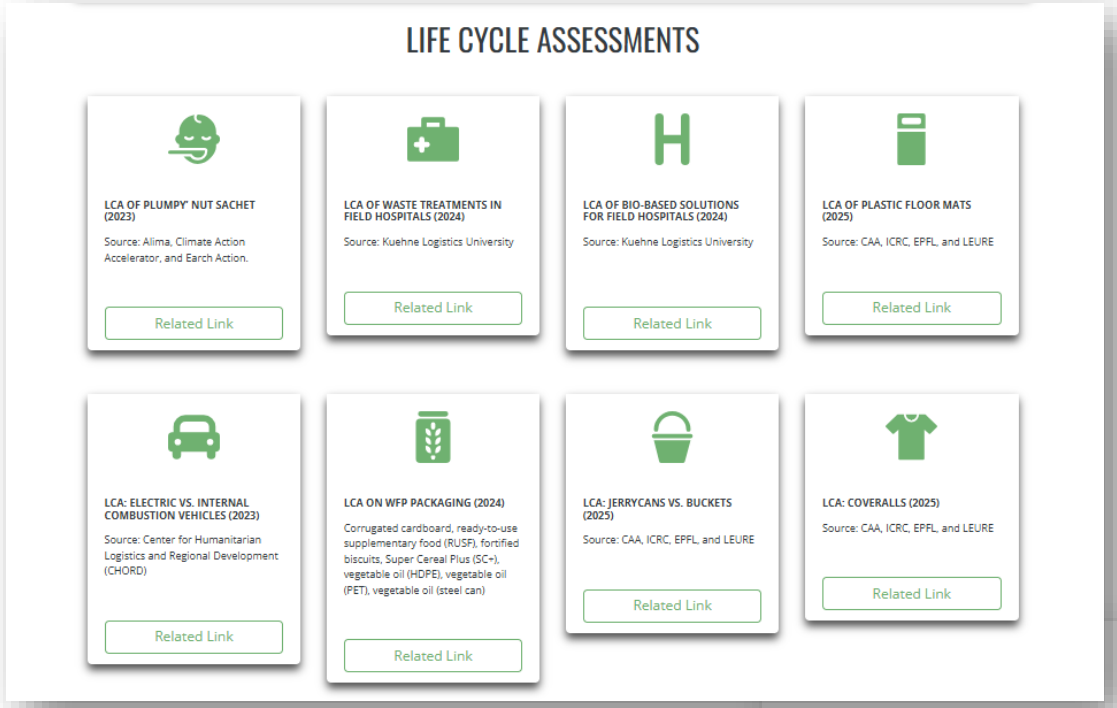
**Data Availability**: Field data may be limited or inconsistent.

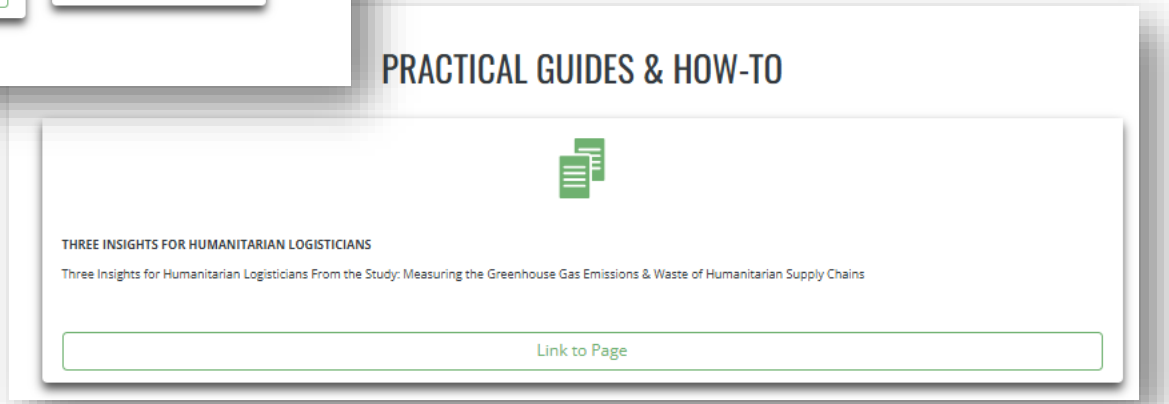
**Complexity and Capacity**: Requires experts training and tools to implement effectively.

**Cost**: It might be expensive

# LCA Resource Hub




LINK:
Life Cycle Assessment (LCA) Resource Hub

# Applying LCA in the Humanitarian Context

ICRC

MEDECINS SANS FRONTIERES

WFP World Food Programme

UNHCR The UN Refugee Agency

Svenska Röda Korset

LOGISTICS CLUSTER

DRC DANISH REFUGEE COUNCIL

IFRC

Save the Children

WFP

# ICRC

*Carmen Garcia Duro*

Public data.

# NON FOOD ITEMS - NFI

mattresses, blanket, solar lamp, hygienic parcel and hygienic pad, jerry can, plastic bucket, surgical mask, plastic floor mat, coverall, RTUF, Mosquito net, soap bar

## How this has support ICRC

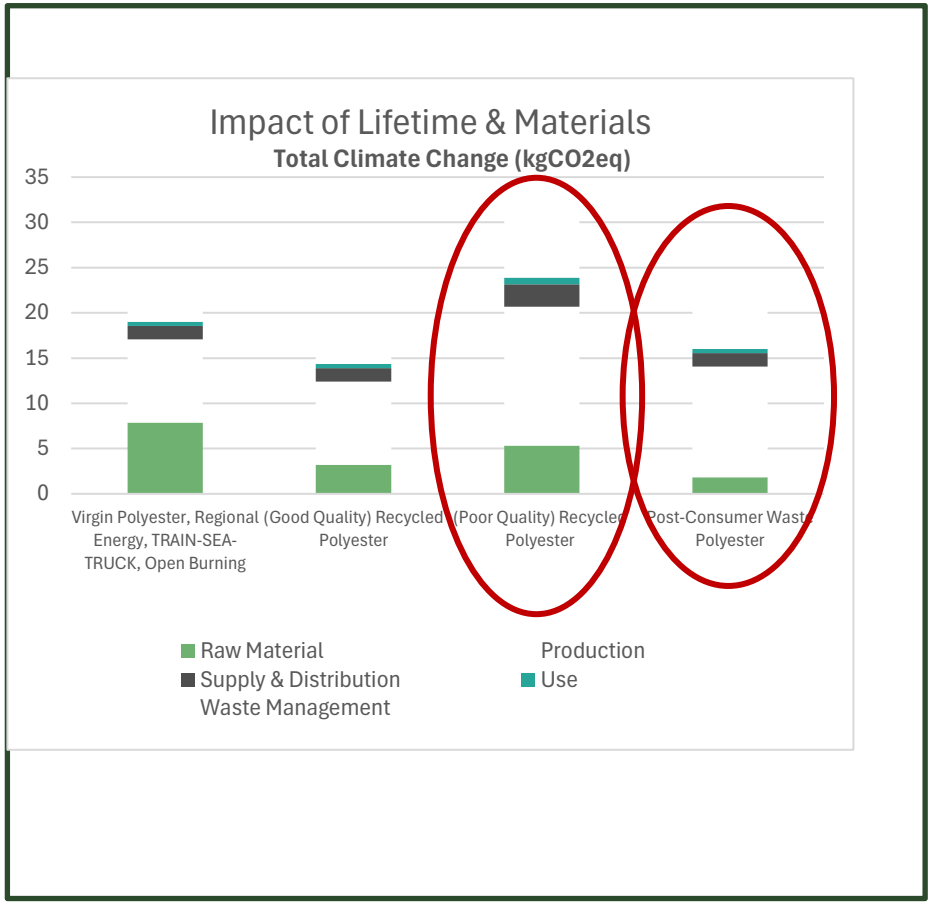
- **Validate** current actions made to have more sustainable EHIs
- **Measure** the impact of implemented solutions.
- **Explore new solutions and feasibility,** no so many in the end

## Measuring sustainability improvements

1. $CO_2$ Reduction Achievements
   - **Hygienic Kit:** 30% $CO_2$ reduction of the product.
   - **Solar Lamp:** 50% $CO_2$ reduction.

2. Impact of Using Recycled Plastic
   - **Blankets:** 30% $CO_2$ reduction, with a 12% increase on cost.
   - **Mattresses:** 40% $CO_2$ reduction (seems not feasibility but under review).

3. Renewable energy (next slide)

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# Integrating renewable energy in the ST

Non Food Items frame agreements:

- Specific methdology in the tender (document base)
- QSE audit  (evidence base)

100% renewable energy =
32% reduction C02 of the product

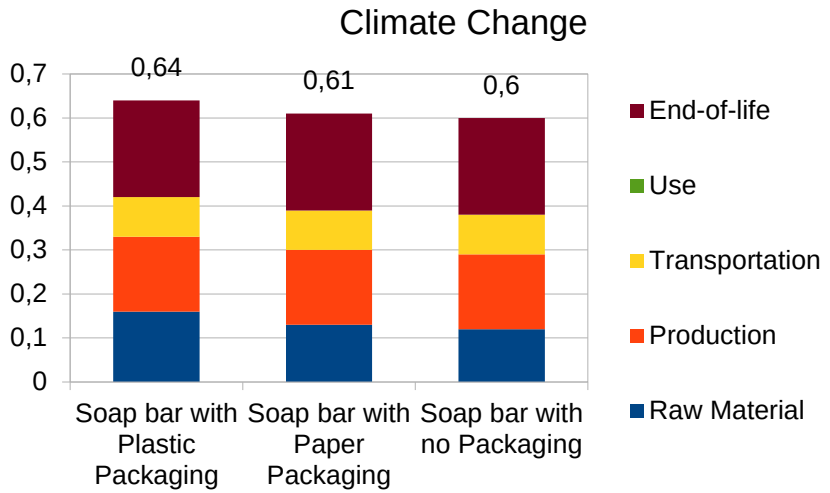
| Blanket Suppliers | Renewable energy 100% (ST criteria minimum 30%) | GHG reduction  with real % renewable energy |
|---|---|---|
| Supplier 1 | 56% | 17,92% |
| Supplier 2 | 32% | 10,24% |
| Supplier 3 | 42% | 13,44% |
| | Average | 13,86% |

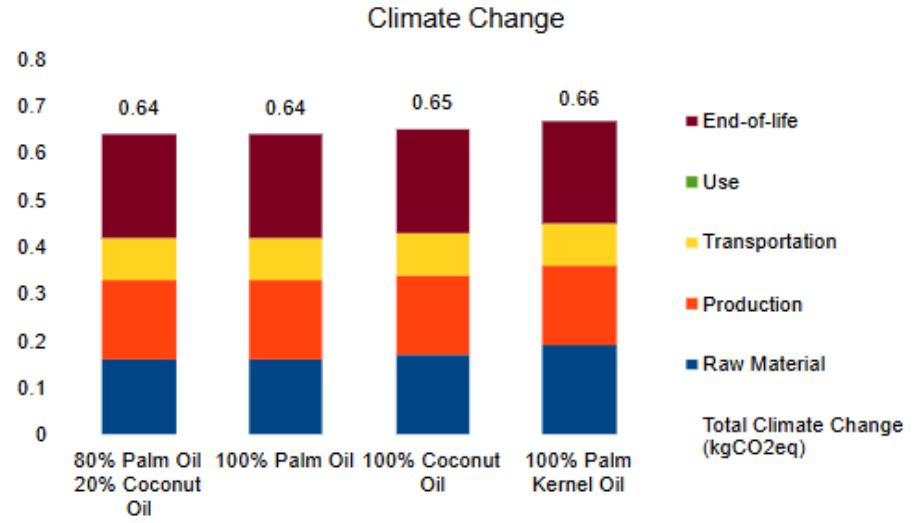
Kitchen set ST validated with renewable energy

# NON FOOD ITEMS - NFI

How was the LCA conducted?

Public data.

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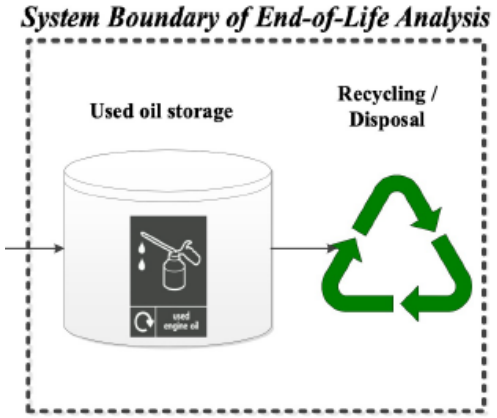
Public data.

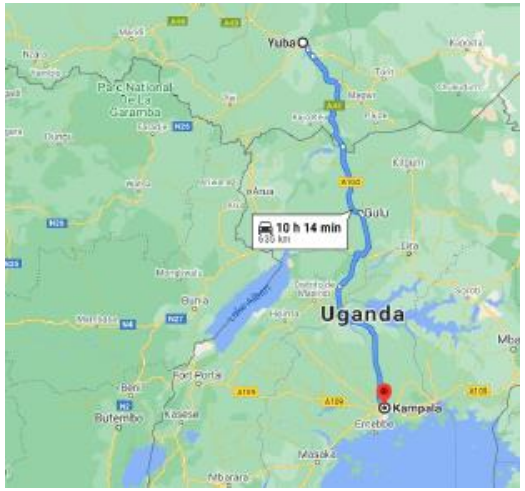
# USED OIL WASTE

1. Export it and properly manage there
2. Given to local population as termite treatment

**Learning**: used oil used as termite treatment is very bad for humans, soil, etc

**Decision:** To stop giving the used oil to local population.




**1 pilot:** 10.000 liters of used oil were sent to Uganda. A lot of lessons learnt, pilot not repeted again

# USED OIL WASTE

How was the LCA conducted (e.g., using public data, in collaboration with academia, or via consultancy)?

Public data + data from suppliers.

# General learning from LCAs.

- Durability is crucial
  - Recycled material, only if durability remains
- Renewable energy huge impact if the supplier of Non Food Items is a manufacture, small impact if suppliers are traders
- Sustainable design is key to reduce C02 and waste
- Transport low impact if it is done by road or sea (30% of the total C02 if it is transported by air)
- Packaging has small emissions contribution, higher risk local pollution.

Talk to your supplier, don't wait to have a LCA

Now:
Life Cycle Analysis of rice (IR6)

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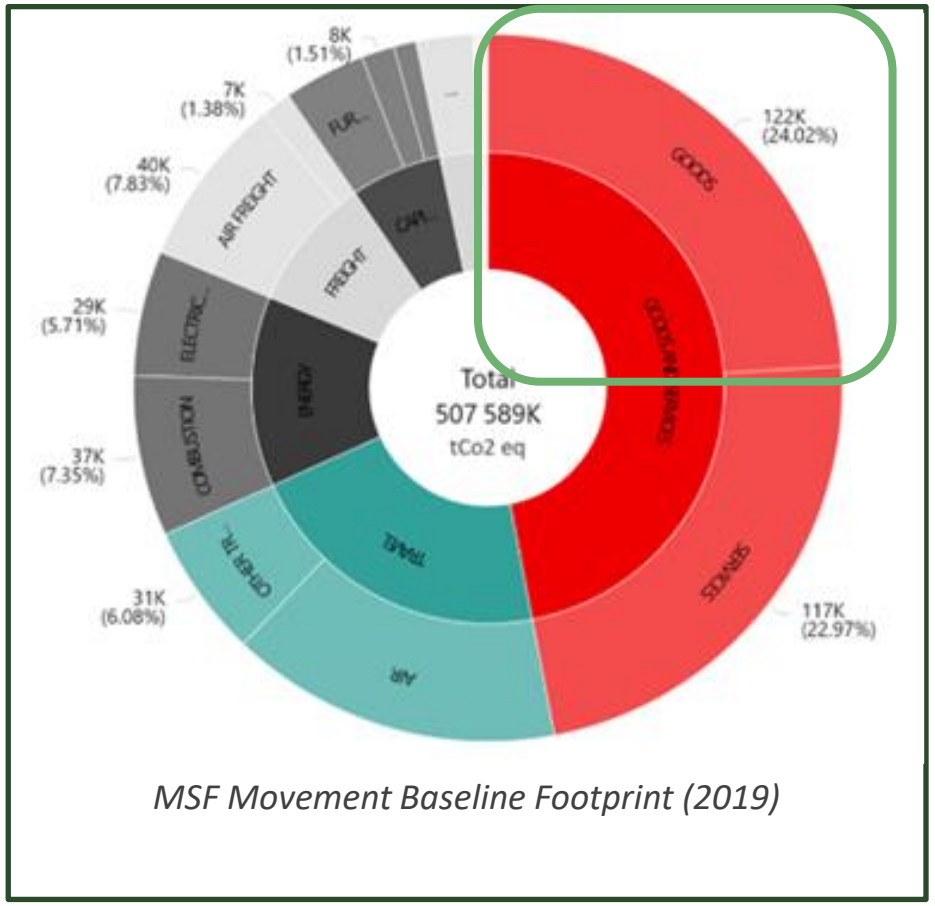
# Medecins Sans Frontiers

*David Renard*

# Single Use Medical Items (incl. Examination Gloves)

"Rethinking Single Use Medical items"

- **Decarbonization Roadmap** Objectives (2030)
- SUMD-Specific Project with a **LCA Approach**
- Analyze items based on their **Raw Material Content**
- **Hotspotting** Exercise
- Identification of item-specific **Mitigation Measures**




*MSF Movement Baseline Footprint (2019)*

# Single Use Medical Items (incl. Examination Gloves)

How was the LCA (approach) conducted ?

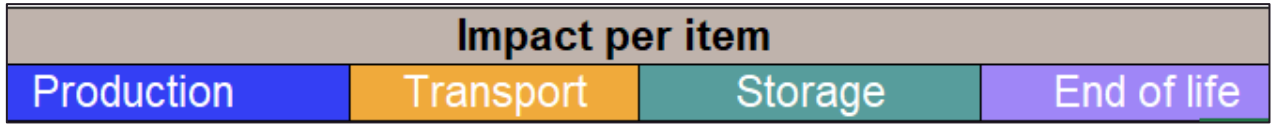
## 1. Data Collection

- Weight
- Suppliers Tech. Sheets
- Samples
- Literature
- Existing Databases

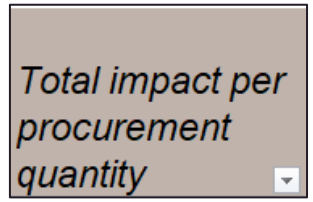
## 2. Impact Analysis

- Climate Change
- Human Health
- Plastic Pollution

| **Total product weight** | **Weight of plastic** | Aluminium | Bromobutyl elastomer | Cardboard | Cellulose fiber | Cotton | Lithium Battery |
|---|---|---|---|---|---|---|---|
| Metal | Nitrile | Natural latex | Paper | Wood | *Share of high impact plastic (PVC)* | *Share of medium impact plastic (polyurethane, polyester, nylon)* | *Share of low impact plastic (PET, polystyrene, polyethylene, polypropylene)* |




=> 3. Ranking



Raw Material

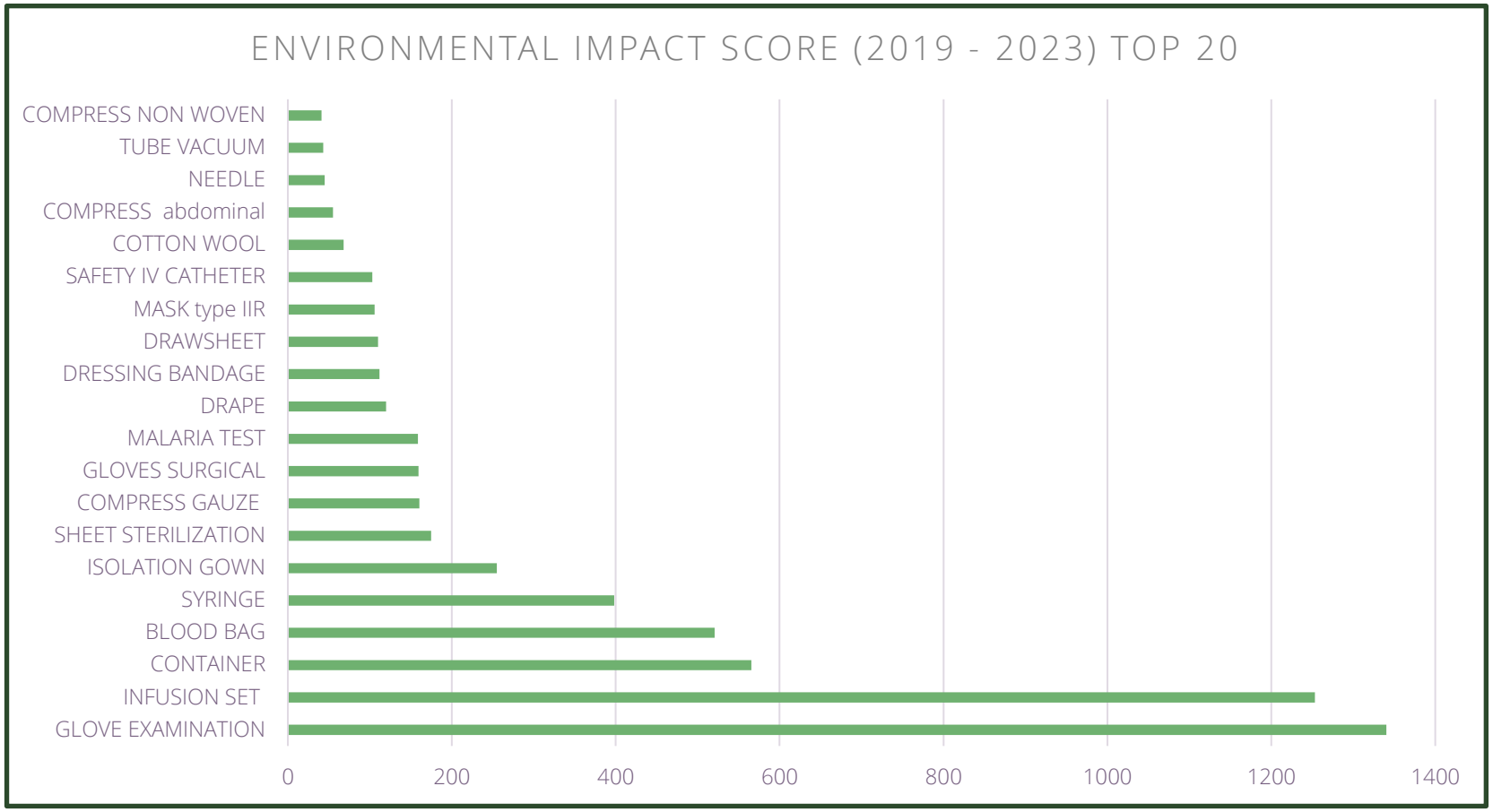
Disproportionate Impact of PVC

2 Main Categories of Items

Personal Protective Equipment

Injection Devices

1st - Examination Gloves
(= ~20% Weight of all SUMD sent)



Mitigation Measures

1) Practices

Rational use through behavior change campaign with Medical Staff

Pilot in Lebanon

Results : - 40% consumption per patient consultation

2) Products

## Non-Sterile Examination Gloves : Latex vs Nitrile

Based on MSF Log and MSF Supply Data, we see that, on average of the 3 different main sizes (S, M, L), **nitriles gloves are 36% lighter** [32%-48%] and **45% less voluminous** [35%-60%] than same sizes latex gloves.

**By OC's, potential savings** compared to 2019 – 2023 consumption data :

- **OCB** (83% Latex) : **30 % less weight** and **37 % less volume**
- **OCG** (88% Latex) : **31 % less weight** and **40 % less volume**
- **OCP** (95% Latex) : **34 % less weight** and **42 % less volume**
- **OCA** (3% Latex) : **1 % less weight** and **1 % less volume**
- **OCBA** (0% Latex) : **no potential savings**

of non sterile examination gloves **transported, stored, and disposed of**.

**Overall : A shift from latex to nitrile gloves seems to have the potential to partially mitigate the environmental impact of non-sterile examination gloves.**

# World Food Programme

*Aldo Spaini & Jose Hincapie*

Global Logistics Cluster

# Food commodities

What we are doing:

1) LCA for Food commodities – Rice, Beans, Maize meal (all ongoing with the support from the academia and partners)
2) Framework for humanitarian food commodity LCA (FC-LCA) with UNEP

How we plan to use LCA outputs:

LCAs will support decision-making within micro-level contexts by identifying opportunities such as:

- Engaging farmers and suppliers (e.g., promoting sustainable practices and product development)
- Sustainable Procurement based on scientific data
- Enhancing operations across the supply chain
- Certification framework for Rice with ICRC/IFC/SRP
- Raising donor awareness and engagement
- Increasing awareness and knowledge of field officers and the broader humanitarian community

...with some important caveats:

- LCA does not replace actual implementation, that can happen concurrently; extensive data is already available, and action can be taken for “low hanging fruit”
- Sustainable Procurement should be pursued in alignment with Localization priorities and cost-effectiveness

# Food commodities

How the FC-LCA Framework is being conducted

| | |
|---|---|
| Main objective | Support operational decision-making in sustainability performance (micro-level decision context) |
| Target audience | Internal and external humanitarian practitioners who seek to expand their knowledge of environmental and social impacts of food commodities |
| Modelling approach | Attributional (analysis of impacts of specific commodities) |
| System boundaries | Cradle to grave, with special focus on agricultural stages |
| Environmental impact categories | GHG emissions, biodiversity, eutrophication, acidification, land use, and water use (to further explore: ecotoxicity and soil health) |
| Social impact categories | Child labor, health & safety, conditions for smallholder farmers, living conditions, local employment, sexual harassment & abuse |
| Functional Unit | Provision of 100 kcal (FUs are to be explored for a food basket) |
| Data sources | Internal platforms and public databases were consulted (i.e., Ecoinvent, Agrifootprint), calculations made with SimaPro and ReCiPe |
| Study case | Maize meal in the Central African Republic (produced by smallholder farmers and consumed **locally**) |

How the FC-LCA Framework is being conducted

Future discussions we would like to engage with LCAs

- Understanding of the environmental and efficiency performance of agroecological practices (i.e., regenerative, indigenous)
- Identifying potential regionally-adequate commodities in terms of physical adaptability, environmental impact, nutritional value, and cultural acceptability
- Increasing our knowledge of other environmental impacts of food production, i.e., soil health, land use, water use and their effects on local communities
- Development of eco-smart packaging solutions
- Understanding the long-term progression of environmental and social impacts associated with food supply chains
- Exploring functional units that facilitate LCA comparability across commodities and food baskets (e.g., provision of 100 kcal)

# UNHCR

*Tatyana Ageyeva*

# Relief Matresses

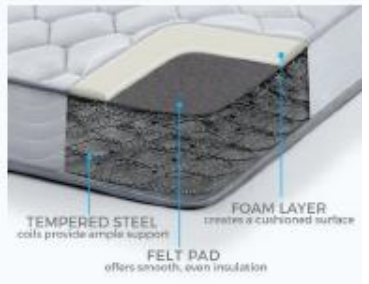
TABLE 1. POTENTIAL OPTIONS FOR SUSTAINABLE MATERIALS THAT CAN REDUCE THE CARBON FOOTPRINT OF PU MATTRESSES

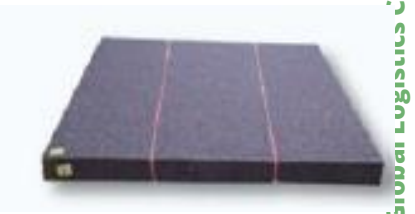
| Options | Mattresses' material | Material that can reduce carbon footprint | Max. theoretical content (%) |
|---|---|---|---|
| **Reference baseline*** | PU made of 100% virgin fossil-based polyol | - | - |
| **Option 1** | PU made with the inclusion of chemically recycled polyol | Chemically recycled polyol | Up to 80% in polyol composition<br>Which is up 48%** in the overall material composition |
| **Option 2** | PU made with the inclusion of bio-based polyol | Bio-based polyol | Up to 100% in polyol composition<br>Which is ~60% in the overall material composition |
| **Option 3** | PU made with the inclusion of $CO_2$-based polyol | polyethercarbonate polyols from carbon dioxide | Up to 100% in polyol composition<br>Which is ~60% in the overall material composition |
| **Option 4** | Metal springs and fibers | Metal springs and fibers (preferably recycled) | No maximum material composition specified because this applies to PU material. Springs and textiles have different compositions, so this approach has not been considered. |
| **Option 5** | Textile (fibers) | Waste textile (fibers) | |

# Relief Matresses

TABLE 4. SIZES AND WEIGHTS OF THE ANALYSED MATTRESSES

| Characteristic | Option 0 | Option 1 | Option 2 | Option 3 | Option 1 | Option 5 |
|---|---|---|---|---|---|---|
| Material | PU, 100% virgin fossil-based polyol | PU with the inclusion of chemically recycled polyol | PU with the inclusion of bio-based polyol | PU with the inclusion of $CO_2$-based polyol | Metal spring mattress | Recycled textile mattress |
| Sizes | 1.9 x 0.8 x 0.1 m | | | | 2.0 x 1.0 x 0.2 m | 1.9 x 0.95 x 0.1 m |
| Weight of 1 mattress, kg | 3.5 kg | | | | 21.3 kg | 6.2 kg |



# Relief Matresses

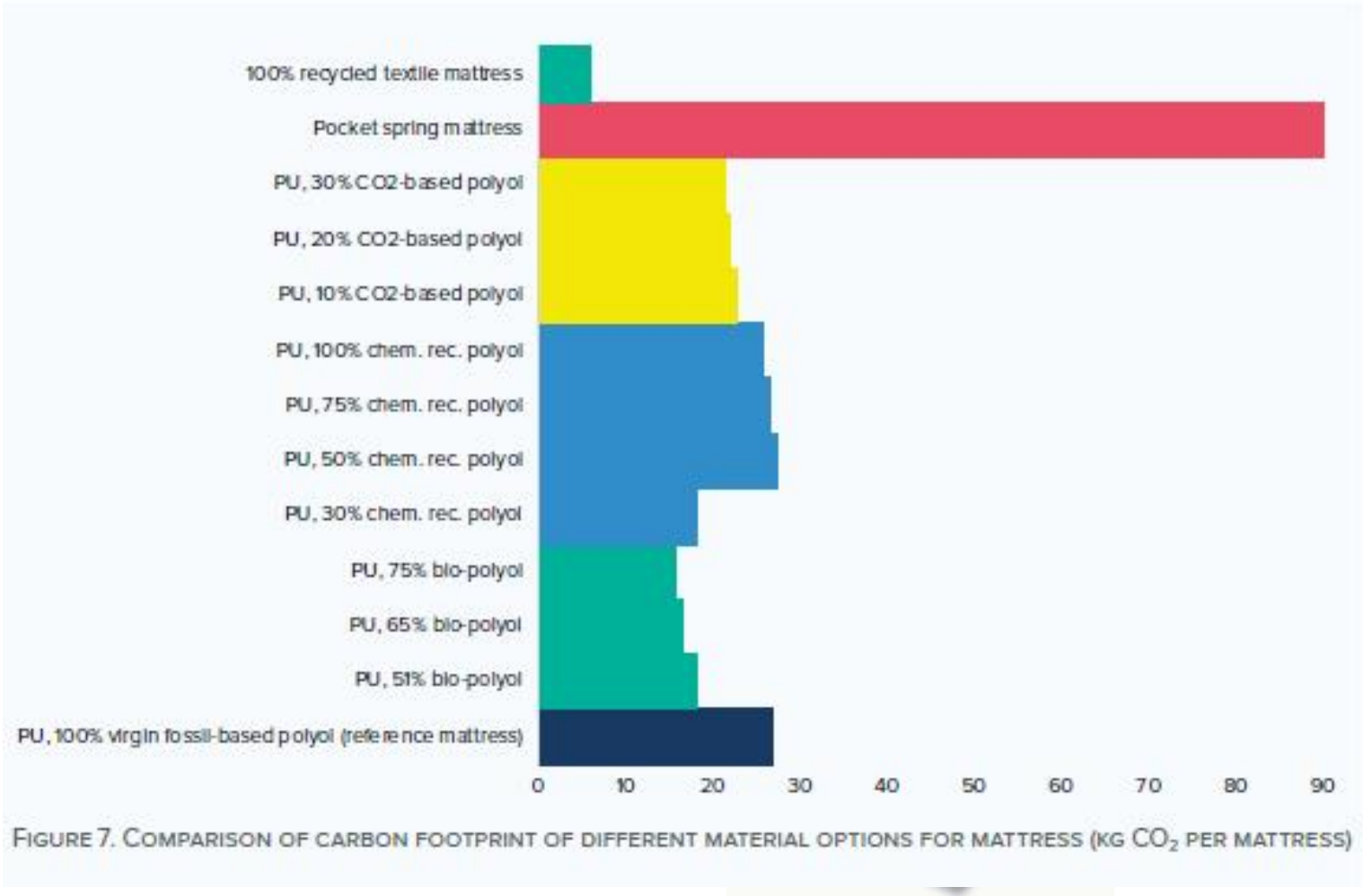
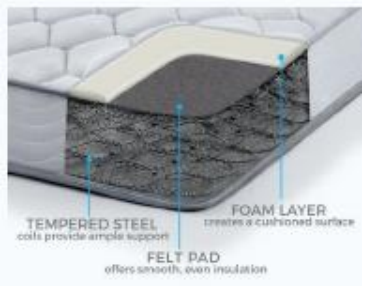
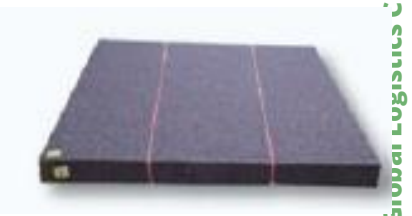



FIGURE 7. COMPARISON OF CARBON FOOTPRINT OF DIFFERENT MATERIAL OPTIONS FOR MATTRESS (KG $CO_2$ PER MATTRESS)



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# Swedish Red Cross

*Sarah Hayman*

# Water Supply Module

- In 2017 Swedish Red Cross led a joint Emergency Response Unit supporting Ugandan Red Cross to collect, treat, store then distribute drinking water following refugee population influx from South Sudan.

- In 2019-20 sponsored a Master's student from KTH to research and evaluate life cycle perspectives and environmental management of the operation. Ecoinvent v.3.3.

Promotes consideration for alternative response strategies to minimize negative environmental impact

Limiting water trucking via ie.
- Water supply rehabilitation
- Household water treatment
- Pump or Gravity fed systems
- Rainwater harvesting or technical water

Encourages Relevance and further use of Environmental assessments and data

Proven tools for identifying specific measurable ways to improve services

Data demand, benchmarking

Variance in operations

Highlights Gaps around Waste Management

Opportunities for increased technical, operational, logistical, monitoring and financial attention to humanitarian WM and environmental footprints

Supported increased awareness and communication through data & examples easy to share in Guidance & Training of staff, delegates and volunteers

Svenska Röda Korset

# How has it been useful to Swedish Red Cross and partners?

Contact sarah.hayman@redcross.se and Kanika.Thakar@redcross.se with any questions

# Getting started with LCAs and building on existing work

Climate Action Accelerator

# **Applying Life Cycle Assessments in the Humanitarian Sector –** Getting started with LCAs and building on existing work

**Sonja Schmid** – Head, Solutions Team

*September 11, 2025*

# Where to start?

**Understand basics of LCA**

- Cradle to gate vs cradle to crave
- Indicators

**Check for existing LCAs**

- WREC LCA repository
- LCAs performed by ICRC/Accelerator/EPFL

**Identify key impact categories and levers**

- LCA results of the product / product category / similar products
- Summary of LCA results
- Reports and analyses

# How to use LCA results?

- Focus on high impact products
- Focus on high impact levers (typically materials, energy type in the production, end of life)
- Check feasibility (product alternatives, alternative materials, cost, acceptability)
  - Engage with suppliers
  - Engage with internal teams

# About the LCA project

**Analysed Items**

- High-thermal blankets
- Mattresses
- Soap bars
- Plastic floor mats
- Foldable Jerrycan
- Buckets
- Solar Lamps
- Hygienic pads
- Face masks
- Coveralls
- RUTF
- Hygiene kits
- Mosquito nets

**Outputs**

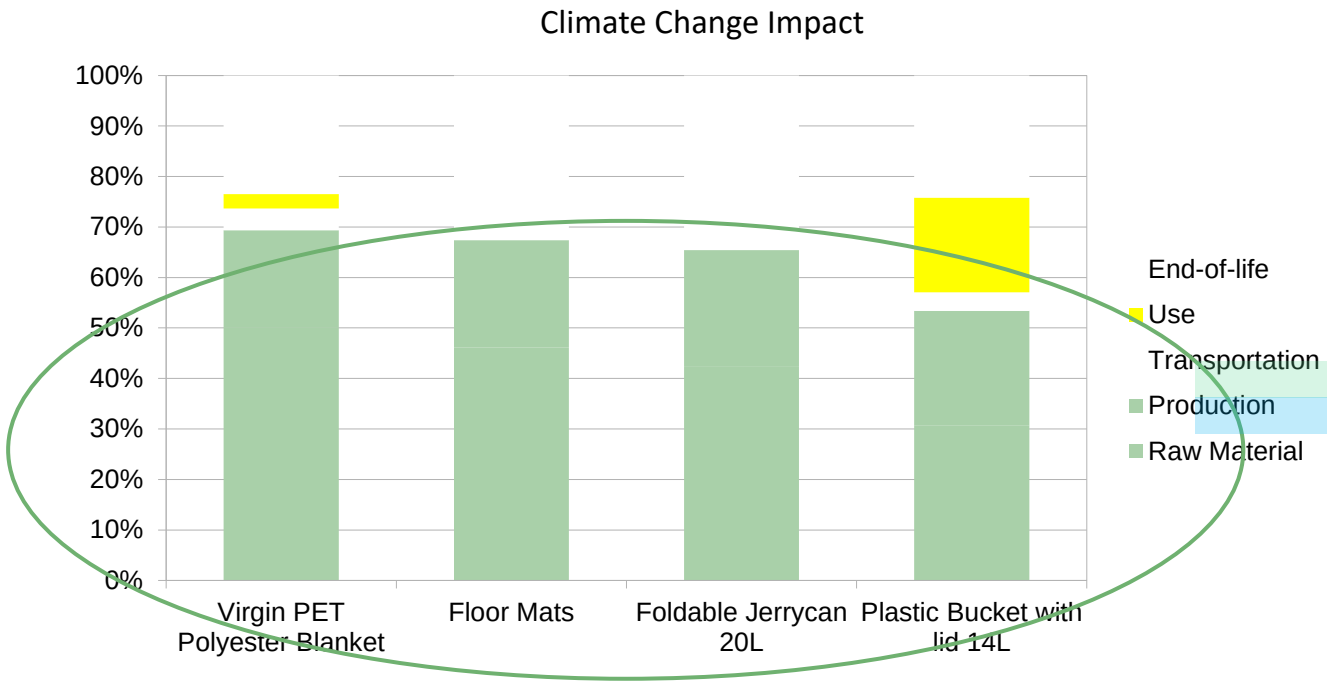
- LCA Repository: https://climateactionaccelerator.org/repository-of-lifecycle-assessments/
- Methodology paper: https://climateactionaccelerator.org/wp-content/uploads/2025/06/EPFL_LCA_methodology_v1.0.pdf

# Key Findings

**In general, raw materials and production stage are the most impactful.**

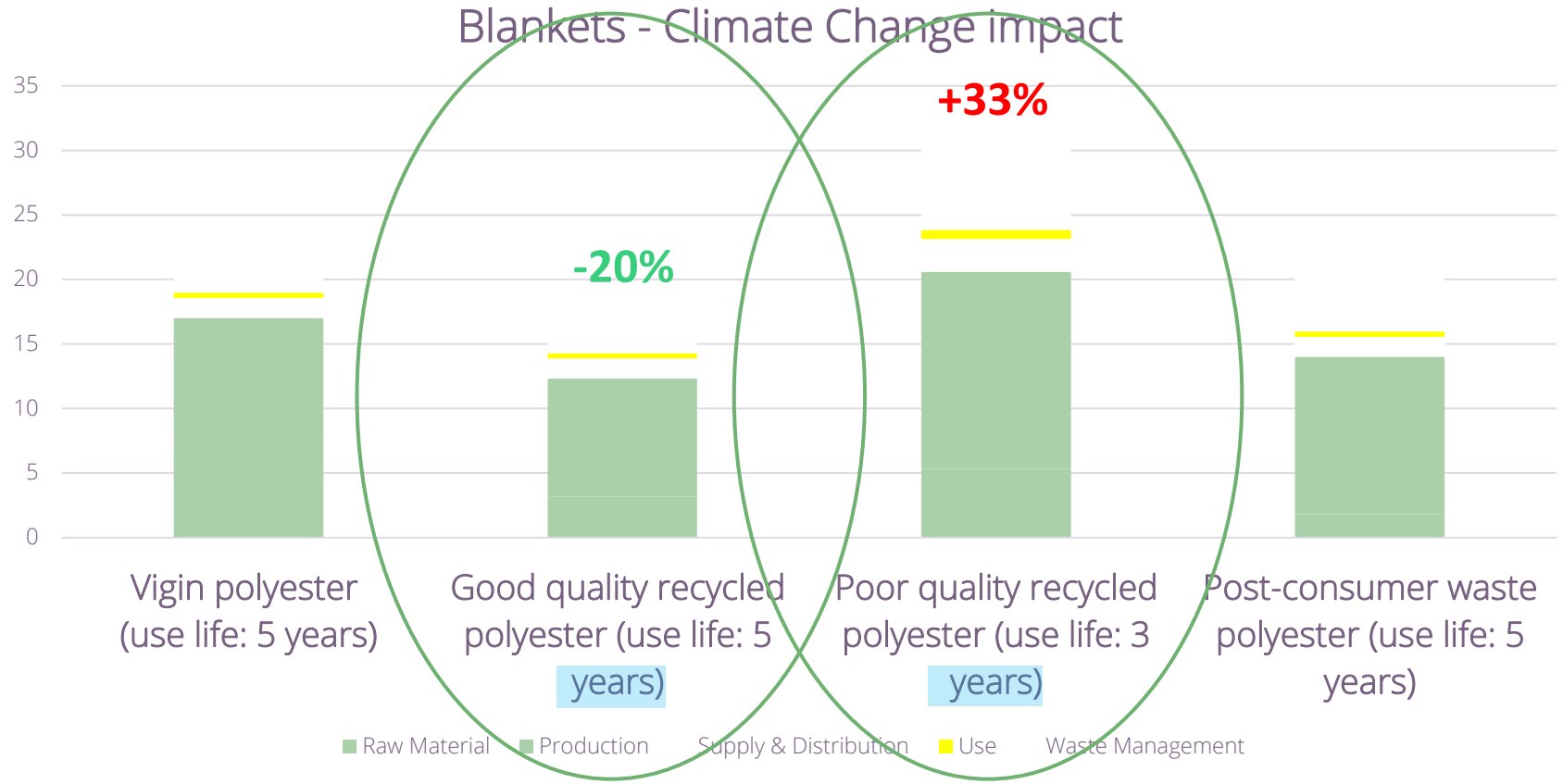
- *30-50% for raw material*
- *20% for production*

**Key lever:** Increasing the lifespan of an item (quality, durability, repairability)



# Key Findings I Material

**Using good quality recycled polyester can reduce the climate change impact by 20%** - if the lifespan of the product is maintained.

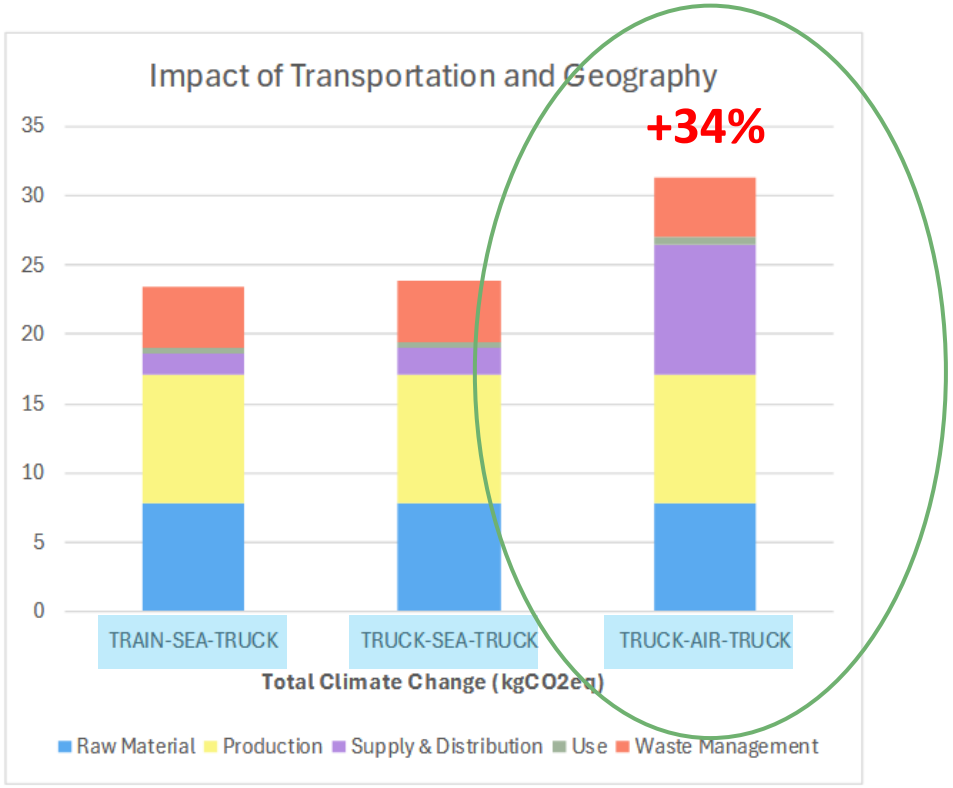



*All displayed variations: Average energy mix in the production country (India), train-sea-train transport, open burning.*

# Key Findings I Transport

**Transportation** is usually a smaller share of the life-cycle impact of any product – as long as the transport is by **sea.**

When using **air freight**, the impact increases drastically and can add up to 30-50% impact to a lightweight product.

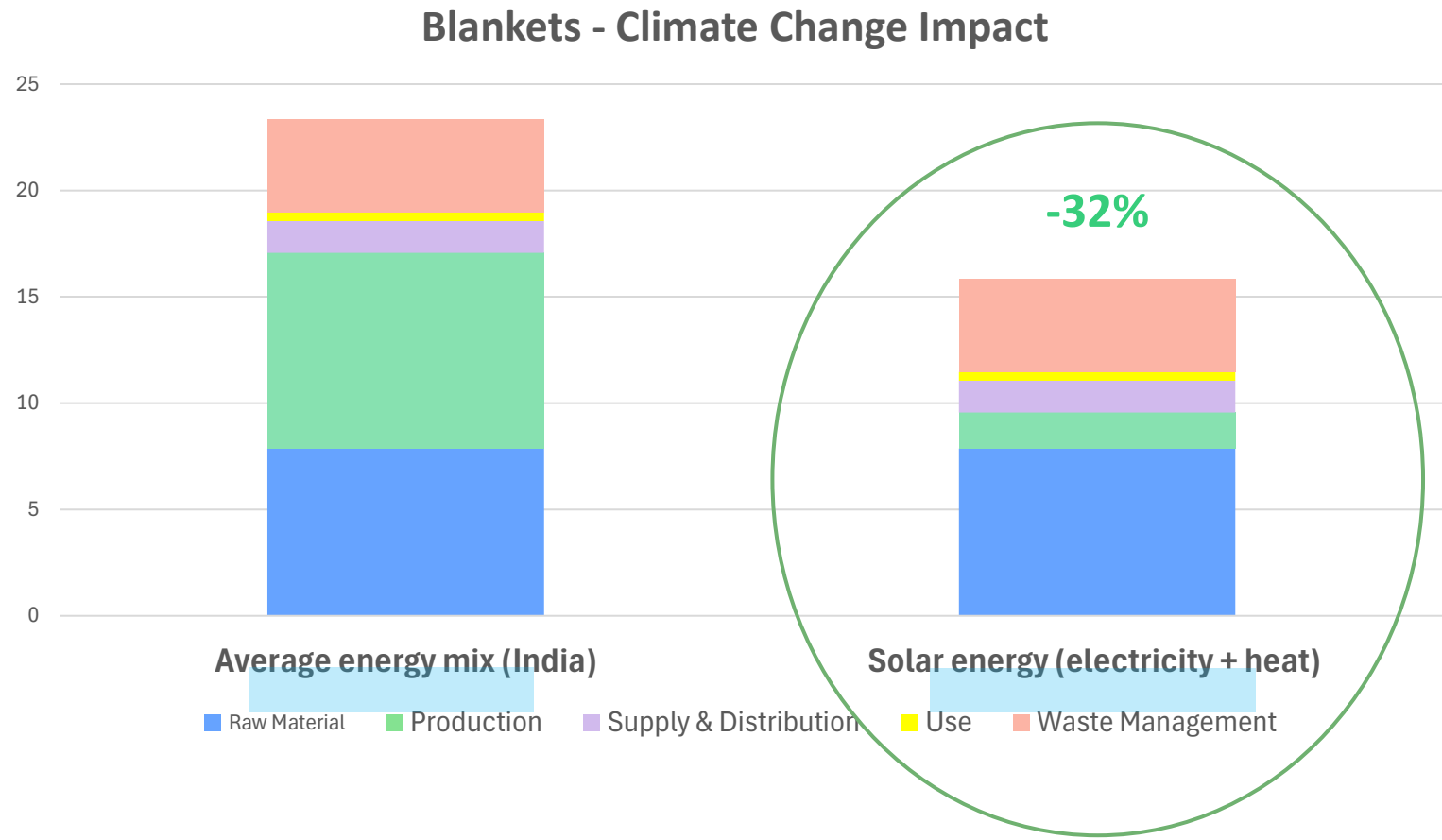



Synthetic high-thermal blanket

# Key Findings I Energy (Production)

Using **low-carbon energy** in the production process reduces the climate change impact in general by 10-20%.

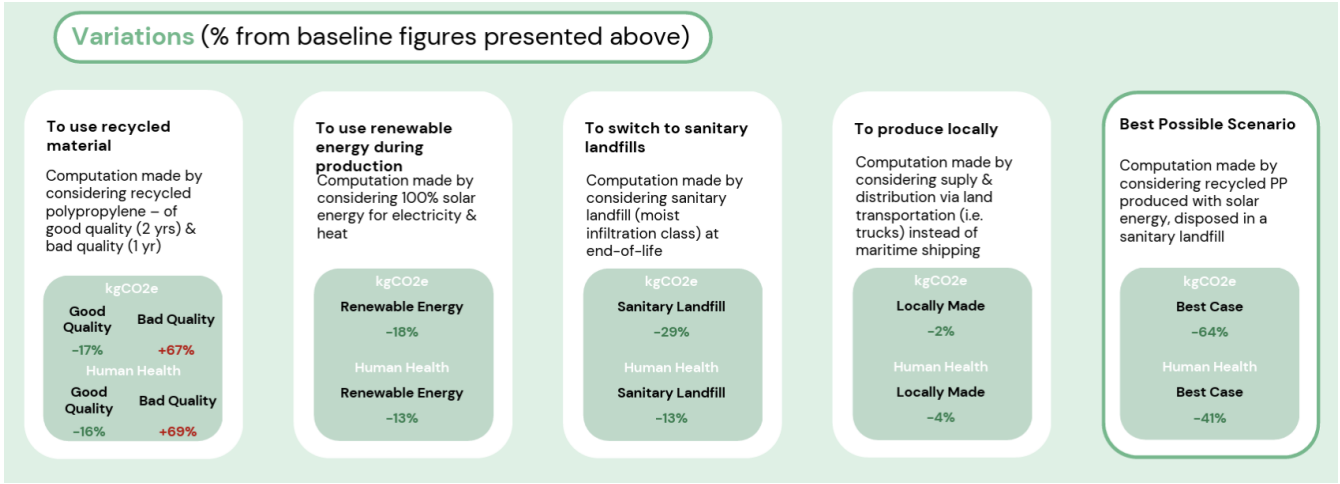
For items with a high share of impact in the production stage, such as blankets, reductions of more than 30% can be achieved across the whole lifecycle.




*All displayed variations: Virgin polyester, Train-sea-train transport, open burning*

# LCA Results – Repository

- Repository of life cycle assessments: https://climateactionaccelerator.org/repository-of-lifecycle-assessments/



**Plastic Floor Mats**

Summary
Output document
Technical appendix

**Jerrycans vs Buckets**

Summary
Output document
Technical appendix

**Coveralls**

Summary
Output document
Technical appendix

**Type I Face Masks**

Summary
Output document
Technical appendix

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LEURE

# Thank you !


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Climate Action Accelerator

# LCA Assessment

# Lifecycle Assessments

## Mapping and Overview of current use by humanitarian organizations

Preliminary Findings

### Objectives

Mapping LCAs - database

LCAs methodologies

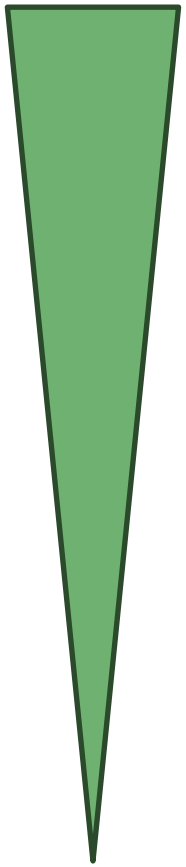
Access to LCAs

LCA Use

### Methodology

Desk review
37 interviews (48 people)
Content analysis (ongoing)

### Main findings on LCA GOALS



- Identifying environmental hotspots (to take impact reduction actions, to define product specifications).
- To measure progress on environmental impacts (accountability)
- To calculate only the carbon footprint of a product (~ 30% of LCAs) and extract emission factors.
- To compare products:
  - Two different products
  - 1 product, several scenarios
  - Global vs international procurement
- Generating evidence, understanding, awareness
- Inform/support strategic decisions

# Lifecycle Assessments

## Mapping and Overview of current use by humanitarian organizations

Preliminary Findings

### Main findings on LCA limitations

- ✓ Complexity (process and results)
- ✓ Context based - difficult to extrapolate
- ✓ Data quality and access
- ✓ Resources consumption (cost and time)
- ✓ Translation to actionable steps
- ✓ End-of-life difficult to assess
- ✓ Confidentiality/Accessibility

### Main findings on LCA use and LCA results

- **No need to conduct an LCA for each humanitarian product**
- LCAs results are useful to confirm and/or understand environmental impacts and trends.
- Production and durability (quality) as the major contributors to impact.
- Relevance of transportation impacts. Local vs. international procurement.
- Accessibility conditioned by: LCA purpose, reporting, external verification, reputational impact, legal implications.

# POLL & Q&A

# THANK YOU!

**FOR MORE INFORMATION:**

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**Global Logistics Cluster**