A DATA-DRIVEN STUDY OF

THE ENVIRONMENTAL PERFORMANCE OF CSB++

SHOULD HUMANITARIAN ACTORS PROCUREMENT LOCAL FOR ENVIRONMENTAL – ON TOP OF SOCIOECONOMIC AND OPERATIONAL – REASONS?
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Humanitarian organisations increasingly respond to disasters resulting from (or exacerbated by) global warming and environmental degradation. Yet, through their operations, humanitarian organisations also unintentionally harm the environment and do contribute to the climate and environmental crises. Following the “do no harm” principle, humanitarian actors must take action to mitigate their environmental footprint. At the same time, many humanitarian organisations also prioritize local procurement over global procurement to stimulate local economies. Is local procurement compatible with sustainable procurement? Should humanitarian organisations purchase locally for environmental reasons? We address this question with help of one case study.

Our case study looks at CSB++, a fortified food product distributed by humanitarian organisations to treat and prevent malnutrition. It considers one large humanitarian organisation, which we refer to as HO. HO predominantly sources CSB++ from a global supplier located in Western Europe and from a local supplier located in East Africa. To evaluate which sourcing option is the most environmentally sustainable, we perform a life cycle assessment (LCA) to measure the environmental footprint of CSB++ throughout its full life cycle and consider in turn the local and global sourcing options. LCA is a comprehensive methodology because of its vertical and horizontal breadth — i.e., it considers multiple life cycle steps and multiple environmental dimensions. It is, however, data intensive, and our study was only made possible thanks to close collaboration with HO’s global and local suppliers.

The results of our study show that transportation does not contribute significantly (relative to other life cycle steps) to the environmental footprint. In terms of environmental sustainability, local procurement may be aligned with sustainable procurement, but it is not automatically the case, rather there are many other factors to consider.
of CSB++, which means that the question of local vs. global, from an environmental point of view, is highly contextual. In other words, in terms of environmental sustainability, local procurement may be aligned with sustainable procurement, but it is not automatically the case, rather there are many other factors to consider. The life cycle step that contributes the most to CSB++ environmental footprint is the production of its ingredients. Thus, what matters (for the environment) is in fact not so much where CSB++ is procured from, but how it is produced (and what ingredients and inputs are included). HO should thus engage with its suppliers and help them make their value chain more environmentally sustainable. Note that our conclusion would have been different if CSB++ was transported from the global supplier by air rather than sea. Air transportation is indeed a real carbon bomb.

Environmental action calls for both vision and visibility. Humanitarian organisations need visibility to understand and decide on what to change and they need vision to plan (and implement) the change. The outcomes and learnings from visibility initiatives, like our CSB++ case study, must be shared across the sector — by both practitioners and academia — to accelerate the understanding of environmental challenges and lay the foundation for environmental action at appropriate scale.

The question of local vs. global, from an environmental point of view, is highly contextual. Our study illustrates the dynamics at play, and we hope it will further empower humanitarian actors with evidence.
Humanitarian organisations are on the front line of the climate and environmental crises. Each day, they witness and react to disasters resulting from (or exacerbated by) global warming and environmental degradation. Yet, humanitarian operations also result in a significant environmental footprint. Following the “do no harm” principle, humanitarian organisations must take action to mitigate their impact on the environment. An increasing number of them are doing so by adopting sustainable procurement strategies. At the same time, many humanitarian organisations also prioritize local procurement over global procurement to stimulate local economies. Is local procurement compatible with sustainable procurement? Should humanitarian organisations purchase locally for environmental reasons?

Is local procurement more environmentally sustainable than global procurement? The debate is very much ongoing in the humanitarian sector. When possible, humanitarian actors purchase relief items close to where they are needed. By doing so, they aim to strengthen vulnerable economies of countries affected by disasters. Additionally, procuring locally often comes with reduced lead times and transport costs making humanitarian response both quicker and more cost-efficient. But what about the impact of local procurement on the environment? Should humanitarian actors procure locally for environmental — on top of socioeconomic and operational — reasons? Comprehensive end-to-end supply chain visibility is key to seriously address this question. We provide an example of such visibility with the case study which we describe in this report. Ultimately, through this study, our objective is to provide humanitarian actors with fact-based evidence on
the environmental dynamics at play when it comes to local and global procurement — and further build the case for environmental visibility and its importance in decision-making. This first section briefly describes the interplay between humanitarian aid and the environment, and in light of that contextualizes the question of local vs. global procurement. The second section addresses the said question through one case study. The third and last section summarizes the lessons learned from the case study and concludes on the importance of environmental visibility (on top of vision) for the sector to effectively reduce its environmental footprint.

HUMANITARIAN AID AND THE ENVIRONMENT

Humanitarian organisations are on the front line of climate and environmental crises. Each day, they witness and react to disasters resulting from (or exacerbated by) global warming, and both acute and chronic environmental degradation. Humanitarian organisations must adapt to these challenging yet glaring realities. On one hand, they must scale up to face the increasing needs for humanitarian assistance. They must also help the communities they support become more resilient to future shocks triggered by climate change. On the other hand, humanitarian organisations must look inward and continuously work on reducing the negative impact that their operations have on the environment, as well as foster sustainable development efforts. Guided by the “do no harm” principle, they must ensure that their activities save and improve lives without harming the environment — in the short- and long-run.

Humanitarian operations may harm the environment in different ways. The production and distribution of relief items emit greenhouse gases and further contribute to global warming. So does flying practitioners from one location to another. When not properly disposed, waste — such as packaging materials, used disposables, but also damaged, expired, or obsolete stock — pollutes the local environment. The construction of internally displaced person (IDP) and refugee camps can cause deforestation in surrounding areas; its high population density can further exacerbate this phenomenon and more generally, it can represent a stress on scarce local resources.

As the supply chain forms the backbone of humanitarian operations — and because it typically represents around 60% to 80% of humanitarian expenses — the environmental footprint of humanitarian organisations can largely be associated with supply chain activities. To mitigate their environmental footprint, humanitarian organisations should thus focus on their supply chains and implement necessary changes considering all echelons. To successfully implement such change, humanitarian organisations must adopt a short- and long-term vision.

GREEN PROCUREMENT IN THE HUMANITARIAN SECTOR

The upstream supply chain of humanitarian organisations (see Figure 1) typically represents an important share of their environmental footprint (this is not just true for the humanitarian sector). The activities performed by tier-1 suppliers — tier-2 suppliers, tier-3 suppliers, et cetera — often sum up to a significantly large carbon footprint.

Humanitarian organisations must think short-term because now is the time to act. They must also think long-term to define feasible but ambitious environmental targets as well as plans to effectively reach these.
and might pose various environmental threats. The understanding of this is growing in the humanitarian sector, together with a sense of responsibility to act upon it. Several humanitarian organisations have developed sustainable procurement strategies and/or guidelines to address and mitigate the environmental footprint of their upstream supply chains. **Sustainable procurement is about including environmental criteria in sourcing decisions. It is also about engaging with suppliers and supporting them in decreasing the environmental load of their activities — and of the items (or services) that they produce.** Note that sustainable procurement is not limited to environmental sustainability; organisations typically consider sustainability from an environmental, social, and economic perspective as these three dimensions are so closely interrelated.

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**Figure 1:** Example of upstream and downstream supply chain for a humanitarian organisation (HO)

[Diagram showing upstream and downstream supply chain stages: Raw material extraction, Tier-3 supplier, Tier-2 supplier, Tier-1 supplier, Distribution point, HO local warehouse, HO global warehouse, Beneficiaries.]

*This illustration excludes reverse logistics which links downstream back together with upstream.*
THE QUESTION OF LOCAL VS. GLOBAL PROCUREMENT IN LIGHT OF ENVIRONMENTAL SUSTAINABILITY

SECTION 2 IN SHORT

HO (a large humanitarian organisation kept confidential) can source CSB++ (a fortified food product) from a global or local supplier. To evaluate which sourcing option is the most environmentally sustainable, we measure the environmental footprint of CSB++ throughout its entire life cycle — considering in turn the local and global sourcing options. Our results show that transportation does not contribute significantly (relative to other life cycle steps) to the environmental footprint of CSB++, which means that the question of local vs. global, from an environmental point of view, is highly contextual.

CASE STUDY DESCRIPTION

CSB++ (also known as Super Cereal Plus) is a fortified food product which is used to treat and prevent malnutrition among children aged between six and 24 months. Humanitarian organisations commonly distribute this product to IDPs, refugees, and communities facing low food security. CSB++ is mainly composed of corn and soy (CSB stands for corn-soy blend); it also contains milk powder, soybean oil, sugar, as well as a few supplements (see Appendix 1 for the list of ingredients and their quantities).

Our study considers one large humanitarian organisation, kept confidential. This humanitarian organisation (HO hereafter) can source CSB++ from two main suppliers: one supplier located in West Europe (we will refer to it as the global supplier) and one supplier located in East Africa (we will refer to it as the local supplier) (see Figure 2). The global supplier is the largest supplier of fortified food products to humanitarian organisations in Europe. It is a family-owned business with more than 50 years of experience in cereal extrusion. It sources all the CSB++ ingredients from Europe, except for a portion...
of soybeans and one (out of three) supplement. The local supplier is located in Rwanda. It is the result of a public-private joint venture between the Government of Rwanda and a consortium of international organisations. Its modern plant is intended to provide fortified food products to the local community via the Nutrition Program of the Government of Rwanda and to humanitarian organisations. The local supplier sources corn and soy (the two main CSB++ ingredients) as much as possible from smallholder farms located within the country (80% for corn and 5% for soy) and the remaining from neighbouring countries (20% for corn and 95% for soy). This also includes targeted efforts to enhance the local value chain such as working with farmers to improve yields and quality, as well as get the best price for their products. Other CSB++ ingredients are sourced from outside sub-Saharan Africa, except for a small portion of sugar.

Is it more environmentally sustainable for HO to procure CSB++ from the local supplier or from the global one? To answer this question, we perform a life cycle assessment of CSB++ considering both local and global sourcing options.

**CASE STUDY APPROACH**

Life cycle assessment (LCA) is a methodology used to measure the environmental footprint of products (or services) considering their entire life cycle — from raw materials extraction to the use and disposal of the product itself (see Figure 3) — across multiple environmental dimensions — eg, global warming, land use, terrestrial acidification, freshwater eutrophication, et cetera. It is thus a comprehensive methodology. Organisations typically perform LCAs to identify environmental hotspots in the life cycle of their products and act upon these, or to compare the environmental performance of similar products.
An LCA consists of four main steps: (1) goal and scope definition, (2) life cycle inventory, (3) life cycle impact assessment, and (4) results interpretation (see Figure 4). In the next subsections, we describe each step in theory and then apply it to our CSB++ case study.

**LCA STEP 1: GOAL AND SCOPE DEFINITION**

**STEP 1 IN THEORY**

The first step of an LCA is the definition of its goal and scope to create a model that mirrors reality as closely as possible. While the goal steers the entire study, the scope defines the LCA’s functional unit and system boundaries. The functional unit describes the product and the function that it is to fulfil as part of the LCA (e.g., an LCA of milk could consider the life cycle of a liter of milk, as well as the intake of x grams of proteins and/or x kilocalories). System boundaries define what product life cycle steps are considered as part of the LCA (e.g., the transportation of milk from the factory up to the selling point), and for each step, what enabling inputs (e.g., the truck and fuel required to transport the milk).
The goal of our CSB++ LCA is to understand whether it is more environmentally sustainable for HO to procure CSB++ from the local supplier or from the global one. We thus defined our functional unit as one bag of CSB++ (1.5 kg) consumed at a refugee camp in East Africa — and consider in turn the CSB++ bag to be procured and distributed by HO from the local supplier and from the global one. Note that while the goal of our LCA is to compare the environmental footprint of CSB++ when procured locally vs. globally, our objective more generally is to understand the environmental dynamics at play when it comes to local and global procurement and share our findings with the sector.

Appendix 2 illustrates the system boundaries of our CSB++ LCA. The system boundaries include the below product life cycle steps:

- Production of CSB++ five main ingredients and packaging by the suppliers of the local and global suppliers
- Distribution (including storage and transportation) of all CSB++ ingredients and packaging up to the local and global suppliers
- Processing and packing of CSB++ by the local and global suppliers
- Distribution (including storage and transportation) of CSB++ up to the refugee camp
- Use (preparation) of CSB++ at the refugee camp
- Disposal of CSB++ packaging at the refugee camp

We consider the production¹ and usage of all the primary inputs enabling these steps.

The system boundaries of our LCA exclude the below product life cycle steps:

- Production of the CSB++ supplements
- Storage of the ingredients before processing and packing

Input data must be gathered for each product life cycle step (in scope) — either as foreground or background data. Foreground data is specifically measured or collected against a product life cycle step. Background data is generic and comes from specialized databases (checked for quality and accuracy); it can be defined at different spatial aggregation levels (e.g., average energy required to produce milk in Belgium, or average energy required to produce milk in the world). Input data is entered in an LCA software which then “converts” it into output data².

We collected both foreground and background data for our CSB++ LCA through collaboration with the local and global suppliers as well as with HO. The local and global suppliers shared foreground data on:

- Where the suppliers source the CSB++ ingredients from and how these get distributed (transported and stored) up to their plants
- How the suppliers produce CSB++
- How the suppliers distribute (transport and store) CSB++ to HO (up until the handover)

¹ For consumables inputs (e.g., fertilizers), the full production is allocated to the CSB++ life cycle step. For capital goods inputs (e.g., trucks), production is only partially allocated to the CSB++ life cycle step (proportionally to the usage of the capital good for that one life cycle step).

² Output data could also directly be collected, but that is generally the case only with highly specialised LCAs.
The local supplier also shared foreground data on the agricultural production of corn and soy sourced from within the country by farmers within their value chain network. For the rest of the ingredients, and for all the ingredients in the case of the global supplier, we relied on background data for agricultural production.

We relied on a mix of foreground input data (from HO) and background input data on:

- How CSB++ packaging is produced
- How HO distributes (transports and stores) CSB++ to the refugee camp
- How CSB++ is prepared (i.e., cooked)
- How CSB++ packaging is disposed of

**LCA STEP 3: IMPACT ASSESSMENT**

**STEP 3 IN THEORY**

During the third step of an LCA, output data is translated into environmental impacts. The climate and environmental crises represent in fact many different environmental problems. An LCA can look at a multitude of these problems; the ones considered depend on the selected impact assessment methodology. The impact assessment methodology defines which environmental problems — referred to as impact categories — are considered as part of the LCA. It also defines which output element contributes to which impact category and to what extent (e.g., which emissions to air contribute to global warming and the extent of their contribution based on the global warming potential of each emission type).

**STEP 3 APPLIED TO CSB++ CASE STUDY**

We selected ReCiPe as impact assessment methodology. ReCiPe is one of the most used impact assessment methodologies. Its strength lies in the fact that it considers 16 midpoint impact categories, which it then aggregates into three endpoint impact categories (see Figure 5). The midpoint impact categories present a detailed picture of the product’s environmental footprint while the endpoint impact categories summarize these at aggregated level.
The fourth step of an LCA is the interpretation of its results. It is the final step of an LCA, but it should be the start of targeted environmental action.

**STEP 4 APPLIED TO CSB++ CASE STUDY**

Figure 6 presents the results of our CSB++ LCA considering ReCiPe’s 16 midpoint impact categories and Figure 7 presents the results considering ReCiPe’s three endpoint impact categories. At midpoint level, the local procurement scenario presents significantly better results than the global procurement scenario for several impact categories (e.g., terrestrial acidification), but it is the other way around — i.e., the global procurement scenario presents significantly better results than the local procurement scenario — for some other impact categories (e.g., land use). These opposite results illustrate the complex dynamics behind environmental sustainability. For the remaining midpoint impact categories (e.g., global warming), the results of the local and global procurement scenarios are very much alike.

Aggregated at endpoint level, the local procurement scenario appears to be less harmful to human health than the global procurement scenario but slightly more harmful to ecosystems. The two scenarios are alike when it comes to the damage that they cause to resources availability.

Which of the local and global procurement scenarios is thus the most environmentally friendly (or the least environmentally unfriendly)? The results at midpoint and endpoint impact category levels do not depict a clear answer to this question. The more detailed results at product life cycle step level do however provide valuable insights. At that level, it clearly appears that all transport life cycle steps, together, are proportionally of little (to no) importance to the three endpoint impact categories (see Figure 8).
Figure 6: LCA results at midpoint level

The results are normalized to the yearly environmental footprint of an average world citizen in 2010 (e.g., 0.002 equals to 0.2% of the yearly footprint of an average world citizen in 2010). Normalization helps understand the relative weight of the impact categories based on a reference (in our case an average world citizen in 2010) and makes it possible to visualize the results of all impact categories with one same unit of measure. Source: Pré (2016). Introduction to LCA with SimaPro. Retrieved on 15.06.2022 from https://pre-sustainability.com/files/2014/05/SimaPro8IntroductionToLCA.pdf.

Figure 7: LCA results at endpoint level
appears to be agricultural production (of corn, soy, milk powder, soybean oil, and sugar). Accordingly, what matters (for the environment) is in fact not so much where CSB++ is procured from, but how it is produced. In light of these findings, the question of whether local procurement is more environmentally sustainable than global procurement is deemed irrelevant.

**WHICH OF THE LOCAL AND GLOBAL PROCUREMENT SCENARIOS IS THUS THE MOST ENVIRONMENTALLY FRIENDLY (OR THE LEAST ENVIRONMENTALLY UNFRIENDLY)?**

**Figure 8:** LCA results at endpoint impact categories level considering different life cycle steps

**WHAT MATTERS (FOR THE ENVIRONMENT) IS IN FACT NOT SO MUCH WHERE CSB++ IS PROCURED FROM, BUT HOW IT IS PRODUCED.**
The advantage of the LCA methodology is the potential to deeply dive into results across a broad spectrum of impact categories. Figure 9 illustrates the above points considering the global warming midpoint impact category specifically. Here, we also look at the impact of air versus sea transport for global procurement.

Agricultural production clearly stands out as the most important product life cycle step (59 and 60% for local and global procurement scenarios, respectively). However, the production of dried skim milk powder contributes to a significant portion of the greenhouse gases (GHG) associated with agricultural production (and 46 and 45% of total GHG for the entire life cycle of CSB++ for the local and global scenarios, respectively). Transport only represents a small part of CSB++ carbon footprint (around 6% for both local and global procurement scenarios). While CSB++ (as a finished product) needs to travel less with the local procurement scenario compared to the global procurement one, its ingredients (the raw materials) do travel just as much (if not slightly more) — and this explains the fact that the carbon footprint of transport is similar for both local and global procurement scenarios. Note that reverse logistics was not considered as part of our LCA scope (because CSB++ packaging is disposed on site) but if it was, it would have slightly increased the importance of transport. What if CSB++ was transported from the global supplier to East Africa by air rather than by sea? In that case, transport rather than agricultural production would stand out as the most important product life cycle step. Air transport is indeed a real carbon bomb.

**Figure 9:** LCA results for global warming (also including air transportation scenario)
What do the results of the LCA mean for HO? To mitigate its environmental impact, HO should not choose one supplier over the other (which would also not be recommended from a supply chain resiliency point of view), but rather it should engage with both of them and help them make their value chain more environmentally sustainable (e.g., by introducing more sustainable agriculture methods at farm level). It should also review the recipe of CSB++ from an environmental point of view and consider replacing ingredients with a high environmental price tag with more sustainable alternatives (e.g., replace the milk powder by soymilk concentrate) without compromising the nutritional integrity of the product. In general, if a humanitarian organisation were to increase local sourcing of food items, it should ensure its suppliers (and actors up the chain) put the right emphasis on sustainable agricultural production methods (aimed at enhancing or sustaining the natural environment). Unsustainable methods would degrade the environment in the long-term, and eventually make local communities more (rather than less) vulnerable, resulting in an increased (rather than decreased) need for aid.

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Animal-based products have a much larger impact on the environment than plant-based ones. For CSB++, milk powder (animal-based) contributes to close to 80% of the total carbon footprint of the agricultural production life cycle step, while it in fact only accounts for 8% of CSB++ total weight.
Environmental visibility to drive change

Section 3 in short

Environmental action calls for both vision and visibility. Humanitarian organisations need visibility to understand and decide on what to change and they need vision to plan (and implement) the change. The outcomes and learnings from visibility initiatives must be shared across the sector — by both practitioners and academia — to speed up the understanding of environmental challenges and lay the foundation for environmental action at scale.

When it comes to environmental sustainability, our CSB++ LCA showed that the question of local vs. global procurement is highly contextual. This is the case for CSB++, but can be generalized to other relief items. The place where an item is procured from is indeed just one piece of a bigger puzzle — which needs to be considered fully. For CSB++ specifically, agricultural production appeared as the largest piece of the puzzle. It is indeed the life cycle step which contributes the most to CSB++ environmental footprint, both in case of local and global procurement, and HO should thus orient environmental action primarily in that direction.

In the first section of this report, we mentioned that to mitigate their environmental footprint, humanitarian organisations must develop a short- and long-term vision. Vision is indeed important, but it prerequires visibility. Humanitarian organisations need visibility to understand how and to what extent their operations are harming the environment and to subsequently define a vision and roadmap to mitigate their environmental footprint.

The volume of studies, reports, and tools measuring the environmental performance of products, flows, and organisations has been growing in relation to the climate and environmental crises. Environmental visibility is thus improving overall, and that is also the case in the humanitarian sector where an increasing number of organisations are working on initiatives that aim to provide a more transparent overview of the environmental impacts of operations. Many humanitarian organisations
have for example been publishing carbon reports and some have worked on LCAs. At field level, humanitarian practitioners can use a tool (NEAT+) developed by the UNEP/OCHA Joint Environment Unit to identify and address environmental risks. To further amplify the impact of ongoing initiatives, humanitarian organisations should share their results with the sector so that everyone can learn from these. They should further unite and work jointly on visibility initiatives (e.g., leverage their purchasing power to request environmental visibility at supplier level). Academia also has a role to play: researchers should run more empirical studies, share the result of their work with the sector and make sure these can be understood and subsequently trigger environmental action. This report is our first step in that direction.

Sustainability should always be considered from its three dimensions: economic, social, and environmental. This report focuses on the environmental dimension, but its main conclusion — the need for 360° visibility to feed sustainable change — is applicable to all. Humanitarian organisations need not only to understand their environmental footprint, but also their social footprint (and possible handprint), as well as the cost-efficiency of their programs. The three dimensions of sustainability are interconnected and integrating them in decision-making is certainly not easy. Let us continue to learn from each other.
APPENDIX 1: CSB++ INGREDIENTS

The below table lists out all the ingredients of CSB++ and their weight for one package.

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Type</th>
<th>Weight in one CSB++ package (kg)</th>
<th>Share of total weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn</td>
<td>Main</td>
<td>0.820</td>
<td>54.80%</td>
</tr>
<tr>
<td>Soybeans</td>
<td>Main</td>
<td>0.350</td>
<td>23.50%</td>
</tr>
<tr>
<td>Dried skim milk powder</td>
<td>Main</td>
<td>0.120</td>
<td>8.00%</td>
</tr>
<tr>
<td>Refined soybean oil</td>
<td>Main</td>
<td>0.050</td>
<td>3.00%</td>
</tr>
<tr>
<td>Sugar</td>
<td>Main</td>
<td>0.140</td>
<td>9.00%</td>
</tr>
<tr>
<td>Vitamin and mineral FBF-V-13</td>
<td>Supplement</td>
<td>0.003</td>
<td>0.20%</td>
</tr>
<tr>
<td>Dicalcium phosphate anhy-drous</td>
<td>Supplement</td>
<td>0.018</td>
<td>1.23%</td>
</tr>
<tr>
<td>Potassium chloride</td>
<td>Supplement</td>
<td>0.004</td>
<td>0.27%</td>
</tr>
</tbody>
</table>
APPENDIX 2: INPUTS, OUTPUTS, AND PRODUCT LIFE CYCLE STEPS IN SCOPE OF OUR CSB++ LCA

The below picture illustrates the inputs, outputs, and product life cycle steps in scope of our CBS++ LCA.
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