Sustainability Impacts of Food Recovery & Redistribution Organizations

A methodology to calculate the avoided emissions and co-benefits from redirecting food loss and waste to direct human consumption, through food recovery and redistribution operations.

August 2024

In a groundbreaking initiative to address global sustainability challenges, The Global FoodBanking Network, in partnership with the Global Methane Hub and working with the Carbon Trust, developed the FRAME (Food Recovery to Avoid Methane Emissions) methodology for quantifying the avoided emissions and co-benefits from redirecting food loss and waste to direct human consumption, through food recovery and redistribution operations. The methodology aligns with several United Nations Sustainable Development Goals (SDGs), most notably SDG 13 (Climate Action) by fitting climate change impacts, SDG 12 (Responsible Consumption and Production) by reducing food waste, and SDG 2 (Zero Hunger) by redirecting edible surplus to those in need.

This project arises from the critical need to document and quantify the significant role that food banks play in sustainability efforts, particularly in reducing greenhouse gas emissions. The methodology was developed to provide a credible framework for food banks to calculate their greenhouse gas emission reductions, not only highlighting their critical role in mitigating climate change but also opening up new avenues for these organizations to access climate finance through the generation of carbon credits.

The research is conducted in the context of GFN's work with the Carbon Trust, facilitating the integration of estimates from internal GFN sources and external data, existing and proprietary methodologies from GFN were used, including the analysis of nutritional contributions and other external methodologies such as greenhouse emission methodologies.

This co-authorship approach enriches the context and validity of the results obtained. The methodology employed quantitative techniques, ensuring a holistic approach to identify meaningful patterns and formulate evidence-based recommendations. This collaborative framework, encompassing data collection, analysis, and methodological development, not only facilitates an in-depth understanding of the impact of food banks through food recovery and redistribution but also provides a robust structure for ongoing data analysis.

By providing food banks with a tool to credibly report their avoided emissions, this methodology aims to improve the quality of data collected and enable effective documentation of the current situation based on solid evidence. Ultimately, this initiative seeks to strengthen the position of food banks in the global fight against hunger and climate change, while opening new possibilities for sustainable growth and impact.

Acknowledgements
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Contents

1. Glossary

Anaerobic digestion (dry)	A process through which bacteria break down organic matter—such as animal manure, wastewater biosolids, and food wastes—in the absence of oxygen. The dry matter content is generally >15%.
Anaerobic digestion (wet)	A process through which bacteria break down organic matter—such as animal manure, wastewater biosolids, and food wastes—in the absence of oxygen. The dry matter content is generally <15%.
Animal feed	A waste disposal method where organic matter is used as a feedstock for animals.
Avoided emissions	Avoided emissions are defined as the positive impact on society when comparing the GHG impact of a solution to an alternative reference scenario where the solution would not be used.
Baseline Scenario	The activities that would be business-as-usual if the project did not exist.
Composting	The process of recycling organic materials into an amendment that can be used to enrich soil and plants.
Controlled combustion, incineration	Waste treatment process that involves the combustion of substances contained in waste materials.
Dry matter (DM) content	The dry matter of plant and animal material consists of all its constituents excluding water.
Food loss	The decrease in the quantity or quality of food resulting from decisions and actions by food suppliers in the supply chain, excluding retailers, food service providers and consumers (FAO, 2011).
Food waste	The decrease in the quantity or quality of food resulting from decisions and actions by retailers, food services and consumers (FAO, 2011).
Inedible parts	Components associated with a food that, in a particular food supply chain, are not intended to be consumed by humans. E.g. the skin of a banana.
Landfill with flaring	A landfill system that combusts any gases produced by the landfill.
Landfill without flaring	A landfill system that releases any gases produced by the landfill into the atmosphere.
Leakage	Any food that is redirected by the food bank as part of the project scenario but is wasted by the project, meaning that it then becomes FLW and has associated FLW transportation and processing emissions.
Open burning	An informal method of waste disposal that combusts waste.

Open dump	A waste disposal site at which solid wastes are disposed of in a manner that does not protect the environment
Project	Catch all term for non-profit food banks, food recovery & redistribution organizations.
Project Scenario	The activities that fall within the boundary of food bank and food redistribution operations to be compared against the baseline scenario.
Recovered food	Food that has been kept in the human food chain because of the project activity; includes food that when the food bank is involved were stopped of being discarded, as well as "rescue" (redistributing to people food at risk of being discarded).
Sewer/Wastewater	The process of removing and destroying or converting the noxious substances of sewage especially by ammonification and nitrification through bacterial action.
Water content	The measurement of total water contained in food.

2. Introduction

According to a 2023 study (Zhu, 2023), the emissions that occur due to food loss and waste (FLW) reached up to 9.3 GtCO_2e in 2017. This overall figure considers not only the methane emissions that occur at the end-of-life destinations that the FLW reaches but also any extra embedded emissions that are released in order to produce enough food to compensate for the FLW. Around 14% of the world's food is lost after harvest and before it reaches retailers (FAO, 2019), with the United Nation Environment Programme (UNEP) Food Waste Index Report detailing that an additional 17% is then wasted at retail and by consumers. Qu Dongyu, Director-General of the FAO, estimates that the food that we lose and waste globally could feed 1.26 billion hungry people each year (FAO News & Media, 2021).

FLW not only has an environmental effect but also social and economic impacts, especially at the farm level where food loss can lead to loss of income and negative social impacts. In the context of climate change, in 2022 there were as many as 783 million people affected by hunger; this illustrates the real opportunity within our food system to strive for zero hunger (SDG 2) as well as taking climate action (SDG 13) through reduction of food loss and waste (UN DESA-EN, 2024). In this scenario, food bank organizations and facilities can catalyze transformation of the food system to benefit those that are facing hunger by reducing FLW at the source as well as redirecting this food to the most vulnerable populations, thereby also contributing to methane emissions reduction.

Food banks are expanding all around the world. According to a study commissioned by The Global FoodBanking Network (GFN), the collective global impact of food banks in 2019 represented over 12 million tCO_2eq avoided from being wasted, 3.75 million tonnes of nutritious surplus food saved from landfills and over 66 million people facing hunger served by the food banks within the network (GFN, 2019).

This methodology has been developed so that food banks can credibly report the avoided emissions that occur due to redistribution of potential FLW and communicate the wider role they could play in the future of our food system, both environmentally and socially. Using this methodology, it can also allow food banks to move away from solely relying on donations to survive by accessing climate finance to help grow operations in a sustainable manner. This will help more people facing hunger and reduce global emissions. The methodology is specific to projects relating to the diversion of potential food loss and waste to human consumption through food bank activities.

3. Methodology Discussion

The types of FLW end-of-life destinations are classified differently by different organizations. In October 2023, the EPA released the "Wasted Food Scale" encompassing both food loss and waste, which rates the type of end-of-life destination on a scale of how preferable these destinations are for dealing with FLW (see Figure 1) (EPA, 2023). Based on this scale, the most preferred option for dealing with FLW is to prevent food waste from ever occurring, whereas the least preferred option is food waste being sent to landfill or wastewater with no energy recovery. When taking this scale into account, this methodology proposes a clear distinction in classifying FLW as: (i) food that is processed at an end-of-life destination without being directly consumed (see section 6 for end-of-life destinations), and (ii) food that without food banks activities will become waste. This view is also backed by the Food Loss & Waste Protocol's *Food Loss and Waste Accounting and Reporting Standard (FLW Standard)* as demonstrated in Figure 2, which makes the distinction between what is and is not classed as possible FLW.

The Food Loss & Waste Protocol is a multi-stakeholder collaboration that has created the FLW Standard to facilitate quantification of FLW to encourage consistency and transparency for countries, companies, and other organizations (Food Loss & Waste Protocol, 2016). The stakeholders of this protocol include organizations such as the World Resource Institute (WRI), UN Environment Programme (UNEP), Waste & Resources Action Programme (WRAP) and the FAO among others, giving credibility to the methodology.

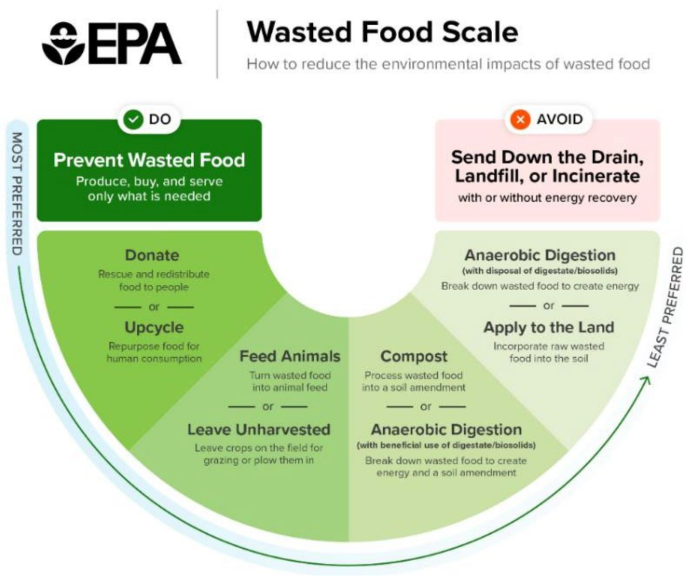
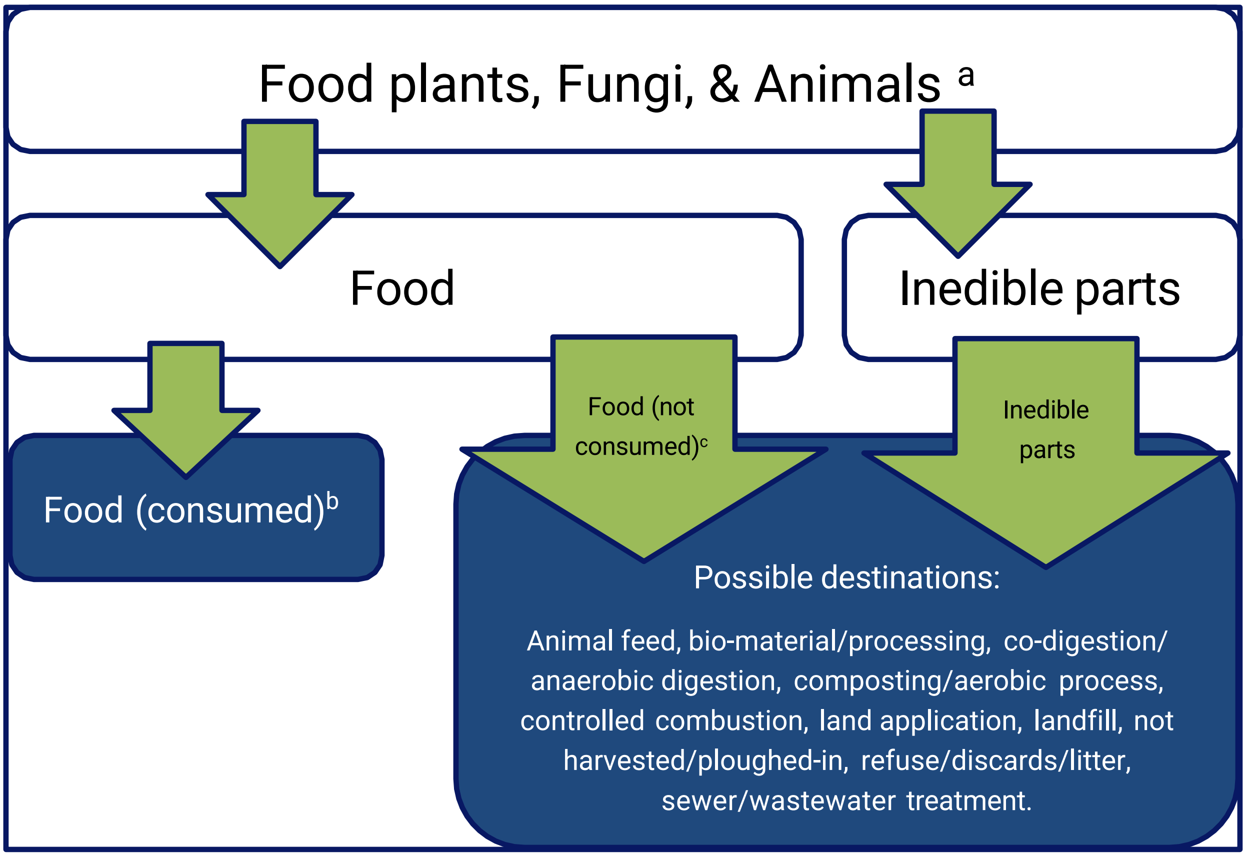


Figure 1: EPA wasted food scale.



[a] Intended for human consumption (i.e., excludes crops intentionally grown for bioenergy, animal feed, seed, or industrial use)
[b] At some point in the food supply chain (including surplus food redistributed to people and consumed)
[c] This is the food that is studied in this methodology

Figure 2: Distinction between food consumed and FLW destinations, adapted from FLW Standard (Food Loss & Waste Protocol, 2016).

Some methodologies, such as the one developed by Verra, are only applicable to FLW kept in the human supply chain and not if diverting FLW from one destination to another (e.g., from landfill to animal feed or composting to be used as fertilizer). (Verra, Quantis inc., Kai Robertson, 2023). The interpretation of Target SDG12.3 by Champions 12.3 has selected which of the destinations should be considered food loss or waste for the purpose of tracking progress towards the recommended 50% reduction by 2030 and excluded animal feed and bio-material/biochemical processing from being in scope. It can be argued that the food diverted to some end-of-life destinations do not lose their level of quality and in some cases can indirectly enhance the nutritional value of the food. Although this argument does have merit, it does mean that this potential food will unlikely reach the vulnerable populations that food banks serve. While this approach can meet SDG 13 on Climate Action, it has reduced co-benefits with SDG 2 Zero Hunger.

Therefore, this methodology has chosen to align with the broad set of destinations laid out by the *FLW Standard* to demonstrate the social and economic benefits of food bank operations as well as the environmental benefits. This means that the methodology may not fit with all existing frameworks on FLW but does highlight all the sustainable benefits that food banks can generate.

The food loss and waste avoided emissions methodology developed by Verra has informed core elements of the methodology presented here. Differences between the two methodologies include this methodology's smaller scope of focusing on only food that is diverted to direct human consumption, the focus of this methodology being on food bank organizations, and the inclusion of other SDGs. The other SDGs apart from SDG 13: Climate Action, are SDG 2: Zero Hunger, SDG 8: Decent Work and Economic Growth and SDG 12: Responsible Consumption and Production, showcasing the co-benefits from food bank operations. Concepts between this proposed methodology and Verra's own methodology are similar, due to Verra's robustness and credibility when it comes to avoided emissions calculations, such as the overall project and baseline scenario framework in Figure 4.

One other distinction with this methodology is the inclusion of the concept of suppressed demand developed in "The Gold Standard Suppressed Demand Small-scale Methodology for Low GHG Food Preservation" (The Gold Standard Foundation, 2013) document. This concept relates to increasing the avoided emissions that can be claimed by the food bank when a project is demonstrated to provide food security to those who are food insecure. Suppressed demand sets a minimum service level that a human being needs to be healthy and in the case of this methodology, to be food secure. The World Food Programme defines, in part, a food secure individual as someone who has a nutritional intake of 2,100 kcal/person/day (World Food Programme, 2021). By establishing a baseline of the nutritional intake of the people served, the gap to becoming food secure can be established, and the emissions that occur due to the food bank operations to achieve food security can be discounted when calculating the overall avoided emissions. This concept has already been implemented by Gold Standard and can help increase the benefits of the food banks. However, the data requirements and level of traceability are much greater and much more detailed in the Gold Standard. This could only be applied to food banks who have monitoring systems that allow them to understand the overall consumption of food rather than just provision of food to people served. When the suppressed demand concept is chosen to be adopted within the methodology, the scope of the methodology changes to include the people served and associated emissions. This must be considered when deciding whether the suppressed demand concept should be included or not (full details on the methodology refer to Appendix 2).

Another organization that has developed an avoided emissions methodology for food banks is CoreZero. CoreZero is a platform that enables food banks to create carbon credits more easily from their operations. Their approach has a similar goal to this methodology, to promote the climate benefits of food banks. However, CoreZero's methodology only considers climate benefits, and risks overestimation of avoided emissions due to the additionality requirements. CoreZero's methodology to quantify avoided emissions only considered the avoidance of landfill and incineration baseline activities. Food banks and food bank networks around the globe have been innovative in calculating their environmental impact, however these have mainly focused on the avoidance of upstream emissions of the food they recover (such as the emissions associated with the growing of crops) and how many upstream emissions they stop from being wasted, such as the emissions associated with the growing of crops, rather than the avoided emissions that occur at the downstream end-of-life destinations (Grace Clare, 2023). Although other LCAs (Life Cycle Assessments) concerning food banks consider the substitution effect of less food production is required due to people served being provided with food banks, so the carbon emissions due to production is lowered (Niina Sundin, 2022). This substitution effect is not considered within this methodology due to the uncertainty and sensitivities that arise from the assumptions made on emissions. While most current methodologies also overstate their avoided emissions by including the inedible parts of the food, this methodology includes an inedible food part factor to ensure that emissions are not overestimated. The key distinction of this methodology is the demonstration that food banking is the only activity to keep potential FLW in its current form and provide nutrition for vulnerable populations in the most efficient way, while reducing FLW, avoiding emissions, alleviating hunger, and creating jobs.

4. Applicability

This methodology is specific to projects relating to the diversion of potential food loss and waste to human consumption through food bank activities. The potential food loss and waste may be sourced from various points along a food item's lifecycle, e.g. farms, logistic sites, warehouses, hospitality locations, industrial sites, or retail shops.

It is noted here that any reference to food banks and the activities carried out by food banks also refers to any non-profit food recovery and redistribution organization.

The methodology is applicable under the following scenarios:

1) Project activities must introduce a diversion of food from potentially becoming food loss and waste through food bank and food redistribution activities to human consumption.
2) The project organization must be non-profit/not-for-profit.
3) The activity must divert potential food loss and waste away from the scenarios that do not lead to direct human consumption, such as:
    a. Anaerobic digestion (wet)
    b. Anaerobic digestion (dry)
    c. Composting
    d. Controlled combustion, incineration
    e. Landfill without flaring
    f. Landfill with flaring
    g. Open burning
    h. Open dump
    i. Sewer/Wastewater
    j. Animal feed
4) The methodology does not apply to activities that shift potential food loss and waste from one end-of-life destination to another.
5) Project activities must only be applied to food that is donated rather than purchased by the project.
6) Activities associated with the people served the food once processed and transported from the food banks, including wastage or further processing, is not included within this methodology's boundary.
7) Food that arrives at the organization must be in a state that allows the food to be consumed directly by humans; any food already spoiled when it arrives at the organization is discounted from the analysis.

a. If the wasted food mass that is reported does not distinguish between already spoiled food and food that spoils at the food bank then it is assumed all food has spoiled at the food bank.

Assumptions

1) The end-of-life emissions of inedible parts are assumed to be the same for the baseline and project scenarios.
2) The end-of-life emissions of any packaging of the FLW when it arrives at the food bank are assumed to be the same for the baseline and project scenarios.
3) All data related to food (quantity, classification, etc.) that applies to the baseline and project scenario must be from the same reporting period as the data for the project scenario.

5. Assessment Boundary

Food recovery and redistribution programmes such as food banks promote keeping food within the food supply chain by redirecting wholesome food and edible surplus food to people in need. Food loss is generated from on-farm post slaughter/harvest operations, transportation and storage, and the processing and packaging of food. Food waste is generated through retail and hospitality operations or public and household consumption.

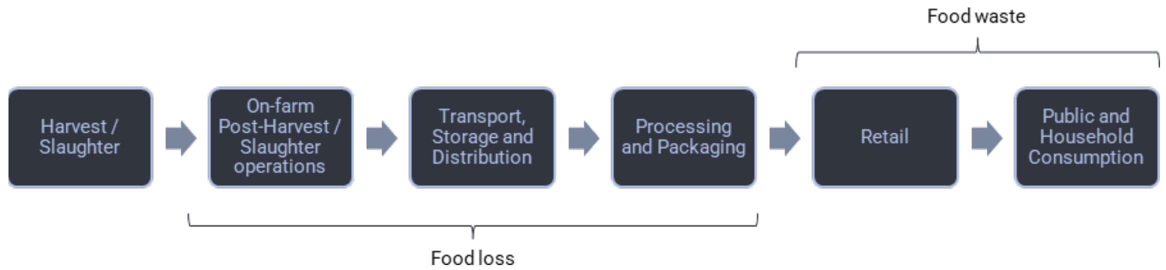


Figure 3. Generic food supply chain with sources for food loss and food waste.

Based on the above, the assessment boundary includes the baseline scenario, and the project scenario as described in Figure 4 below. The baseline scenario includes the regular pathway of the FLW that would occur if the food bank operation did not exist, which includes the transportation to the destination and the processing that occurs at the destination. The project scenario includes transportation to the food bank and any processing of the food required to allow it to be directly consumed by humans. The project scenario also includes any leakage of the food that becomes FLW from food bank operations.

The boundary does not consider what happens to the food once it leaves the food banks and reaches the people served, due to lack of data and control over how or if the people served consume the food. Therefore, the methodology does not consider any substitution effect, where less additional food is purchased and produced due to people served receiving food from the project. This can have additional environmental benefits but is not considered within this boundary. Rebound effects that have been considered in other studies include the increase in budget that people served might have due to receiving food from food banks, and this extra budget being used to buy other goods (Niina Sundin, 2022). Due to the same reasoning as the boundary approach, these rebound effects are not considered.

The assessment boundary can be split into the baseline scenario and project scenario to calculate the final avoided emissions figure which can be used to access climate finance. Both the baseline and project scenario for all SDGs detailed in the methodology must be calculated. If the organization only wants to calculate the environmental impact and social and economic co-benefits of the redistribution of food, then only the project scenario is taken into consideration. However, if only the project scenario is calculated then the organization cannot claim any avoided emissions.

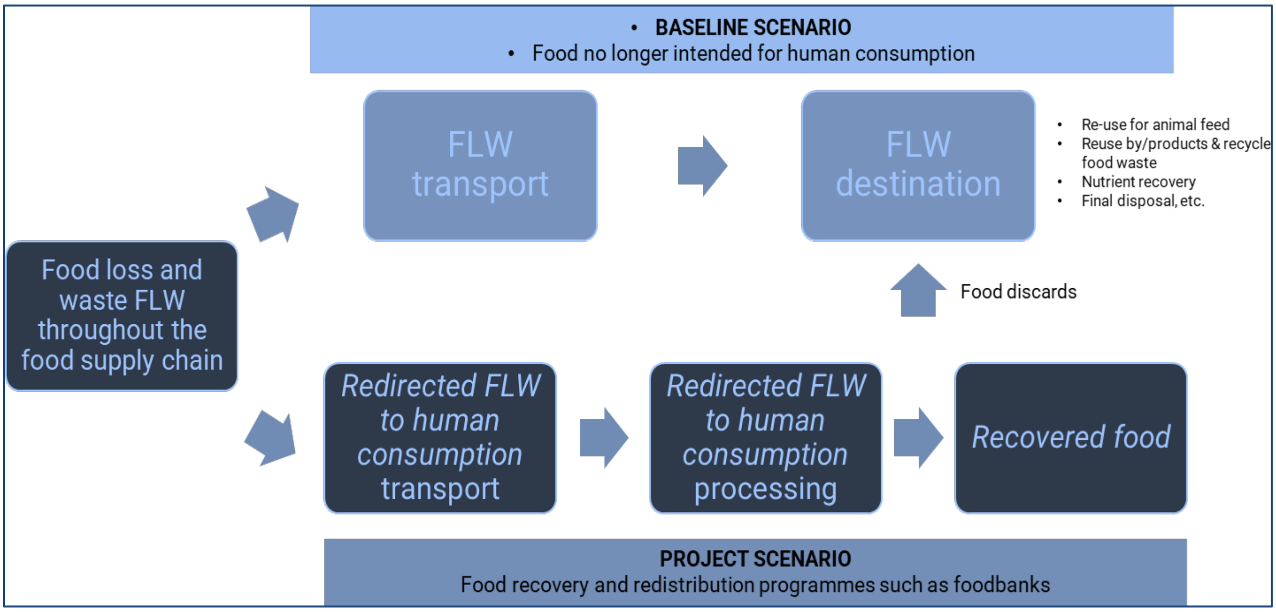


Figure 4: Baseline scenario and project scenario comparison when activities that redirect FLW to human consumption are implemented.

Baseline scenario

The main baseline emissions accounted for according to this methodology are associated with both the treatment of food at the FLW destination and any transport emissions that occur in transporting the FLW to the destinations. The baseline scenario creates a weighted average of emissions depending on how much of the food goes to each of the normal end- of- life destinations.

Project scenario

GHG emissions included in the food bank enabled scenario are those related to the food bank's own operations and third-party transport when the food comes from donations only and falls under the classification of food loss and waste, (as specified in section 1). The project scenario includes GHG emissions from transporting recovered/donated food from donors to food banks, processing, packaging, storage, distribution, as well as any other GHG emissions not included in the baseline scenario. The leakage emissions from the project are related to food wasted at the food bank itself and then that goes to an end-of- life destination., Leakage does not account for any food that is wasted by the people served, unless the suppressed demand concept is integrated into the calculation, then leakage by people served is also calculated.

The total avoided emissions achieved by the food banks will depend on the baseline scenario but also on the efficiencies of the food bank itself. By reducing the project scenario emissions, the avoided emissions increase. For example, these reductions can be achieved through on-site renewable electricity production, intelligent routing and first-expired-first-out storage/inventory management practices to reduce leakage.

The social and economic co-benefits, or externalities, of food bank operations are only calculated within the project scenario.

6. Quantification of SDGs

Accounting for the trade-off between Sustainable Development Goals (SDGs), such as emissions avoidance and other social considerations, involves adopting a holistic approach. In the case of emissions reduction versus meeting immediate human needs like food security, a balanced approach should prioritize addressing immediate social concerns. It would be unlikely that this situation would arise, as the more food that is prevented from going to other end-of-life destinations inherently goes to feed people.

6.1. SDG 13: Climate Action

Food banks contribute to climate change mitigation by recovering and distributing surplus or unsold food that would otherwise go to waste. Food banks help reduce the environmental impact of food decomposition in landfills. In addition, they tend to work efficiently, optimize transportation routes and can be coordinated with local partners, minimizing the carbon footprint associated with the transportation of the recovered food. The most relevant target related to SDG 13 is the one that integrates the greenhouse gas emissions avoided.

13.2 Integrate climate change measures into national policies, strategies, and planning.

Figure 5. SDG 13: Climate Action: most relevant SDG target.

The total amount of **greenhouse gas emissions avoided** (tCO_2eq), the primary indicator derived from this methodology, and it will be calculated as the difference of baseline emissions, project emissions and leakage emissions as illustrated in the following equation (See also ***Section 6.1.2 Project scenario)***):

$$AE_y = (BE_y - PE_y - LE_y)$$

AE_y	Avoided GHG emissions from project activities in year y (tCO_2eq)
BE_y	Baseline GHG emissions of activity x, in year y (tCO_2eq)
PE_y	Project GHG emissions in year y (tCO_2eq)
LE_y	Leakage GHG emissions in year y (tCO_2eq)

To calculate the individual contribution of methane to the total CO_2 equivalent emissions total, use the methane proportion in Table 1 when calculating the baseline scenario emissions and the leakage emissions from the project scenario, methane emissions from the project activities are assumed to be de-minimis. Ensure when reporting methane emissions that the Global Warming Potential value for 25 for biogenic methane is used to convert from CO2e to CH_4, the CO2e value must be divided by 25.

$$AE_{M_y} = \left(BE_{M_y} - LE_{M_y}\right)$$

AE_{My}	Avoided methane emissions from project activities in year y (tCH_4)
BE_{My}	Baseline methane emissions of activity x, in year y (tCH_4)
LE_{My}	Leakage methane emissions in year y (tCH_4)

$$BE_y = \sum_j M_{FLW_{j,y}} \times DM_{j,y} \times EF_{FLW_{j,y}} \times MP_{FLW_{j,y}}$$

Where:

$BE_{j,y}$	Total baseline methane emissions for FLW destinations in year y (tCH_4)
$M_{FLWj,y}$	Sum of all FLW flows going to FLW destination j in year y (tonne)
$DM_{j,y}$	Mean dry matter content of FLW flows going to destination j in year y (weight fraction kg-DM/kg)
$EF_{FLW_{j,y}}$	EF of the FLW destination j in year y (Table 1) (tCO_2e/t DM)
$MP_{FLW_{j,y}}$	Proportion of methane in emission factor $EF_{FLW_{j,y}}$, for destination j, in year y
j	FLW destinations
y	Reporting year

$$LE_{M_y} = \sum_m \left((M_{W,S_{m,y}} + M_{W,T_{m,y}}) \times DM_{m,y} \right) \times EF_{FLW_y} \times MP_{FLW_{j,y}}$$

Where:

LE_y	Leakage emissions from wasted recovered food from food bank operations, in year *y*, (tCO_2e)
$M_{W,S_{m,y}}$	Mass of recovered food wasted on site, by food category *m*, in year *y*, (kg)
$M_{W,T_{m,y}}$	Mass of recovered food wasted during transport, by food category *m*, in year *y*, (kg)
$DM_{W_{j,y}}$	Dry matter content of the wasted recovered food by food category m, in year *y*, (kg-DM/kg)
EF_{FLW_y}	Emission factor for FLW destinations in year y ($kgCO_2e$/kg-DM)
$MP_{FLW_{j,y}}$	Proportion of methane in emission factor $EF_{FLW_{j,y}}$, for destination j, in year y
m	Food categories
y	Reporting year

The following sections 6.1.1 and 6.1.2 details the steps to complete the above calculations.

6.1.1. Baseline Scenario Calculation

A baseline scenario comprises the business as usual (BAU) transport and the destination treatment of FLW. This involves modelling the circumstances and emissions that would have occurred if the food bank did not take the food, and it became FLW sent to one of the end-of-life destinations described in section 4.

Emissions that are included within the calculation:

a) The transportation of the FLW to the FLW destination.

b) Any on-site processing utilities consumed such as electricity or fossil fuel combustion.

c) Any fugitive emissions from the end-of-life destination such as methane emissions from organic matter degradation at landfills. These emissions occur due to the activity itself rather than through emissions from utilities or energy consumption.

To calculate the emissions for the baseline scenario the following parameters must be defined. This can be accomplished through primary data by requesting data from specific donors or processing sites, or from secondary data obtained through proxies or national databases, etc. These data quality requirements are defined in section 7 for monitoring.

a) Quantity of food that would have been sent to each of the FLW destinations.
b) The emission factor of each FLW destination.
c) The distance travelled to each FLW destination.

The individual emissions linked to the baseline scenario, or their sources are detailed in Figure 6.

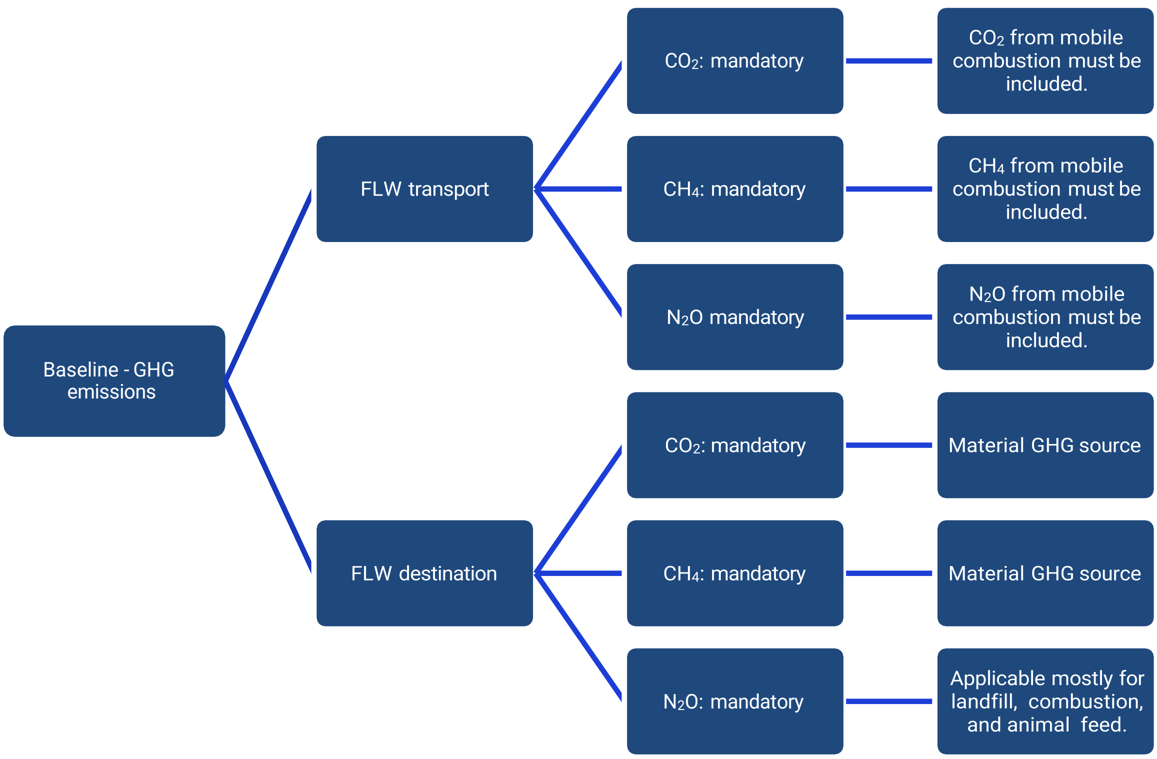


Figure 6. GHG emissions applicable for the baseline scenario.

The overall calculation for the baseline emissions is the sum of the transport, processing, and fugitive emissions for each of the end-of-life destinations that the FLW would have been sent to. The following equation details this calculation:

$$BE_y = \sum_j BE_{j,y} + BE_{Trans_{j,y}}$$

Where:

BE_y	Total baseline GHG emissions in year y (tCO_2e)
$BE_{j,y}$	Baseline emissions from the FLW destination j in year y (tCO_2e)
$BE_{Trans,j,y}$	Baseline emissions from transport of FLW flows to destination j in year y (tCO_2e)
j	FLW destination
y	Reporting year

In order to use these overall equations to calculate the emissions arising from the baseline scenario the following steps must be taken:

Step 1. Identify the FLW sources and FLW destinations.

Identifying and describing all FLW sources and destinations within the boundary of the food bank's operations is the first step. Following Figure 7, FLW will be divided according to the following sources: Agriculture, Wholesale Distributor, Food Manufacturer, Commodities or Wholesale Market, Retailer or Grocer and Food Service. Although this mostly matches the typical food supply chain detailed in Figure 3, food waste from human & public consumption is unlikely to be donated to food banks so this source has been excluded.

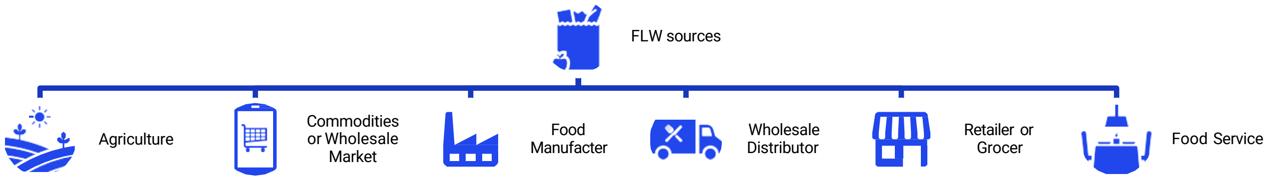


Figure 7. FLW sources.

In addition, FLW must be classified according to the hypothetical destination they would have reached if they had not been donated to the food banks. FLW destinations can include Co-digestion, Anaerobic digestion, Incineration, Landfill and Animal feed (the full list of destinations is in section 4).

A hierarchy must be followed to use the most accurate data when categorizing destinations of where the food would have ended had it not been donated:

1. Firstly, if there is primary data available (percentages by destinations) from the donators, that primary data must be used.
2. Alternatively, for food banks that are not able to gather primary data, national averages from reliable sources can be employed.
3. Lastly, for countries with lack of representative national averages, food banks must apply proxy estimates of either national averages from comparable countries, regional averages or global

averages from reliable sources.

One data base that provides percentage destinations at both a city and country level is the World Banks's "What a Waste Global Database" (The World Bank, 2024). However, this database does not provide specific waste rates for food or organic waste.

Step 2. Classify food types.

A robust food classification is important for minimizing the level of uncertainty in the calculations. Figure 8 below illustrates an example of selected food classifications chosen considering the type of foods commonly received and donated by food banks. This categorization is indicative, with specific food banks having their own classification of food, but any classification must be to a granular level of detail. The level of specificity must be justified by the organization.

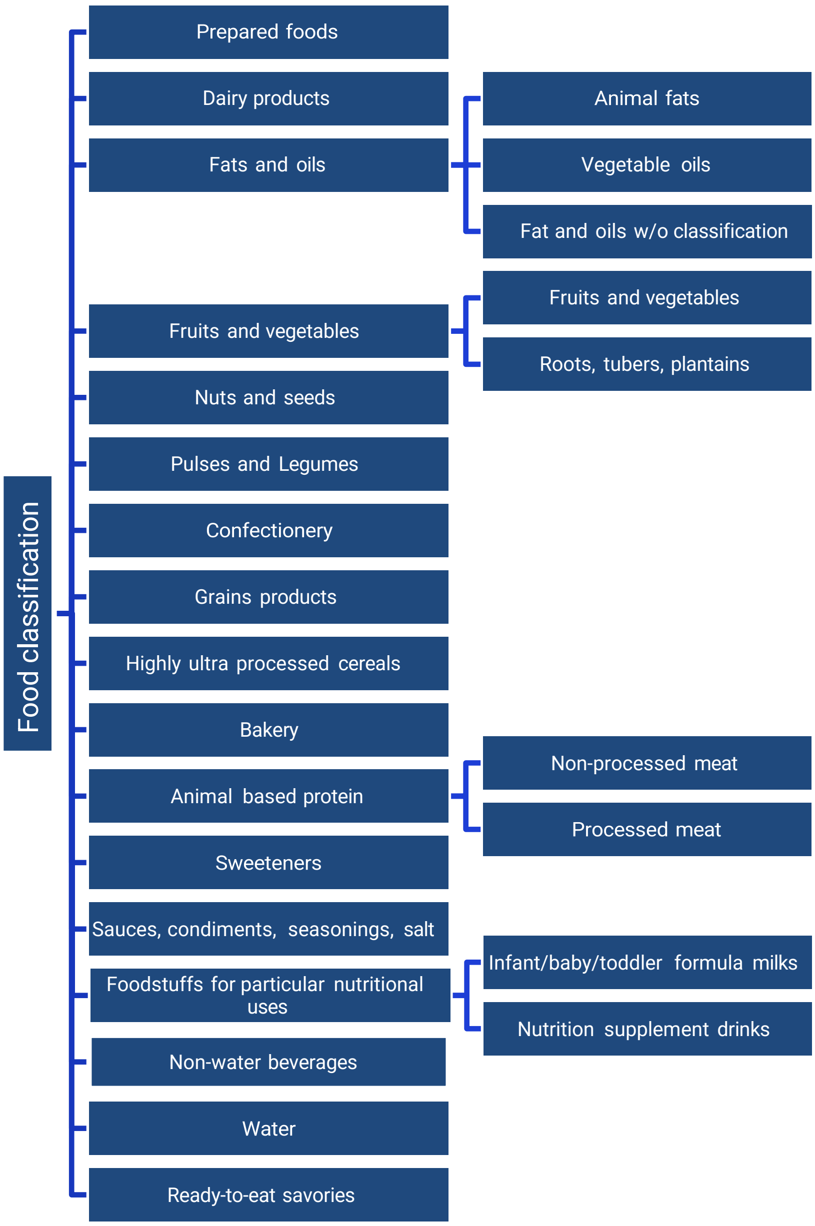


Figure 8. Food classification.

Step 3. Calculate the mean dry matter (DM) content of FLW flows using default data.

The emissions associated with the end-of-life of various food types can be calculated using the dry matter (DM) content of the food itself. This is due to the breakdown of organic matter into GHG emissions which occur because of the solid contents of the food as opposed to any water that the food may contain. In step 4, the dry matter content is used to calculate the resulting GHG emissions using emission factors that are provided in terms of kgCO2e per kg-DM.

One method of calculating the default dry matter (DM) of redistributed food is by using the USDA FoodData Central database (U.S. Department of Agriculture (USDA), Agricultural Research Service., 2023). This database provides the average water content of different food types, so the food groups you measure can follow the same classification from Step 2. Averages of food categories can be made with a representative enough sample of food items, e.g. if a food category is described as "Vegetables", best judgement should be used to find a representative sample of different vegetables to create an average dry matter content for vegetables. The water content is the inverse of the dry matter content of the food type.

$$DM_i = (1 - WC_i)$$

DM_i	Average dry matter content of food type *i*.
WC_i	Average water content of food type *i*.

Calculate the mean DM content on the FLW flows using the following equation:

$$DM_{j,y} = \sum_{i,j} DM_{i,j,y} \times MFI_{i,j,y} \times \frac{M_{FLW_{i,j,y}}}{M_{FLW_{j,y}}}$$

Where:

$DM_{j,y}$	Mean dry matter content of FLW flows going to destination j in year y (weight fraction, kg-DM/kg)
$DM_{i,j,y}$	Default mean dry matter content of food category i inside the FLW flow going to FLW Destination j in year y (weight fraction, kg-DM/kg)
$MFI_{i,j,y}$	Mass fraction of food category i, going to destination j, that is inedible (%)
$M_{FLWi,j,y}$	FLW flow (mass) pertaining to food category i going to FLW destination j in year y (tonnes)
$M_{FLWj,y}$	Sum of all FLW flows going to FLW destination j in year y (tonnes)
i	Food categories
j	FLW destinations
y	Reporting year

To ensure that the avoided emissions calculation is accurate, an average inedible food part factor of the food that has been recovered must be found. This can be done using the USDA FoodData database, as noted above, to ensure the calculated dry matter content only contains edible food and no inedible parts of the food. Retailers can also utilize the report on US grocery retail food inedible parts factors (ReFED, 2019), as the average inedible food part factor can be found for the appropriate food types.

Step 4. Calculate GHG emissions from FLW destinations.

The following equation is applied to calculate baseline emissions from FLW destinations, depending on the DM content (from step 3) and the specific emission factors of the end-of-life destinations below:

$$BE_{j,y} = M_{FLW_{j,y}} \times DM_{j,y} \times EF_{FLW_{j,y}}$$

Where:

$BE_{j,y}$	Baseline emissions from FLW destination j in year y (tCO_2e)
$M_{FLWj,y}$	Sum of all FLW flows going to FLW destination j in year y (tonne)
$DM_{j,y}$	Mean dry matter content of FLW flows going to destination j in year y (weight fraction)
$EF_{FLW_{j,y}}$	EF of the FLW destination j in year y (Table 1) (tCO_2e/t DM)
j	FLW destinations
y	Reporting year

To calculate GHG emissions it is always recommended to use primary data for emission factors where it is available; for all activity data such as amount of food, it is a requirement to use primary data. Calculating emission factors using primary data can be achieved by identifying the facilities and destinations that the FLW go to and collaborating with these facilities to find a specific emission factor.

In Table 1, several default emission factors (EFs) have been provided for end-of-life destinations, these EFs are globally weighted so they are not country specific. Therefore, they should be used in the absence of more accurate emission factors. It is advised that country or regional specific emission factors should be used instead of the values provided in Table 1.

The following emission factors have a unit of analysis of tonnes of dry matter. Dry matter is used instead of the other commonly used unit of tonnes of water content. Both units have benefits, as when calculating emissions from processes such as incineration it is useful to know the water content to get a more accurate footprint; however dry matter content is more accurate when calculating emissions from methane producing processes such as landfilling. As this methodology has a focus on the overall methane emissions, emission factors using dry matter content have been chosen.

When comparing the emission factors in Table 1 to other databases or calculated emission factors, make sure the units of analysis are the same and both utilize the dry matter content of the food.

Table 1. GHG emission factors for calculating baseline emissions.

(Verra, Quantis inc., Kai Robertson, 2023)

FLW destination	Emission factors (tCO_2e / t DM)	Comments	Methane proportion $MP_{FLW_{j,y}}$ [1]
Anaerobic digestion (wet)[2]	0.359	Includes fugitive CH4 and N2O emissions from the digester and from digestate application on land. Excludes avoided emissions from co-product offsets and transportation.[3]	54%
Anaerobic digestion (dry)[1]	0.457		
Composting	0.392	Includes fugitive CH4 and N2O emissions. from composting. Excludes avoided emissions from co-product offsets and waste transportation.	80%
Incineration[1]	0.131	Includes non-CO_2 emissions from the combustion process. Excludes avoided emissions from co-product offsets and transportation	0%
Landfill without flaring[4]	6.528	Excludes emissions from transportation	100%
Landfill with flaring[3]	2.222	Excludes avoided emissions from co-product offsets and transportation	100%
Open burning	0.141	Includes non-CO2 emissions from the combustion process. Excludes emissions from transportation	83%
Open dump	2.285	Excludes transportation emissions	100%
Sewer / Wastewater	0.418	Includes emissions from electricity consumption for wastewater treatment and subsequent anaerobic digestion process	15%
Animal feed	0.0791	Depending on the FAO geographical area (see Annex) average emission factors including manure, enteric fermentation, and post farm activities	90%

All emissions that may occur in the future outside of the reporting period due to the end-of-life destination should be considered. This includes all future methane emissions from landfills or other destinations that are emitted over time due to the degradation of organic matter.

To calculate the total processing emissions for all the FLW destinations, sum all the different FLW destination emissions together.

[1] Proportions calculated using Ecoquery from Ecoinvent 3.10, or through modelling using the below references.

[2] Adapted (converted from short wet tons to kg DM) from the emission factors in the EPA report (EPA, 2023); incineration EF from Exhibit 1-44, and wet and dry anaerobic digestion EF from Exhibit 1-52 and Exhibit 1-51 respectively. Discount factors of 0.8 have been applied.

[3] The avoided emissions due to the displacement of synthetic fertilizer has not been taken into account due to the uncertainty of the relationship.

[4] Adapted from CDM TOOL04. (CDM, n.d.) Applied MCF value of 1 (landfill with and without flaring). Global warming potential of biogenic methane from latest IPCC AR6 report (IPCC, 2022). Average flaring factor of 0.61 applied (EPA, 2023). Adapted from CDM TOOL04 (CDM, n.d.). Discount factors of 0.8 (landfill without flaring) and 0.7 (landfill with flaring) applied.

Step 5. Calculate GHG emissions from FLW transport.

For the baseline scenario, not only are the emissions due to processing or degradation of food matter included, but also the transportation of the food from the FLW source to the processing site.

$$BE_{Trans_{j,y}} = D_{j,y} \times M_{FLW_{j,y}} \times EF_{trans.mode_{j,y}} \times 0.001$$

Where:

$BE_{Trans,j,y}$	Baseline emissions from transport of FLW flows to destination j in year y (tCO_2e)
$D_{j,y}$	Distance travelled of one journey for transport of FLW flows (source to destination) going to destination j during year y (km).
$M_{FLW,j,y}$	Sum of all FLW flows going to FLW destination j in year y (tonnes)
$EF_{trans,mode,j,y}$	Emission factor for transportation to destination j in year y ($kgCO_2e$/tonne.km). (If unknown mode of transport, a default value of 0.21457 may be used (based on the emission factor of a rigid HGV diesel truck – 50% laden). (UK BEIS, 2022)
m	Transportation mode
j	FLW destinations
y	Reporting year
0.001	Conversion factor (tonnes/kg), 1 $kgCO_2e$/tonne.km = 0.001 tCO_2e/tonne.km

If the truck used to transport the food is refrigerated, the emission factor used must reflect this. Primary data for distances must be used if known, however a reasonable estimate based on national sources or frameworks can be used. For example, in the UK waste related products travel on average 64.6km (UK Department for Transport, 2023).

To calculate the total transport emissions for all the FLW destinations, sum all the different FLW destination emissions together.

6.1.2. Project Scenario Calculation

Project activity emissions are those related to the food bank operations. The project emissions are calculated on an overall basis rather than per food category. They are calculated using the following equation:

$$PE_y = PE_{Trans.y} + PE_{Proc.y}$$

Where:

PE_y	Project GHG emissions in year *y* (tCO_2e)
$PE_{Trans.y}$	Project emissions from transportation to collect recovered food (Upstream transport) and to deliver the recovered food (downstream transport) in year *y*, (tCO_2e)
$PE_{Proc.y}$	Project emissions from electricity consumption or other energy and/or material use for food banks operations in year *y*, (tCO_2e)
y	Reporting year

Step 1. Calculate transport related GHG emissions.

This step may consider the distance travelled or fuel consumed in the transportation of the food to the food bank, as well as delivering the recovered food when transport is controlled by the food bank. If the truck used to transport the food is refrigerated, the emission factor used must reflect this.

The transport emissions are calculated using the following equation:

$$PE_{Trans_y} = \sum_m D_{m,y} \times M_{RFF\,m,y} \times EF_{Trans.mode_{m,y}} \times 0.001$$

Where:

$PE_{Trans,y}$	Project emissions from transportation to collect recovered food (Upstream transport) to the food bank and to deliver the recovered food (downstream transport) in year *y*, (tCO_2e)
$D_{m,y}$	Distance travelled by transport mode *m* for the collection of recovered food flows going from the FLW source to the food bank during year *y* (km)
$M_{RFF\,m,y}$	Sum of recovered food going from the FLW to the food bank by transport mode *m* during year *y*. (tonnes)
$EF_{trans.mode}$	Emission factor from transportation mode m in year y ($kgCO_2e$ / tonne.km). The emission factors per transport mode and vehicle type may be taken from DEFRA´s latest GHG conversion factors. (If unknown, a default value of 0.21457 may be used (based on the emission factor of a rigid HGV diesel truck – 50% laden). (UK BEIS, 2022)
0.001	Conversion factor (tonnes/kg)
m	Transport mode
y	Reporting year

Food banks must determine distances between the FLW source to the food bank to correctly calculate transport related emissions, as well as knowing the transport mode, vehicle type between the sources and destinations when vehicles are controlled or owned by the food bank. If the food collected or delivered was transported through a third party and the distance data is unable to be obtained, a reasonable default distance may be used. This should consider the area and range the food bank serves. A representative sample may be taken of the incoming and separately of the outgoing transportation to find a conservative estimate for the distance travelled to and from the food bank. This average can be used to extrapolate transport distances across all journeys.

Step 2. Calculate processing related GHG emissions.

This includes emissions associated with the processing of recovered food flows $M_{RFF\ m,y}$, as well as the project emissions from fossil fuel consumption. All the emissions associated with activities detailed below are summed together to calculate the overall processing related emissions of recovering the food.

GHG emissions linked to project activity (the operation of the food bank) come from:

- The electricity consumption of the food bank.
- The fuel consumption of the food bank.
- The refrigerants leaked by the food bank.
- Other emissions due to the consumption of additional materials, such as any additional packaging that may be required.

$$PE_{Proc_y} = PE_{EC_y} + PE_{FC_y} + PE_{RL_y} + PE_{AM_y}$$

Where:

PE_{Proc_y}	Project emissions from electricity consumption or other energy and/or material use for food banks operations in year *y*, (tCO_2e)
PE_{EC_y}	Project emissions from electricity consumption associated with the processing of recovered food flows ($M_{RFF\ m,y}$) in year y (tCO2e).
PE_{FC_y}	Project emissions from fossil fuel consumption associated with the processing of recovered food flows ($M_{RFF\ m,y}$) in year y (tCO2e).
PE_{RL_y}	Project emissions from refrigerant leaks associated with the processing of recovered food flows ($M_{RFF\ m,y}$) in year y (tCO2e).
PE_{AM_y}	Project emissions from the consumption of additional materials needed for processing and delivering the new food product (e.g., packaging) in year y (tCO2e).
y	Reporting year

Project emissions for electricity consumption, other fuel consumption or refrigerant leaks must be calculated using the GHG Protocol corporate standard (Greenhouse Gas Protocol, 2001).

Additional minor ingredients (such as food additives, preservatives, etc.), may be excluded from project emission calculations where they comprise less than 1 percent of the recovered and processed food mass. See equation below for methodology. Material emission factors can be found through the UK material emission factor database (UK BEIS, 2022).

Step 3. Calculate leakage GHG emissions.

The leakage emissions of a project account for the wasted food that may occur at the project itself; the leakage from discarded food by people served is not included within this boundary.

$$LE_y = \sum_m \left((M_{W,S_{m,y}} + M_{W,T_{m,y}}) \times DM_{m,y} \right) \times EF_{FLW_y} \times 0.001$$

Where:

LE_y	Leakage emissions from wasted recovered food from food bank operations, in year *y*, (tCO_2e)
$M_{W,S_{m,y}}$	Mass of recovered food wasted on site, by food category *m*, in year *y*, (kg)
$M_{W,T_{m,y}}$	Mass of recovered food wasted during transport, by food category *m*, in year *y*, (kg)
$DM_{W_{j,y}}$	Dry matter content of the wasted recovered food by food category m, in year *y*, (kg-DM/kg)
EF_{FLW_y}	Emission factor for FLW destinations in year y ($kgCO_2e$/kg-DM)
0.001	Conversion factor (tonne/kg)
m	Food categories
y	Reporting year

The mass of recovered food wasted during transport can be assumed to be included within the total leakage mass if it is unknown how much has been wasted during transportation compared to how much has been wasted at the food banks.

The mass of food wasted can be split into the individual food categories if this data is available. If this information is unknown then the wasted food can be a representative of the overall food recovered by the project, and the weighted average DM content can be applied to this mass.

The food waste destinations from the project should be known, if known then use the corresponding emission factor in. If not use the following equation and the results from Section 6.1.1 to find the Emission factor for FLW destinations in year y (kgCO2e/kg-DM) (EF_{FLW_y}).

$$EF_{FLW_y} = \frac{BE_y}{M_{FLW_y} \times DM_y}$$

Where:

EF_{FLW_y}	Emission factor for FLW destinations in year y ($kgCO_2e$/kg-DM)
BE_y	Total baseline GHG emissions in year y (tCO_2e)
M_{FLW_y}	Total mass of recovered food in year *y*, (kg)
DM_y	Average dry matter content of all recovered food in year y, (kg-DM/kg)
y	Reporting year

If the suppressed demand concept is integrated into the methodology, then leakage by people served must also be calculated, as the traceability of the food is extended to the people served by default of calculating the suppressed demand baseline. Follow the same methodology as described above.

6.2. SDG 2: Zero hunger

The number of people facing hunger and food insecurity has been rising since 2015, with the pandemic, conflict, climate change and growing inequalities worsening the situation. To achieve zero hunger by 2030, coordinated action and transformation of the food systems is a must (UN, 2023).

As emphasized by The Global Food Banking Network (GFN), food banks play a central role in building sustainable food systems and supporting the resilience of communities (GFN, 2023).

Figure 9. SDG 2: Zero hunger: most relevant SDG targets.

Food banks contribute to ensuring the nutrients of food products that have already been generated are not wasted and remain in the value chain for human consumption.

The loss and waste of food has associated costs in monetary and environmental terms, but the most impactful cost is in terms of the nutritional value each food holds. When food is wasted, the nutrients it contains are also wasted.

The selected indicators to monitor contributions to SDG 2 are the number of people served by the food bank and the weighted average nutritional contribution (%).

As the assessment boundary as defined in section 5 excludes the activities of people served, the nutritional contribution of food provided by food banks to meet SDG 2 does not refer to people served consuming food. The methodology aims to demonstrate increased food access and availability of energy and nutrients in relation to recommended daily requirements under a hypothetical equitable distribution of food.

6.2.1. People served by the food bank.

As mentioned above, food banks provide nutrition to individuals in communities that vary greatly. In addition to the nutritional cost of food, food wastage implies a significant social cost, contributing to food insecurity by reducing the amount of food available for human consumption.

The food bank model allows the different nutrients in food (that have already generated an economic and environmental impact during their production) to be consumed by the most vulnerable people in the communities that benefit from food banks.

The general monitoring indicator is the total number of people served by the food banks. In addition, the following sub-indicators would be monitored to evaluate the diversity and vulnerability of the communities:

- Age groups by gender

- Children (0-18 years)
- People between 19 and 59 years old
- Adults over 60 years old

6.2.2. Weighted average nutritional contribution (%).

The nutrient content of foods establishes their nutritional value, specifically the quantity and quality of nutrients provided. Nutrients are substances essential for the functioning, growth, and development of human beings. Some of their purposes include repairing tissues, regulating body processes, and being used as energy. Nutrients are divided as follows:

- **Macronutrients** - Proteins, fats, carbohydrates, and fiber are the nutrients that are required in greater quantities and have specific functions; they are the ones that provide the essential energy to maintain physiological functions, daily activities, development, and growth.

- **Micronutrients** - Vitamins and minerals are the nutrients that are required in smaller amounts and are necessary for specific functions within the body.

The weighted average nutritional content considers the total quantities delivered per food category, their respective nutritional contribution and estimates the availability of energy and nutrients per beneficiary.

The total delivered quantity (kilograms) per food category is important, as in cases where an item is consistently received, its corresponding category would be higher.

To calculate the weighted average nutritional (%) contribution the following steps must be followed.

Step 1. Consider the required energy and nutrient daily intake by age and gender groups.

Food banks must consider the energy and nutrients requirements per day by age and gender groups that are published by the WHO/FAO and The Institute of Medicine.

Table 2. Energy and nutrients daily requirements and by age and gender groups ($Nr_{n,a,d}$).

Age and gender group	Energy	Carbohydrates 55% total kcal	Proteins 15% total kcal	Fats 30% total kcal	Vitamin A *(ug)*	Vitamin C *(mg)*	Zinc (mg/día)	Iron (mg/día)	Calcium (mg/día)
Male < 18 years	2036	280	76	68	556	41	12,9	10,9	900
Male 18 to 60 years	2764	380	104	92	900	87	14,0	13,7	1000
Male > 60 years	2250	309	84	75	900	75	14,0	13,7	1300
Female < 18years	1754,5	241	66	58	511	39	11,9	12,83	1300
Female 18 to 60 years	2764	380	104	92	700	72	9,8	29,4	1000
Female > 60 years	2050	282	77	68	700	60	9,8	11,3	1300
Gender unknown <18 years	1895	261	71	63	533	40	12,4	11,9	900
Gender unknown 18 to 60 years	2507,1	345	94	84	800	79	11,9	21,6	1000
Gender unknown >60 years	2150	296	81	72	800	68	11,9	12,5	1300

Where:

Carbohydrates	$Carbohydrates\ (grams) = Energy\ (kcal) \times 0.55\ \times \frac{1\ gram}{4\ kcal}$
Proteins	$Proteins\ (grams) = Energy\ (kcal) \times 0.15\ \times \frac{1\ gram}{4\ kcal}$
Fats	$Fats\ (grams) = Energy\ (kcal) \times 0.30\ \times \frac{1\ gram}{9\ kcal}$

Step 2. Consider the energy and nutrients content by food categories.

Food banks are required to consider the energy and nutrient content by food category (provided in the Table 3 for 100 grams of each food category).

Table 3. Average energy and nutrient content by food categories ($Ni_{c,n}$)**.**

Food Categories		Macronutrients				Micronutrients				
		Energy (Kcal)	Carbohydrates (grams)	Protein (grams)	Fats (grams)	Vitamin A (ug/RAE)	Vitamin C (mg)	Zinc (mg)	Iron (mg)	Calcium (mg)
1	Prepared food	208.46	20.21	8.42	9.62	41.08	2.93	0.97	1.11	63.89
2	Dairy products	205.25	6.84	14.19	13.44	130.75	1.13	1.62	0.26	405.44
3	Fats and oils	846.4	0.13	0.16	90.53	245.47	0.03	0.02	0.01	5.05
3.1	Fats	852.88	0.01	0.2	84.95	275.88	0	0.03	0.01	6.38
3.2	Oils	887.00	0.00	0.01	99.89	0.00	0.00	0.01	0.01	0.25
4	Fruits and vegetables total	68.83	15.8	1.9	0.4	90.84	25.18	0.35	0.96	40.4
4.1	Fruit and vegetables	42.66	9.41	1.87	0.4	142.9	35.4	0.4	1.18	63.4
4.2	Roots, tubers and plantain	95.00	22.26	1.90	0.34	38.76	14.94	0.31	0.73	17.41
5	Nuts and seeds	588.70	16.24	22.82	52.99	4.20	1.54	5.7	6.12	178.10
6	Pulses and Legumes	355.49	45.59	25.94	2.80	4.41	4.17	3.78	6.71	132.13
7	Confectionery	236.07	48.71	1.97	4.23	39.36	4.26	0.27	0.26	66.43
8	Grains/ grain products	354.98	73.05	10.56	2.60	3.48	0.16	2.27	3.19	31.13
9	High ultra processed cereals	395.18	67.39	9.06	10.48	44.00	3.13	2.49	7.49	36.06
10	Bakery	356.33	53.35	7.14	12.74	30.05	0.22	0.78	2.49	71.05
11	Animal based	161.03	0.97	17.51	9.52	126.00	3.23	1.58	2.58	35.87

Food Categories		Macronutrients				Micronutrients				
		Energy (Kcal)	Carbohydrates (grams)	Protein (grams)	Fats (grams)	Vitamin A (ug/RAE)	Vitamin C (mg)	Zinc (mg)	Iron (mg)	Calcium (mg)
	proteins total									
11.1	Protein	157.22	0.63	17.63		133.20	3.41	1.56	2.68	37.44
11.2	Processed meat	298.28	2.95	15.96		8.94	0.99	2.24	1.43	44.56
12	Sweeteners	366.30	95.45	0.08	0.08	0.00	0.17	0.06	0.15	2.25
13	Sauces, condiments and spices	158.78	21.44	3.18	7.00	14.88	2.62	0.55	1.29	31.22
14	Foodstuffs for particular nutritional uses	91.33	10.66	3.27	4.07	94.72	11.03	5.22	1.39	88.00
15	Beverages: Soda or sugary drinks	31.62	7.35	0.27	0.18	5.41	3.88	0.08	0.13	14.40
16	Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.20
17	Savouries ready to eat	469.00	60.38	7.46	26.00	15.83	8.23	1.20	1.88	56.17

Step 3. Monitor the quantity of food delivered.

Food banks must monitor the quantity of food delivered by food category, distribution days, and how many people attended.

$$Fd_{c,dd,p}\left(\frac{grams}{person \times day}\right) = \frac{\left(\frac{Fd_c\ (\text{kg})}{1{,}000\ \text{grams}}\right)}{dd\ \times p}$$

Where:

Fdc,p,dd	Food delivered by food category c, distribution day dd and attendee persons p
Fd_c	Food delivered by food category *c*
c	*Food category*
Dd	Distribution days, considering the operations for each food bank (365 if food is distributed throughout the entire year, 260 if food is delivered Monday-Friday)
p	Attendee persons

Step 4. Calculate the energy and nutrient content by food category.

Food banks must calculate the energy and nutrient content by food category.

$$Ni_{c,p,dd,n}\left(\frac{nutrient\ units}{person \times day}\right) = Fd_{c,dd,p}\left(\frac{grams}{person \times day}\right) \times \frac{Ni_{c,n}}{grams}\left(\frac{nutrient\ units}{grams}\right)$$

Where:

$Ni_{c,,n}$	Energy and nutrient contribution by food category c, and nutrient n
Fd_c	Food delivered by food category c,.
$Ni_{c,n}$	Energy and nutrient contribution by food category c and nutrient n Values reported in Table 3)
c	Food category
n	Nutrient (including both macro and micronutrients)

Step 5. Calculate the percentage of energy and nutrient requirements of each age and gender group available

Food banks must calculate the percentage of energy and nutrients requirements of each age group available in the distributed food.

$$Ni_{dd,n,a}(\%) = \frac{Ni_{c,p,dd,n}\left(\frac{nutrient\ units}{person \times day}\right)}{Nr_{n,a,d}\left(\frac{nutrient\ units}{person\ \times day}\right)} \times 100$$

Where:

$Ni_{dd,n,a}$	Energy and nutrient contribution by distribution days dd, nutrient n and age and gender group a
$Ni_{c,p,dd,n}$	Energy and nutrient contribution by food category c, attendee person p, distribution days dd, and nutrient n
$Nr_{n,a,d}$	Energy and nutrient daily requirements by nutrient n, age group a, and day d(Values reported in Table 3)
c	*Food category*
dd	Distribution days, considering the specific operations for each food bank (365 if food is distributed throughout the entire year)
p	Attendee persons
n	Nutrient (including both macro and micronutrients)
a	Age group
d	Day

Step 6. Weight the daily energy and nutrients requirements of the population served.

Food banks must calculate the percentage of daily energy and nutrient requirement according to the composition of the population served, based on the number of people served in each age and gender group.

$$Niwa_{dd,n}(\%) = \frac{\sum_n Ni_{dd,n,a}(\%) \times pa\ (persons)}{p\ (persons)}$$

Where:

$Niwa_{dd,n}$	Weighted averages of energy and nutrient contribution by distribution days dd, and nutrient n
$Ni_{dd,n,a}$	Energy and nutrient contribution by distribution days dd, nutrient n, and age and gender group a
pa	Attendee persons by age and gender group
p	Attendee persons
dd	Distribution days, considering the specific operations for each food bank (365 if food is distributed throughout the entire year)
n	Nutrient (including both macro and micronutrients)
a	Age group

Step 7. Calculate the general weighted average percentage of daily energy and nutrient content.

$$Niwa_{dd}(\%) = \frac{\sum_n Niwa_{dd,n}\ (\%)}{nn}$$

Where:

$Niwa_{dd}$	General weighted averages of energy and nutrient contribution by distribution days dd
$Niwa_{dd,n}$	Weighted averages of energy and nutrient contribution by distribution days dd, and nutrient n
nn	Nutrient number = 8
dd	Distribution days, considering the specific operations for each food bank (365 if food is distributed throughout the entire year)
n	Nutrient (including both macro and micronutrients)

The energy and nutrient contribution are defined as:

$$\frac{Total\ macronutrient\ (\%) + Total\ micronutrient\ (\%)}{8}$$

The collection period (internal) can be adjusted to better reflect how the food categories fluctuate over the year. If there is interest in understanding how the nutrient contribution fluctuates based on the types of food received, another frequency could be added to the methodology (i.e. monthly). However, to maintain consistency with the rest of the methodology and ensure that the nutrient contribution is representative, the final reporting period (external) must be a complete year.

6.3. SDG 8: Decent Work and Economic Growth

According to *The Sustainable Development Goals Report 2023* (UN, 2023), projections indicate that global unemployment is expected to decrease further to 5.3% in 2023. However, this indicator is calculated as an average and there are populations that are more susceptible to unemployment for which the efforts to decrease unemployment and wage gaps are crucial.

8.5: By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value.

Figure 11. SDG 8: Decent Work and Economic Growth: most relevant SDG target.

Food banks generate employment opportunities. They usually have staff positions to manage day-to-day operations, coordinate volunteers, handle administrative tasks, and work on community outreach. Some common employment opportunities within food banks may include roles such as:

- Administrative staff
- Warehouse staff
- Logistics and distribution staff
- Drivers
- Maintenance staff
- Fundraising and development staff
- Public relations and marketing staff
- Nutritionists or dietitians

The selected indicator to monitor the contribution to SDG 8 is the FTE (full-time equivalent).

6.3.1. FTE (Full-Time Equivalent).

FTE is a standardized way to compare the total employment generation for full- time and part-time work. The equation to calculate the FTE is explained below.

$$FTE = Full - time\ employees + \left(\frac{Total\ hours\ worked\ by\ part - time\ employees}{Standard\ number\ of\ hours\ worked\ by\ a\ full - time\ employee}\right)$$

Where:

Total hours worked by part-time employees: Sum of the hours worked by total part-time employees (i.e. two part-time employees who each work 20 hours per week, will sum to 40 hours).

Standard number of hours worked by a full-time employee: The standard number of hours for a full-time employee may vary by country and organization. Common standards include 40 hours per week, but some places may consider a different number of hours as full-time.

Finally, FTEs can optionally be disaggregated by gender if the food bank monitors employment by gender.

$$FTE = FTE_{female} + FTE_{male}$$

Where:

FTE_{female}	Full-Time Equivalent positions for females
FTE_{male}	Full-Time Equivalent positions for males

6.4. SDG 12: Responsible Consumption & Production

As part of the Champions 12.3 call to global action of food loss and waste, it states that "*Governments should include food loss and waste reduction into their enhanced Nationally Determined Contributions to the Paris Agreement on climate change. Likewise, companies should include food loss and waste reduction in their corporate greenhouse gas emission reduction strategies, commitments to Science-Based Targets, and other climate programs.*" The work done by food banks as set out in this methodology inherently cuts down total food loss and waste.

It can be quantified by reporting the total mass of food loss and waste recovered (kg) in the reporting period, or by disaggregating this figure into the total mass per donation origin (e.g. retail, farm) to provide a separate total food loss and total food waste figure.

$$M_{FLW,y} = M_{FL,y} + M_{FW,y}$$

Where:

$M_{FLW,y}$	Total mass of food loss and waste redistributed in the reporting year, y.
$M_{FL,y}$	Total mass of food loss redistributed in the reporting year, y.
$M_{FW,y}$	Total mass of food waste redistributed in the reporting year, y.

6.5. Assigning SDG benefits to donors

The quantification of metrics to meet the various SDGs contained within this methodology can also be allocated to the donating organizations and companies that supply the food banks.

If the food bank tracks the specific food that each donor provides them with, in terms food mass by food type, then the equations above for SDG 13 and SDG 2 can be applied specifically to each donor. However, if this primary data is not available the following allocation method can be used for all SDG calculations detailed above.

$$SDG_{d,y} = \frac{M_{d,y}}{\sum M_{d,y}}$$

Where:

$SDG_{d,y}$	Proportion of the SDG quantification value assigned to donor, d, in the reporting year, y.
$M_{d,y}$	Mass donated to food bank by donor, d, in reporting year, y

7. Monitoring Approach

The monitoring approach sets out the primary data or use of default data that is required to be collected to fulfill the methodology. Primary data should be collected for the project activities that fall within the food bank's operational boundary; however, other pieces of primary data relating to the baseline activities may also be collected. There may be flexibility in the use of proxy or extrapolated data when primary data is required but this must be justified, and most project activity data points must be sourced from primary data.

For the defined reporting period, there are no requirements regarding the frequency of the data collection, only that the data is collected for the entire period chosen. However, when sampling is undertaken to use as proxy data or to calculate weighted averages, then this data must be collected at least every 6 months.

For the calculation of SDG 13, Table 4 details the data parameters, whether they relate to the baseline scenario, project scenario or both and whether primary data is required.

Table 4: Data requirements for SDG 13

Data Parameter	Baseline	Project	Primary data	Comment
Mass of food collected split by food category (e.g. 1000 kg bread)			Required	It is required that food quantity and classification data is primary data.
Location within supply chain food is collected from (e.g. Retail)			Required	It is required that the sourcing within the supply chain data is primary data.
Country the project is based in (e.g. Ecuador)			Required	It is required that the project country data is primary data.
Proportion of food that would be sent to each FLW destination (e.g. 20% landfill)			Recommended	It is recommended that food banks request information regarding which FLW destinations the food would have gone to. However, national averages or proxy country databases can be used to estimate the FLW destination proportions. Ideally this data would be split by location the FLW is sourced from.

The emission factor of each FLW destination (e.g. 2 kgCO2e/kg)			Recommended	It is recommended that specific emission factors of processing sites are requested. However, emission factors sourced for FLW destination in the project counties should be used if no primary data is available. If this data cannot be sourced, then use the default values found in section 6.1.1.

The distance travelled for each FLW destination (e.g. 100km)			Recommended	It is recommended that the distances FLW would have travelled to each FLW destination is used. However, proxy data can be used for distances. These can be sourced from national databases.
Distance travelled or fuel consume for transport of food to/from the food bank (e.g. 100km)			Recommended	It is recommended that either the fuel consumed, or distance travelled to transport the food to and from food banks is used especially if this transportation is completed by owned vehicles rather than third-parties. Total fuel consumed is preferred over distance travelled. If this data is not available then, a suitable proxy must be used. The methodology for calculating a suitable proxy can be found in Section 6.1.2, step 1.
Electricity consumption of the food bank (e.g. 500kWh)			Required	It is required that electricity consumption data is primary data.
Fossil fuel consumption of the food bank (e.g. 500kWh)			Required	It is required that fossil fuel consumption data is primary data.
Refrigerants leaked by the food bank (50kg refrigerant)			Required	It is required that refrigerant leakage data is primary data.
Other materials purchased in processing food for people served (e.g. 50kg plastic)			Required	It is required that consumption of additional material data is primary data.

For the remaining SDGs, the data points detailed in Table 5 are required.

Table 5: Data requirements for SDG 2, 8, 12

Data Parameter	SDG 2	SDG 8	SDG 12	Primary data
Amount of food collected split by food category (e.g. 100kg bread)				Required
People served by the food bank, split by beneficiary profile (e.g. 50 men under 18 years old)				Required
Nutrients and energy requirements of people served (e.g. 2100 kcal/person/day)				Required
Nutrient content of recovery food by food types (e.g. 20kcal/kg)				Required
Number of FTE at the food bank (e.g. 20 FTE)				Required

The following requirements are mandatory only if the suppressed demand concept has been applied to the methodology. Although the data requirements are minimal, the effort and resources to collect this information can be enormous, especially when the food bank is not set up to be able to trace the proportion of food that is consumed by the beneficiary or the baseline nutrient contribution of the people served. This concept should only be undertaken by food banks with mature data collection and traceability processes.

Table 6: Data requirements for suppressed demand

Data parameter	**Primary data**
Amount of food collected split by food category (e.g. 1000kg bread)	Requirement
People served by the food bank, split by age and gender (e.g. 50 men under 18 years old)	Requirement
Baseline nutrient and energy contribution of the people served (e.g. 1800 kcal/person/day)	Requirement
Proportion of food consumed by the people served (e.g. 95% food consumed)	Requirement

8. Additionality

This methodology demonstrates additionality because:

- Demand is usually higher than donations, so food banks must evaluate methods for being as fair and equitable as possible and prioritize maximizing the efficiency of the distribution operations.
- A large part of food bank activities is based on the assistance of volunteers (not paid).
- The existence of food banks is not legally required. However, food banking operations as part of recovery and redistribution programs are among the most cost-effective prevention and recovery solutions for food waste, shown in the marginal food waste abatement cost curve for the USA (FAO, 2019).
- Food bank operations are critical to achieve SDGs 2: Zero Hunger, and SDG 12: Responsible Consumption and Production, as the issue of reducing food loss and waste along production and supply chains represents a large source of donations. By reducing FLW and achieving SDG 12 goals, we will also be closer to achieving SDG 13: Climate Action by reducing end-of-life methane emissions.
- Due to the performance benchmarks used by food banks, which are usually NGOs, they are focused on hunger alleviation rather than profit.

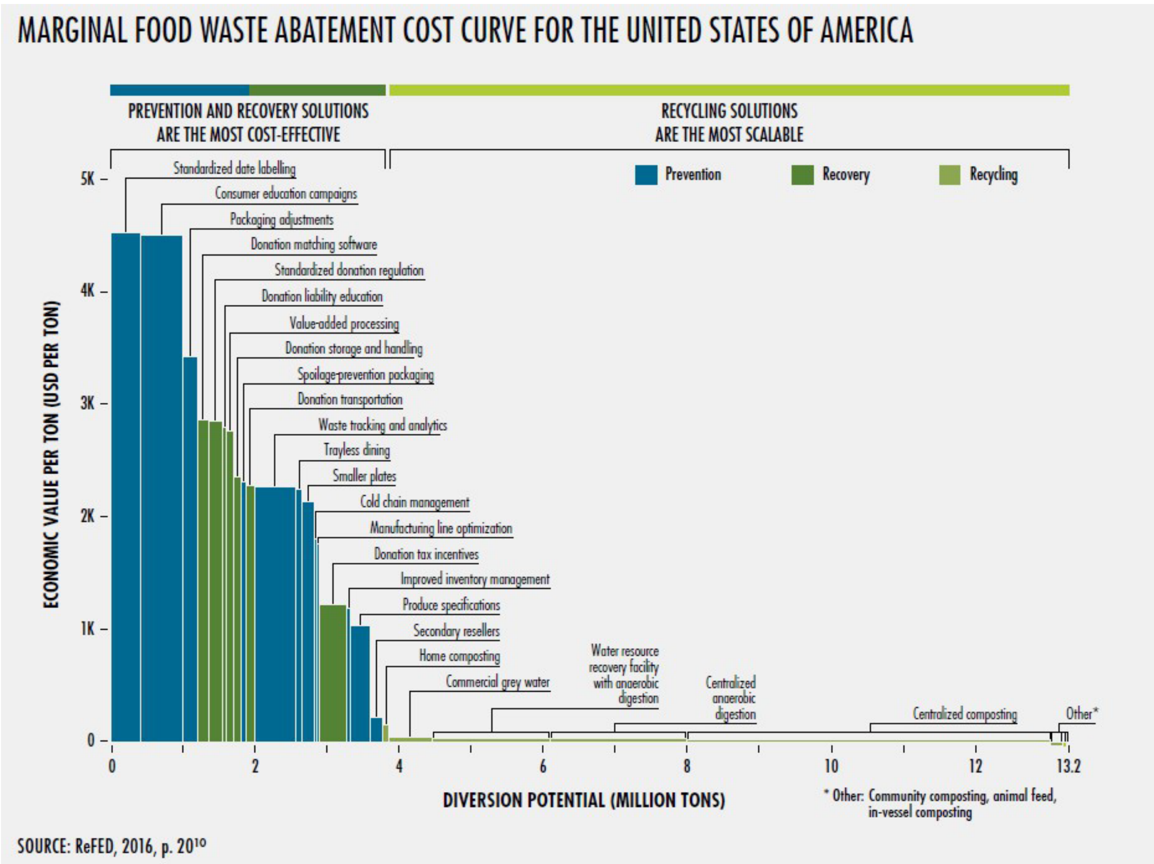


Figure 12: Marginal food waste abatement cost curve for USA, ReFED 2016

In this sense, the use of carbon offset programs would allow the setting up of new food banks and increase the capacity of existing food banks that reduce emissions from FLW. These are essential for cutting national or international food loss or food waste rates.

To demonstrate the increased capacity due to access to climate finance, an appropriate financial analysis and metric must be chosen for the baseline and planned figures. Using a metric such as tonnes of food redirected, or number of individuals food has been given to, would be appropriate. A baseline of this metric must be calculated using an average of the previous three years. Any planned expansions that increase capacity above this baseline must be demonstrated in detail with all expenses identified and demonstrating the expected increase of the chosen metric above the baseline. These expansions could be the opening of new food banks or improvements to the capacity of current food bank facilities.

Other forms of financial modelling to prove additionality past the increased capacity concept may also be developed. It can be argued that food banks are not financially viable on their own, and only with the multiple volunteers that assist in food banks are they able to survive. A financial analysis of the working hours of these volunteers (if they were paid employees) can be used as an argument that current operations wouldn't be functional without carbon finance to allow food banks to be sustainable, and not completely reliant on donations and volunteers.

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Appendix 1: Calculation of animal feed emissions

The emission factors above are calculated based on the Global Livestock Environmental Assessment Model (GLEAM model) from FAO (FAO, 2022). It is a modelling framework that simulates the interaction of activities and processes involved in livestock production and the environment. It operates at national, regional and global scales and is useful for the estimation of emission factors for the GHG emissions per kg of dried matter in FLW (kg_CO2eq/kg DM). The estimation of the emission factor was derived as follows:

1) From GLEAM, we estimated the animal average distribution per FAO region of the four types of livestock (cattle, sheep, goats, pigs and chickens).

2) From GLEAM (FAO, 2022), the emissions intensity (kg CO_2eq/kg protein) were selected, as per the boundary of the project. Since animal feed is considered to be downstream of the food donors value chain, the attributable emissions considered on this methodology concentrate on **farm level**: enteric fermentation (CH_4), manure (CH_4 and N_2O) and post-farm (CO_2) level. Other non-downstream types of emission sources (feed and land use change) and negligible on-site sources (direction-farm energy and embedded on-farm energy) were discarded.

3) Moreover, food banks may not be aware of the type of production system or type of animal whose emissions are avoided. Therefore, the calculated emission factor assumes to come from emissions intensities from two types of animal production systems -mixed (for cattle, buffalo and sheep) and intermediate (for pigs)- out of eight[5], as they were thought to represent average systems. The limitation of this assumption is that there are regions whose main production system may not specifically fit this scheme and emission intensities could be over- or under-estimated.

4) Once emissions intensities (kgCO_2e/kg protein) were identified per region, type of animal, and production system, feed conversion ratios (Mottet, et al., 2017), were applied to transform the emissions intensities units to kgCO_2e/kg DM) DM = dry matter, which is usually the unit in which EF are provided.

[5] Grassland, mixed, backyard, feedlots, intermediate, industrial, layer and broiler

Appendix 2: Guideline on accounting for suppressed demand

The following text is taken from Annex 3 of "The Gold Standard Suppressed Demand Small-scale Methodology for Low GHG Food Preservation" (The Gold Standard Foundation, 2013).

Objective: The objective of this guideline is to allow for the adequate determination of the baseline emissions associated with a situation of suppressed demand. This is done in the following steps:

- Step 1: Procedure to determine cases of suppressed demand.
    - Sub-step 1a: Definition of the suppressed demand sub-step.
    - 1b: Identification of situation of suppressed demand sub-step.
    - 1c: Evaluation whether the project addresses suppressed demand.
- Step 2: Determination of the quantity to consider in suppressed demand.
- Step 3: Calculation of the "Baseline emissions for the food security suppressed demand" ($BE_{FS,SD,y}$).
    - Sub-step 3a: Determine the most likely type of food, which would have been consumed instead.

Step 1: Procedure to determine cases of suppressed demand.

Sub- step 1a: Definition of suppressed demand

Type of suppressed demand: Suppressed demand is the lack of food security and/or food preservation technology (if any) to achieve adequate quantity or quality to address local needs and demands outside the project boundary.

Definition of food security: "Food security, at the individual, household, national, regional and global levels [is achieved] when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life".

Sub-step 1.b: Identification of situation of suppressed demand

Suppressed demand for food exists where food security does not exist for part or all the year for the identified area in which the project is implemented. Project proponents shall therefore:

a) Select the geographic area in which the lack of food or food insecurity is to be determined.

b) Select an approach to demonstrate suppressed demand in the geographic area.

a) Selection of the geographic area in which the lack of the food security is to be determined Among others, project proponents shall select one of the following geographic areas:

a. G1: Single country

b. G2: Province (or group of provinces) within the country

c. G3: Any other nationally defined administrative sub-division of the country

d. G4: A community whose geographic scope is determined unambiguously by the project proponent.

b) Selection of the approach to demonstrate the situation of suppressed demand.

Among others, project proponents shall use one of the following approaches to establish suppressed demand in the geographic area:

D1: By establishing that the country scores below 35 points on the GFS (Global Food Security) index[6] at the time of validation of activity or programme, in any of the last 3 years. This can be established at a national, sub-national or project area level or through prevalence of undernourishment higher than 25% based on FAO data. The threshold used for defining undernourishment shall be the MDER[7] (Minimum Dietary Energy Requirement) expressed in kcal/person/day. This can be done at a national or project level; or

D2: If the host country has made an appeal to the International Federation of Red Cross and Red Crescent Societies on the prevalence of under-nourishment in last 3 years or the host country is listed as being under-nourished in the International Federation of Red Cross and Red Crescent Societies information on country plans and updates[8]; or

D3: By establishing that the area ranks as "Phase 2 (Stressed)" or higher on the IPC (Integrated Food Security Phase Classification), using the latest data[9] (survey conducted by the project participant or one or more existing secondary reliable or peer reviewed studies).

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[6] Many countries and areas within countries are prone to shortfalls in food at certain times and those are identified in the food security indices ref: http://foodsecurityindex.eiu.com/Index. The Global Food Security (GFS) index ranks countries with respect to food security. The index is an aggregation of availability, affordability, quality and safety of food. Food security refers to a household's physical and economic access to sufficient, safe, and nutritious food that fulfils the dietary needs and food preferences of that household for living an active and healthy life (ref: FAO Agricultural and Development Economics Division (June 2006). Food Security. Retrieved June 8, 2012.)

These countries are eligible as are areas in countries where the shortfall exists. To address food security on a daily basis will require 3 to 4 months reserve (ref: http://www.fao.org/docrep/W4979E/w4979e0a.htm#size of reserve)) as a priority, but also to address preserved food for trade (including export). For the sake of this methodology, any country scoring below 35 points on the GFS index is food insecure and projects or programmes in these countries has claim to emissions reductions in reducing the suppressed demand for food.

[7] The MDER (Minimum Dietary Energy Requirement) for the relevant country – as well as the prevalence of undernourishment based on FAO data can be retrieved at: http://www.fao.org/economic/ess/ess-fs/fs-data/ess-fadata/en/

[8] http://www.ifrc.org/en/publications-and-reports/appeals/

[9] The IPC scale and data can be retried from: http://www.fews.net/ml/en/info/pages/scale.aspx. The selected value of "scale 2" corresponds to the following defined criteria: "For at least 20 percent of households, food consumption is reduced but minimally adequate without having to engage in irreversible coping strategies. These households cannot fully meet livelihoods protection needs".

D4: Based on the WFP and FAO joint report on under-nourished areas and countries[10].

D5: No preservation process was applied in the pre-project situation, resulting in the decay of the foods or food storage waste. Both these situations result in local needs not being fully met.

Sub-step 1c: Evaluation whether the project addresses suppressed demand.

To demonstrate that the suppressed demand is addressed, projects would need to demonstrate that an increased amount of food is available for later consumption via one of the following:

A1: The project exports food resulting in an accumulation of currency reserves for the specific sake of food imports in periods of food shortage.

A2: The project applies a food preservation process to a defined quantity of food products to which no preservation process was applied in the pre-project situation, resulting in the decay of the foods. Such projects may include the expansion of the preservation capacity (quantity of food treated for consumption at a later date) or in the development of preservation of types of food products to which no preservation process was previously applied.

A3: The project prolongs the food shelf life (as defined in the methodology) in terms of improved quality of the preservation over time. This reduces food storage wastes[11] (as defined in the methodology).

A4: There is a reduction in food aid as a direct result of food preservation.

Explanation: the methodology includes expanding food preservation specifically by refrigeration volumes and/or drying capacity. The food product outputs may require different quality standards for local use and export markets. Relevant to preserved food availability is the quality of preserved food storage in terms of both temperature for refrigeration and preventing the contamination of food by dust, insects, rodents etc.

The following is relevant to the nutrition service level that the methodology addresses:

1. Fresh food for local consumption at the time of harvest (crops and fruit) and catching fish.
2. Food that is preserved to address food insecurity issues.
3. Food that is preserved for local consumption and export from community, area, or country.

There is no preservation in (1); there will be preservation in (2) and (3). In the case where food is preserved exclusively for local consumption to address food insecurity (2), a service level of the minimum nutrition values shall be utilized as a default value in the calculation of energy required for drying and/or refrigeration. In the case where food is preserved for local consumption and export (3), an ex-post approach to emissions calculations in the baseline shall be utilized using either the actual

[10] http://www.fao.org/publications/sofi/en/ Version 01.0

[11] FAO definition: Amount of the commodity in question lost through wastage (waste) during the year at all stages between the level at which production is recorded and the household, i.e. storage and transportation. Losses occurring before and during harvest are excluded.

energy used or the monitored quantity of food (either dried or raw) and default values for food preservation energy intensities.

The project leads to an increase in the food available by improving its preservation: Increased quality and quantity of food preserved will result in reducing suppressed demand for food as compared to the pre-project situation or increasing the dry/refrigerated food available either for local consumption or for trade. Two options present themselves.

a) The quantity of food that was previously left to decay without any transformation for later use undergoes a preservation process; or

b) The quality of preservation of a food type is improved compared to pre-project situation leading to an overall larger consumption (less waste of food in storage).

For (a) the extra preservation of food can contribute to reducing the suppressed demand in local consumption of food or can be preserved for trade (including export), which may require different specifications including moisture content and/or lower temperature.

For (b) the improved quality of preserved food will result in preserved food stocks lasting longer and being of a quality that makes the preserved food acceptable to export markets. Improved preservation and storage will reduce food losses due to rehydration and decay of dried food. Improved storage and refrigeration will also reduce losses due to insect and rodent infestation. The prolonged availability of food will contribute to reducing the suppressed demand in local consumption of food or can result in increased trade (including export). Fewer losses will result in fewer emissions incurred in the drying process.

Step 2: Determination of the quantity to consider in the suppressed demand for the scenario with lack of food security in baseline situation.

The quantity to consider in the suppressed demand should correspond to the food required to meet the desired nutrition value (2100kcal/person/day). Higher MSL's can be proposed in the context of project activities and will be evaluated on a case-by-case basis.

Step 3: Calculation of the "Baseline emissions for the food security suppressed demand"

Sub- step 3a: Determine the most likely type of food, which would have been consumed instead.

Key components of the World Food Programme (WFP) food basket are: "a staple such as wheat flour or rice; lentils, chickpeas or other pulses; vegetable oil (fortified with vitamin A and D); sugar; and iodized salt. Often these are complemented with special blended foods, such as Corn Soya Blend, that have been fortified with important micronutrients." (ref: https://www.wfp.org/nutrition/WFP-foodbasket). The Sphere Minimum Standard for nutrition can be found at http://www.spherehandbook.org/en/appendix-6/.

The method to determine which food would have made up the shortfall in nutrition is requesting local food aid agents to provide information on the types, quantity, quality, nutritional content, density and moisture content of food aid sent to the region of the project site. This typically would be a food basket of various components such as cereals, pulses, vegetable oil, corn/soya blends, sugar, salt etc.[1]The project participant may make use of the energy and/or GHG intensity of the basket. A conservative default may be used where the energy/GHG intensity is the same nutrition value (2100kCal/person/day) for the preservation of the primary food source in the project area. See Table 7 below.

The nutrition value, moisture content and density will allow for the emissions to be calculated based on nutrition value.

Table 7 below provides an example of some typical food aid types:

Table 7: Typical food aid specifications

Crop type	Emissions intensity per unit of dry mass (EI_k) tCO_2e/tonne-DM	Nutritional density kCal/tonne-DM $*10^6$	Moisture content (1 year) stored for transportation % m/m	Emissions intensity per nutrition unit (EI_k) $tCO_2e/kcal*10^{-6}$	Density for transportation (if volumes are required) $Tonnes/m^3*10^{-3}$
Winter wheat	0.6 (1)	3.59 (4)	13 (2)	0.17	673-769 (5)
Corn	0.48 (1)	4.15 (4)	13 (2)	0.12	760 (5)
Rice		3.81 (4)	13 (2)		577-753 (5)
Soya (1)	0.38 (1)	4.59 (4)	6-8 (3)	0.08	753 (5)

References cited in table:

Ref 1. http://www.sciencedirect.com/science/article/pii/S097308261000013X

2. http://books.google.co.za/books?id=qxBaufhXKoC&pg=PA23&lpg=PA23&dq=moisture+content+of+corn,+rice,+wheat&source=bl&ots=X3T3ENI3Qf&sig=B1Cl bbBd0Xc2Yd9uvbWyCToYstk&hl=en&sa=X&ei=uTdoUKCsKcmShgfVmIDwAw&ved=0CF8Q6AEwCQ#v=onepage&q=moisture%20content%20of%20corn%2C%20rice%2C%20wheat&f=false

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4. Derived from http://www.nal.usda.gov/fnic/foodcomp/Data/SR18/sr18.html in http://en.wikipedia.org/wiki/Staple_food 5: http://www.simetric.co.uk/si_materials.ht

[1] See sphere minimum standard ref: http://www.spherehandbook.org/en/appendix-6/.

ABOUT

The Global FoodBanking Network
Food banking offers a solution to both chronic hunger and the climate crisis. GFN works with partners in over 50 countries to recover and redirect food to those who need it. In 2023, our Network provided food to more than 40 million people, reducing food waste and creating healthy, resilient communities. We help the food system function as it should: nourishing people and the planet together.
For more information, visit foodbanking.org.

The Carbon Trust
The Carbon Trust is a global climate consultancy driven by the mission to accelerate the move to a decarbonized future. We have been climate pioneers for over 20 years, partnering with businesses, governments and financial institutions to drive positive climate action. From strategic planning and target setting to activation and communication—we turn ambition into impact. To date, our 400 experts have helped set 200+ science-based targets and guided 3,000+ organizations and cities across five continents on their route to Net Zero.

CONTACT

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