Evaluation method and data collection protocol

Deliverable D1.2

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CARE project summary

CARE (Circular consumption Activities to tRansform households toward material Efficiency) aims to empower consumer-citizens in European households in the transition to a circular economy (CE). The objective of CARE is to transform a total of 100 households in five European countries (Finland, Norway, Sweden, Germany, and Estonia) to circular model households. To achieve its aim, CARE will further develop, test and validate two pilots related to two critical material flows: food and clothing. They both have high potential for circularity at the household level. The CARE pilots will be implemented in five regions – both urban and rural - that are part of the Circular Cities and Regions Initiative (CCRI): Tampere, Asker, Gothenburg, Berlin, and Lääne-Harju. The pilots are based on the practice-theoretical approach, which goes beyond state-of-the-art by focusing on holistic, social and material aspects of everyday life instead of individualistic and awareness-raising interventions. The pilots will contain both customized, inclusive, and cost-free circular advisory services as well as food and clothing related interventions that target changes in consumption practices. CARE will make a strong contribution towards accelerating fair, inclusive and sustainable consumer-based transition to CE.

Summary

The CARE project addresses the pressing environmental challenges associated with food waste and clothing consumption. Food production is resource-intensive, requiring significant amounts of water and energy, and contributes to environmental issues such as global warming and eutrophication. Alarmingly, about one-third of global food production is wasted, with half of the food being wasted at household-level. Similarly, the fashion industry exacerbates environmental problems through increased production, shortened clothing use cycles, and pollution caused by chemicals and microplastics. The CARE project aims to address these issues by collaborating with households to promote circular consumption practices for food and clothing and thus reducing the environmental footprint of household food and clothing consumption. The project evaluates the effectiveness of its interventions through a life cycle assessment (LCA) based approach using the Product Environmental Footprint (PEF) method.

The evaluation methodology focuses on assessing the environmental and well-being impacts of the CARE project interventions. For food waste prevention, the functional units are the total mass volume (kg) of household food waste created (waste functional unit) and the total mass volume (kg) of household food waste prevented through each of the food waste reduction interventions (prevented waste functional unit). The system boundary is cradle-to-grave, covering all life cycle stages, including production, processing, retail, use, and end-of-life. The PEF method is used to assess environmental impacts, with a focus on categories such as climate change, acidification, eutrophication, and resource use. Data sources like Agribalyse, SpheraEcoinvent provide environmental impact factors for food products.

For clothing consumption and use, the functional unit is defined as "the acquisition, use and disposal of clothes over 1 year", ensuring comparability across households. The system boundary is also cradle-to-grave, encompassing raw material extraction to end-of-life treatment. Impact categories include climate impact, water deprivation, acidification, and toxicity, reflecting the environmental challenges of the textile industry.

In addition to environmental assessments based on data collected through surveying the participating households, the CARE project integrates well-being evaluations. It adopts the HDLB (Having, Doing, Loving, Being) model to measure well-being across multiple dimensions, including material needs, meaningful activities, social connections, and emotional health. Indicators such as the 8-item Flourishing Scale and satisfaction with living standards and financial situations are used, complemented by statements linking circular consumption practices to well-being.

Overall, the methodologies aim to provide a comprehensive understanding of the environmental and well-being impacts of the CARE interventions, ensuring that sustainable practices are implemented without compromising household well-being.

Glossary of abbreviations

EF	Environmental Footprint
EoL	End of Life
EU	European Union
GHG	Greenhouse Gases
LCA	Life Cycle Assessment
LCI	Life Cycle Inventory
LCIA	Life Cycle Impact Assessment
MS	Milestone
OEF	Organisational Environmental Footprint
PEF	Product Environmental Footprint
PEFCR	Product Environmental Footprint Category Rules
SDG	Sustainable Development Goal

Disclaimer

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1. Introduction

The production of food requires significant amounts of energy and resources, such as water and land. This contributes to environmental impacts, including global warming, acidification, and eutrophication. When food is wasted, the resources and energy invested in its production are wasted. It is estimated that worldwide one third of the food produced is discarded as food waste (Gustavsson et al. 2011), with 14% of global food production ending up as food waste before reaching the retail stage and 17% of produced food being wasted in households, food service and retail (United Nations Environment Programme 2021). On EU level, this equals 88 million tons of food waste per year, resulting in 186 Mt CO_2 eq (Scherhaufer et al. 2018). Households are responsible for about half of the total food waste in the EU (FUSIONS 2016). Thus, reducing household food waste contributes to the reduction of environmental impacts. This is in line with the Sustainable Development Goal (SDG) subgoal 12.3, which aims to cut per capita food waste from retailers and consumers in half by 2030 (SDG12 2022).

The acceleration of fashion cycles (Kleinhückelkotten et al. 2018) have resulted in increased clothing production and consumption, as well as a shortened use cycle for the clothing items (Ozdamar-Ertekin 2016). This is problematic as the production of textiles and clothing is associated with substantial greenhouse gas emissions, water consumption and pollution from chemicals and microplastics (Niinimäki et al. 2020). The use phase of clothing (e.g., washing, tumble drying) contributes to the environmental impacts as well (Allwood et al. 2006). To combat this issue, the EU strategy for sustainable and circular textiles aims to increase the circular use of clothing (e.g., through donation or re-use) and measures to extend the clothing use phase (e.g., through repair) (European Commission 2022). For this, consumers play a crucial role, as their decisions on whether and how many textiles they purchase, whether they choose durable materials and sustainably produced clothing items, and determining how and how long they use and how they dispose of their clothing directly impacts their clothing-related environmental footprint (Gwozdz et al. 2017).

The CARE project addresses these challenges by working together with households to develop and establish practices for changing their consumption practices towards circularity and reducing their environmental footprint. Consumers will be empowered in their efforts towards circularity of food and clothing consumption through:

- Participating in a co-creation process with other relevant actors for planning the advisory services and interventions
- Receiving customised and inclusive advisory services regarding circularity of food and clothing
- Participating in circular food and circular clothing interventions which target changes in the consumption practices of the participating households

To evaluate the effectiveness of the household-level interventions, an environmental assessment based on LCA and the PEF-method will be performed. The assessment will be performed both before and after the interventions have been implemented. This is done to determine whether the interventions in fact lead to increased material efficiency and thus reduce resource use and environmental impacts. A graphical overview of the CARE process is shown in Figure 1.

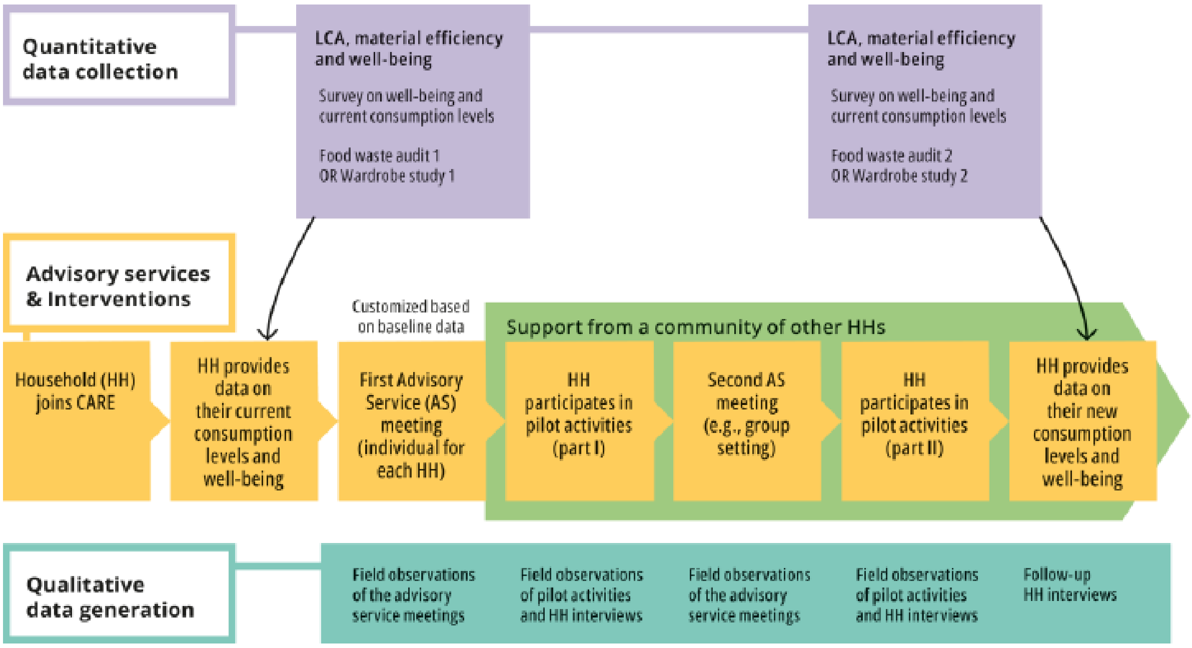

Figure 1: Graphical representation of the CARE project

2. Evaluation method

The assessment method for quantifying the environmental impacts of food waste prevention within the CARE project considers the entire life cycle and is based on life cycle assessment (LCA) and the environmental footprint (EF) method.

LCA is an evaluation method for determining the potential environmental impact of a product, service or other defined system. LCA is internationally standardised in the ISO standards 14040 and 14044 (ISO 14044 2006; ISO 14040 2006). A life cycle assessment study comprises four phases:

1. Goal and scope definition
2. Inventory analysis
3. Impact assessment
4. Interpretation

During the goal and scope definition the decision context and intended application of the study and the study results are determined. Furthermore, the product or system to be analysed is defined in accordance with the study goals. This includes the definition of the functional unit, reference flow, system boundaries, impact categories to be covered, as well as the sources of required data and information. During the inventory analysis, all data necessary for the evaluation is collected. These data are then used to quantify the environmental impacts during the impact assessment. During the interpretation stage, the assessment results are used to answer the questions posed in the goal and scope definition. A graphical representation of these four steps of LCA is shown in Figure 2 (European Commission Joint Research Centre 2010).

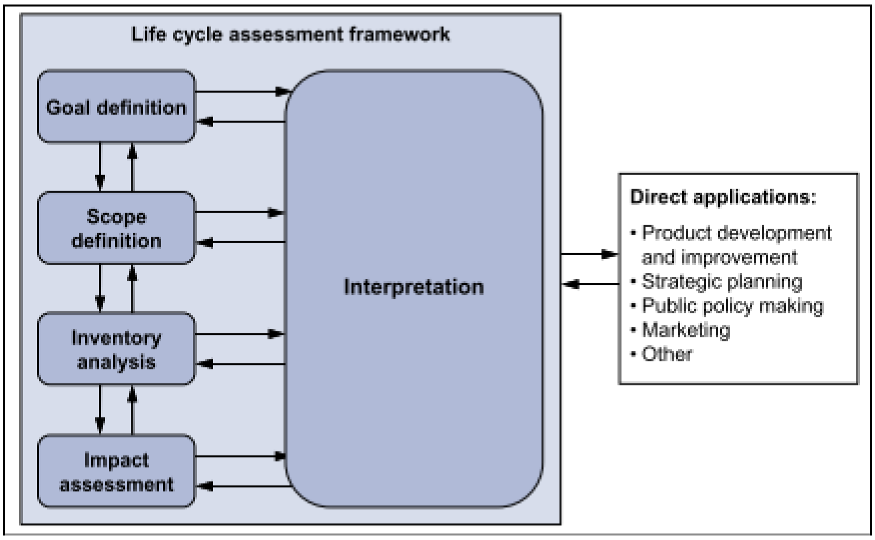

Figure 2: Graphical representation of the mandatory steps of LCA (European Commission Joint Research Centre 2010)

To provide a more standardises methodology for LCA of products and organisations (e.g., functional unit, system boundaries), the European Union created the EF method, which builds on the existing LCA methodology according to ISO 14040/44. The EF consists of the Product Environmental Footprint (PEF) and Organisation Environmental Footprint (OEF). The overarching aim of the PEF and OEF is to quantify the environmental impacts of goods, services and organisations while taking into account the entire value chain. The Product Environmental Footprint Category Rules (PEFCR) and Organisation Environmental Footprint Sector Rules (OEFSR) contain additional methodological requirements depending on the product group or sector, which ensure the consistency and relevance of the results (Damiani et al. 2022).

The PEF provides a standardised LCA methodology for the assessment of products and builds on the existing LCA methodology specified in ISO 14040 and ISO 14044 (European Commission 2018), as it also adds additional criteria for performing the assessment (see Figure 3). Examples for these additions are:

- The functional unit has to be defined through answering the questions what, how much, how long and how well.
- A set of 16 impact categories is proposed.
- Data modelling requirements and data quality requirements are proposed.
- An aggregated single score value of all impact category results shall be calculated using the weighting factors provided.[1]

[1] This step will not be performed during the environmental assessment of clothing consumption, as the PEFCR for clothing and apparel do not allow the use of single score results (Technical Secretariat of the PEFCR for Apparel and Footwear (2025).

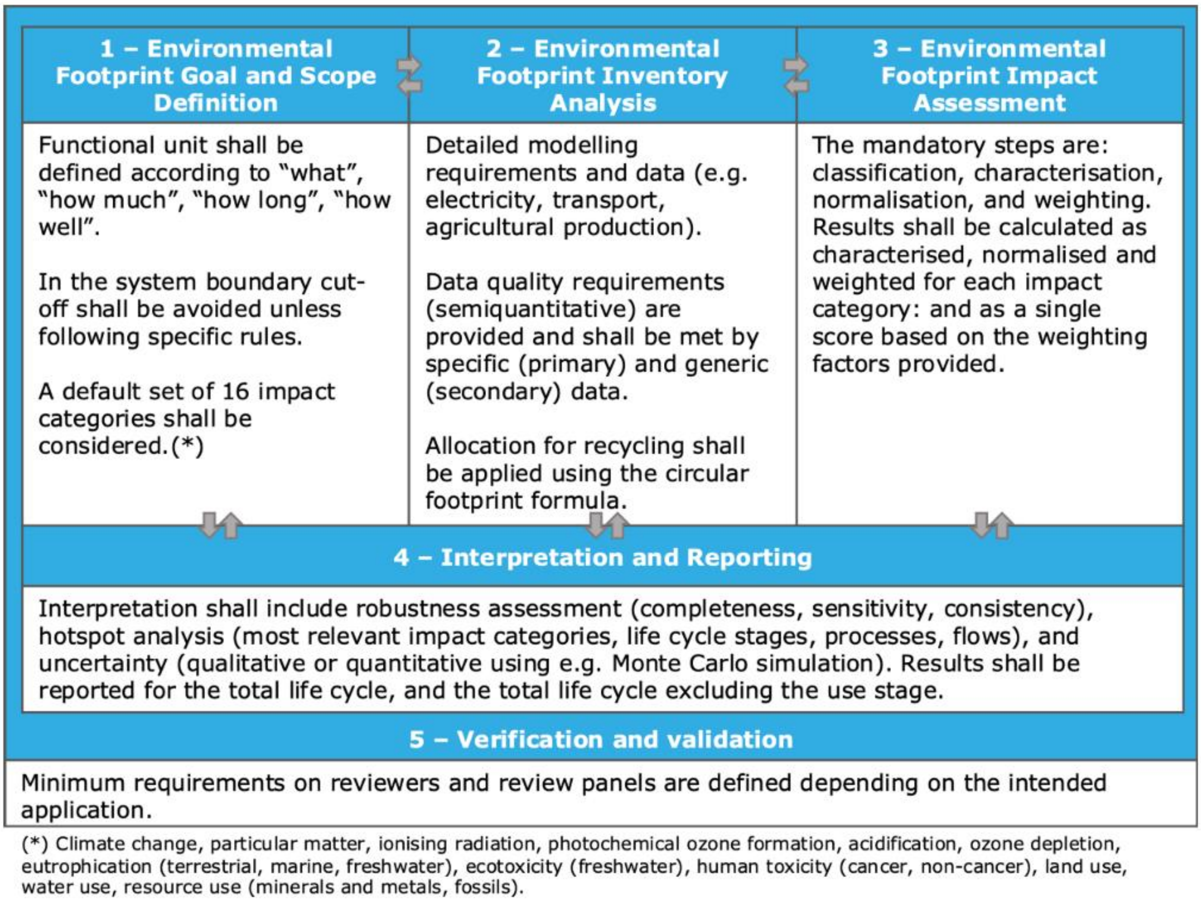

Figure 3: The steps of the environmental footprint (EF) assessment (the white boxes show requirements of the EF method which are added to the requirements of ISO 14040 and ISO 14044)(Damiani et al. 2022)

The PEF is the basis for the environmental assessment of food waste and clothing consumption and use within the CARE project. The methodology for this is elaborated in chapters 0 and 2.2. Currently, the PEFCRs available for food and beverages are the PEFCRs for dairy products and beer (The Brewers of Europe 2020; European Dairy Association 2025). There is a new PEFCR available for apparel and footwear, released in May 2025 (Technical Secretariat of the PEFCR for Apparel and Footwear 2025), These PEFCRs are the basis and guideline for the environmental assessment of food waste prevention and clothing consumption and use within the CARE project..

2.1 Food waste prevention

2.1.1 Functional unit for food waste prevention

The functional unit defines the qualitative and quantitative aspects of the function and/or service provided by the evaluated product (European Commission 2021). The reference flow is the amount of product which is needed to provide the defined function (Damiani et al. 2022). According to the EF method, the functional unit shall be defined as:

- **What**: the function or service provided
- **How much**: the extent of the function or service
- **How long**: the duration or lifetime
- **How well**: the expected quality level (Damiani et al. 2022)

The functional unit for food products is by default mass-based or volume-based. However, when justified by the goal of the study, additional functional units can be selected (e.g. nutritional value provided) (European Dairy Association 2025). As such functional units are of limited usefulness in prevention-oriented LCAs, Gentil et al. (2011) propose the introduction of a functional unit consisting of two flows: a waste functional unit (the amount of waste generated) and a prevented waste functional unit (the amount of waste prevented). The mass of waste (both generated and prevented) is equal in both scenarios and the prevented waste flow has no environmental burdens and is not disposed of in the waste management system. This is shown in Figure 4. Based on this approach, the functional units for the environmental impact assessment of food waste prevention were defined as:

- Waste functional unit: total mass volume (kg) of household food waste created
- Prevented waste functional unit: total mass volume (kg) of household food waste prevented through each of the food waste reduction interventions

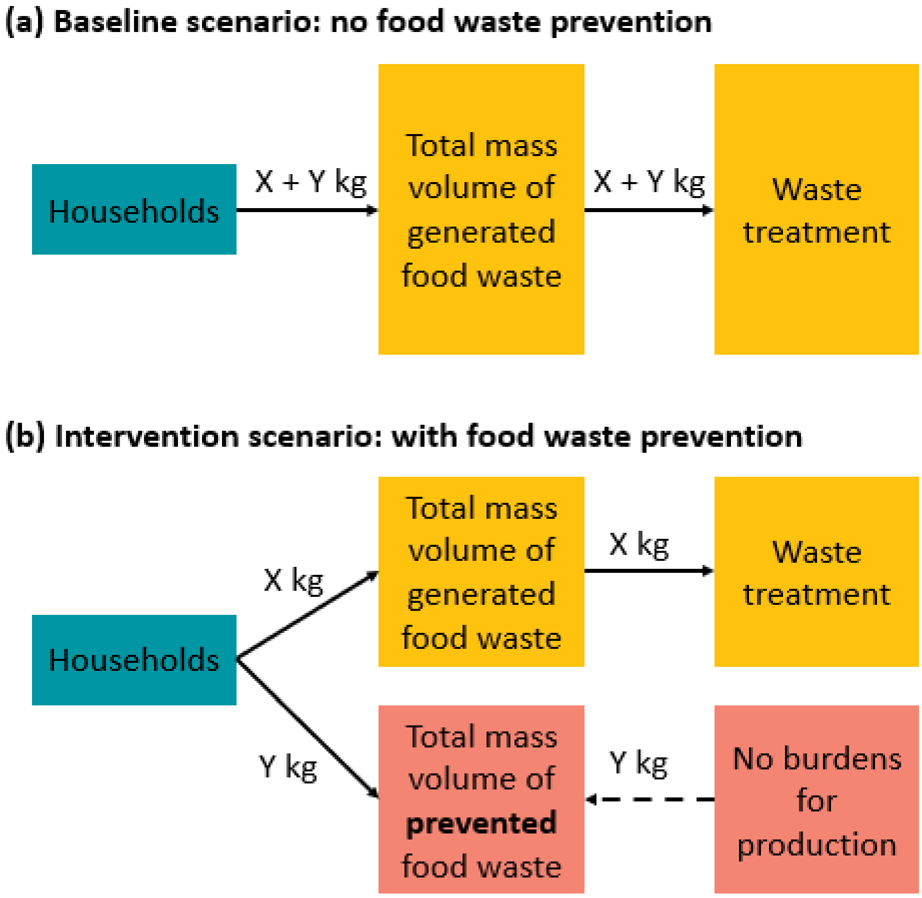

Figure 4: Graphical representation of the waste functional unit and prevented waste functional unit for the baseline (a) and intervention scenario (b) based on the approach proposed by Gentil et al. (2011)

2.1.2 System boundaries for food waste prevention

The system boundary defines all aspects included or excluded from the study (European Commission 2021). For the environmental impact assessment of food waste prevention, the system boundary is cradle to grave. Thus, the entire life cycle of the food waste is considered in the assessment. This includes production, processing, retail and distribution, use phase and the end of life (EoL) stage after the food waste has been disposed of. Figure 5 shows a graphical representation of the system boundaries for the baseline and monitoring stages. The processes included in the individual life cycle stages are listed in Table 1.

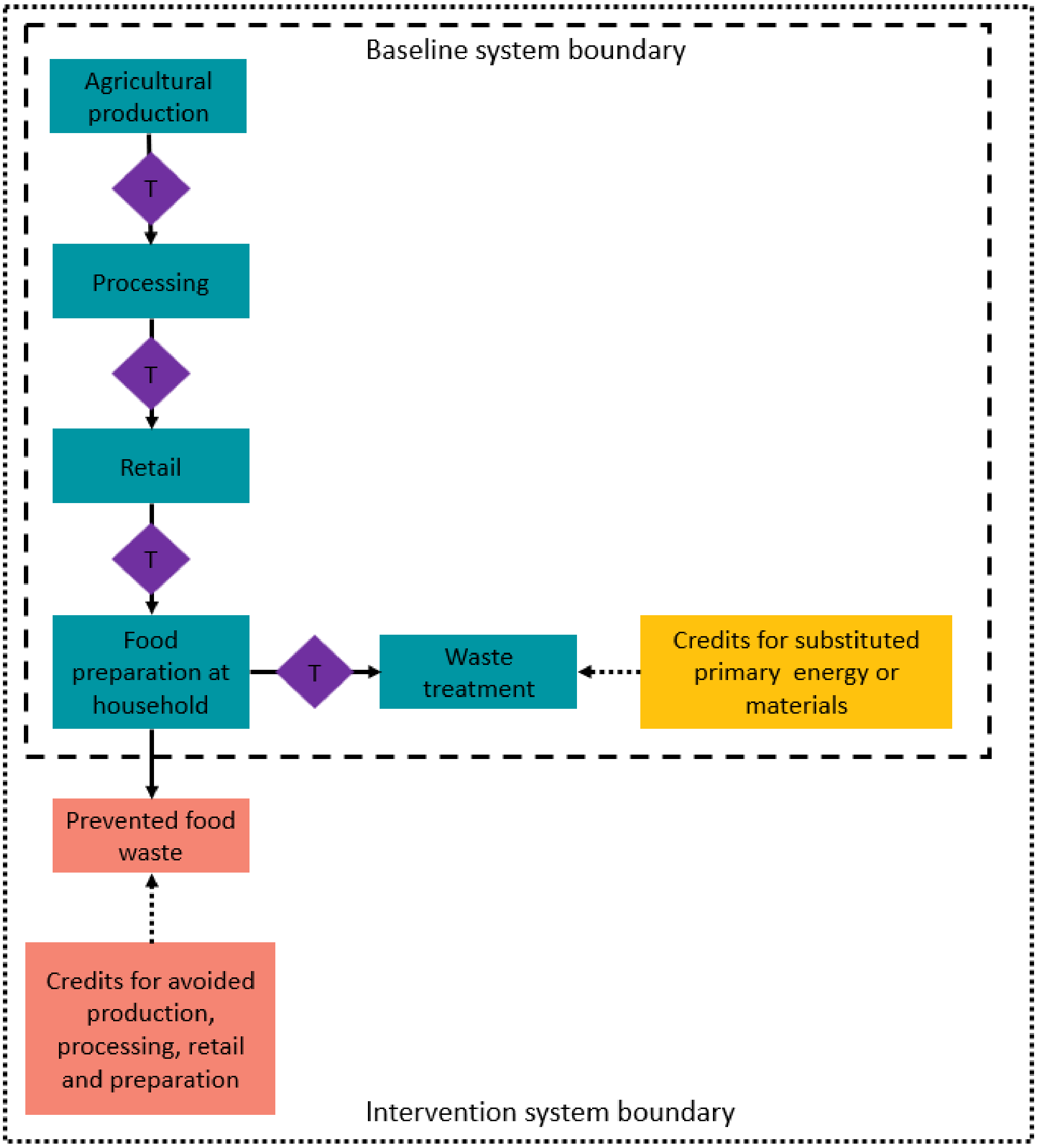

Figure 5: Graphical representation of the baseline and intervention system boundaries for food waste prevention (T = transport)

Table 1: Description of the life cycle stages included within the system boundaries for food waste prevention

Life cycle stage	Description of the processes included
Production	• Agricultural food production
Processing	• Processing of agricultural products • On-site warehousing
Retail and distribution	• Logistics chain/transport for retail • Retailing at point of sale (storage, refrigeration)
Use phase	• Consumer transport • Food preparation at the households
End of Life	• Waste collection • Waste treatment (composting, anaerobic digestion, incineration – credits for recovered energy or material are included in the system boundaries)

Since the main focus of this assessment is food waste, food packaging is not included in the scope of this evaluation. As the evaluation is based on self-reported amounts of food waste, sufficient information about the original packaging of the products cannot be ensured because this would require the households also reporting the packaging of their food in addition to their food waste. The packaging might not be available anymore when reporting the food waste and in general it might be a huge effort for participants to give detailed information on packaging. Additionally, the same product may have different packaging (e.g., paper, cardboard, plastic foil, plastic cups) depending on the manufacturer, retailer or season.

2.1.3 Impact assessment method and impact categories for food waste prevention

During the life cycle impact assessment (LCIA) the information from the life cycle inventory of a product is used to assess their respective contributions to each environmental impact category (Damiani et al. 2022). For the environmental assessment of household food waste prevention, the EF method is used for the impact assessment. The EF method lists a set of 16 individual impact categories for quantifying the environmental impacts. These impact categories and their respective indicators as well as a short description are listed in Table 2.

Table 2: Impact categories recommended by the Product Environmental Footprint (PEF) method (Damiani et al. 2022)

<table>
<tr><th>Impact category</th><th>Impact category indicator (unit of measure)</th><th>Description</th></tr>
<tr><td>Climate change total</td><td>Radiative forcing as global warming potential – GWP100 (kg CO_2 eq)</td><td>Increase in the average global temperature resulting from greenhouse gas emissions (GHG)</td></tr>
<tr><td>Ozone depletion</td><td>Ozone Depletion Potential – ODP (kg CFC-11 eq)</td><td>Depletion of the stratospheric ozone layer protecting from hazardous ultraviolet radiation</td></tr>
<tr><td>Human toxicity, cancer</td><td>Comparative Toxic Unit for humans (CTUh)</td><td rowspan="2">Impact on human health caused by absorbing substances through the air, water, and soil. Direct effects of products on humans are not measured</td></tr>
<tr><td>Human toxicity, non-cancer</td><td>Comparative Toxic Unit for humans (CTUh)</td></tr>
</table>

Impact category	**Impact category indicator (unit of measure)**	**Description**
Particulate Matter	Impact on human health (disease incidence)	Impact on human health caused by particulate matter emissions and its precursors (e.g., sulphur and nitrogen oxides)
Ionising radiation, human health	Human exposure efficiency relative to U-235 (kBq U-235 eq)	Impact of exposure to ionising radiations on human health
Photochemical ozone formation, human health	Tropospheric ozone concentration increase (kg NMVOC eq)	Potential of harmful tropospheric ozone formation ("summer smog") from air emissions
Acidification	Accumulated Exceedance – AE (mol H^+ eq)	Acidification from air, water, and soil emissions (primarily sulfur compounds) mainly due to combustion processes in electricity generation, heating, and transport
Eutrophication, terrestrial	Accumulated Exceedance – AE (mol N eq)	Eutrophication and potential impact on ecosystems caused by nitrogen and phosphorous emissions mainly due to fertilizers, combustion, sewage systems
Eutrophication, freshwater	Fraction of nutrients reaching freshwater end compartment (kg P eq)	
Eutrophication, marine	Fraction of nutrients reaching marine end compartment (kg N eq)	
Ecotoxicity, freshwater	Comparative Toxic Unit for ecosystems (CTUe)	Impact of toxic substances on freshwater ecosystems
Land use	Soil quality index, representing the aggregated impact of land use on: Biotic production; Erosion resistance; Mechanical filtration; Groundwater replenishment (Dimensionless – pt)	Transformation and use of land for agriculture, roads, housing, mining or other purposes. The impact can include loss of species, organic matter, soil, filtration capacity, permeability
Water use	Weighted user deprivation potential (m^3 world eq)	Depletion of available water depending on local water scarcity and water needs for human activities and ecosystem integrity
Resource use, minerals and metals	Abiotic resource depletion – ADP ultimate reserves (kg Sb eq)	Depletion of non-renewable resources and deprivation for future generations
Resource use, fossils	Abiotic resource depletion, fossil fuels – ADP-fossil (MJ)	

The PEF method allows the LCA practitioner to select the most relevant environmental impact categories for their assessment. These are the impact categories that cumulatively are responsible for at least 80% of the total environmental impacts (European Dairy Association 2025). For the purpose of the CARE project, relevant environmental impact and resource use indicators are selected. Based on the PEFCR for dairy products (European Dairy Association 2025), the following EF impact categories were selected for the environmental impact assessment of food waste within the CARE project:

- Climate change
- Ecotoxicity, freshwater
- Particulate matter
- Acidification
- Eutrophication, terrestrial
- Eutrophication, marine
- Resource use, fossils
- Water use

2.1.4 Impact factors and background data sources for food waste prevention

For the production and processing stages, environmental impact factors are taken from existing databases like the Agribalyse database (ADEME 2024a). Agribalyse is an open source LCA database which contains environmental impact factors for the main agricultural products produced in France and the main food products consumed in France (including products produced abroad and then imported). In total, Agribalyse contains over 200 agricultural products and over 2,500 food products (ADEME 2024b).

The Agribalyse database provides impact factors for all 16 environmental impact categories from the PEF method for each individual food product. These impact factors were calculated based on the EF method and take into account the agricultural production, processing, transport, packaging, retail and consumption stages of the food product's life cycle (ADEME 2024a). The values in the database are for a consumer market mix, i.e., for the average product intended for the consumer (e.g., an apple). This means that these values include both regionally produced and imported products, as well as organic and conventionally produced products, in order to reflect the market as accurately as possible.

If necessary, Agribalyse data will be adapted for the countries of the participating CARE households. The Nordic countries rely on imports of certain products, for example of fruits and vegetables (Agrarmarkt Informations-Gesellschaft 2024). Thus, additional transport will be added for products which are usually not produced locally in the respective country but are imported instead (Mayanti 2024). For this, national import data for the respective countries will be used. In the Nordic countries, some fruits and vegetables have to be produced in greenhouses (Agrarmarkt Informations-Gesellschaft 2024). For this, more energy is necessary to heat the greenhouses than when producing the products in warmer climates. This is also considered when modelling the local production of fruits and vegetables (Mayanti 2024).

Environmental impact data regarding the life cycle phases other than production are taken from other LCA databases such as Ecoinvent (Wernet et al. 2016) and Sphera (Sphera Solutions GmbH 2011). This includes data for processes like for example transport, any inputs related to the interventions (e.g., energy) or waste treatment (e.g., composting, anaerobic digestion, incineration).

2.2 Clothing consumption and use

The goal of the life cycle assessment for clothing consumption and use is to investigate the environmental impact of different interventions linked to clothing. The goal is achieved by quantifying the environmental impact of behavioural changes when implementing the interventions defined in the CARE-project related to clothing consumption and use.

2.2.1 Functional unit for clothing consumption and use

The functional unit defines the key functions of the study and serves as a reference point for linking the results to these functions. It helps us to fairly compare the environmental impact of the clothing consumption and use of different households before and after the interventions, which is the goal of this LCA study. This way, the effectiveness of the interventions in terms of how they impact the households' clothing footprint is assessed.

The choice of functional unit when assessing behaviour change related to clothing consumption and use is not straightforward. For example, Klint et al. (2022) show that individual laundering behaviour mostly is socially motivated, which influences the choice of functional unit. Klint (2024) states that ideally the functional unit should capture the realities of consumer behaviour and usage patterns, rather than just the outcome of a technical system. Likewise, Mora-Sojo et al. (2023) identify clothing consumption rather than the need of owning or using garments as the main driver of clothing consumption. In Piontek et al. (2019) a similar functional unit has been used.

As the goal of this study is to capture changes in behaviour related to clothing consumption and use, we chose the functional unit "the acquisition, use and disposal of clothes over one year". Acquisition includes obtaining both newly produced and second-hand clothes. The term "use" refers to laundering and repairing clothes.The change in behaviour of the households, in terms of acquired clothes, washing, drying, repair of clothes and disposal of clothes, will be defined by each household through the survey.The environmental impact of the interventions is quantified by the changes in behaviour in terms of consumption and use of clothing as well as washing habits, while the functional unit remains constant. Any extraordinary events where major changes are made (i.e., a fire, transition from private to shared washing machine) is removed from the dataset, since the focus of the study is to study behaviour change under "normal" circumstances. The reference flows are related to the behaviour at the beginning and end of the study.

2.2.2 System boundary for clothing consumption and use

This LCA-study is a cradle-to-grave study, meaning that we start from the activity of raw material extraction and end at the end-of-life treatment of the clothing. A simplified flowchart illustrating the activities included in the study is shown in Figure 6 below.

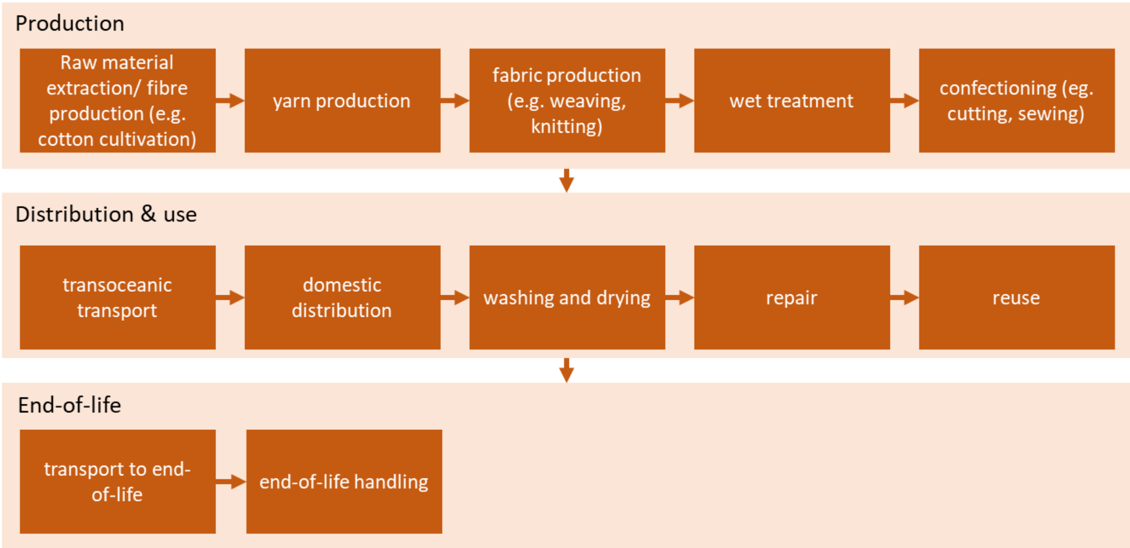

Figure 6: A simplified flowchart of a clothing item's life cycle and the life cycle phases included in this assessment.

2.2.3 Geographical scope for clothing consumption and use

When studying the environmental impacts from clothing consumption and use, the geographical settings are important due to differences in, for example, consumption and washing habits (Nautiyal et al. 2023; Sohn et al. 2021). In this study we use different emission factors the respective national electricity mixes when capturing the changes in behaviour during the use stage. This will capture the hot spots in terms of environmental impact for each specific country. It also enables the results to be relevant for the households participating in the project. As an alternative, we could use an average European energy mix. By using that alternative, differences in behaviour for the households in each country would be captured more easily.

2.2.4 Life Cycle Inventory for clothing consumption and use

Primary data related to clothing consumption and laundry habits will be collected within the CARE project through questionnaires. This data will be complemented by literature and database data, when necessary, e.g., for manufacturing processes. As the intention is to capture changes in behaviour, a complete inventory of the household's clothing stock is not necessary. Instead, we will collect data based on the consumption and use of clothing. The collection of data for clothing consumption would ideally take place over at least 6 months to capture the changes in consumption behaviour for different seasons. However, this is deemed not possible for this study since it will be too burdensome for the households to remember all acquisitions of clothing during the last 6 months. Therefore, the households will document their clothing acquisition for 3 months retrospectively. The data from three months will be extrapolated to represent one year. The results will transparently reflect what data the households provide. When collecting data for acquisition of clothing, the following aspects needs to be considered:

- Purchases: e.g., is the garment purchased new, second hand, rented or swapped? What was the purpose of the purchase?
- Logistics: e.g., how was the garment purchased, online or in a retail shop? What mode of travelling was used?

In addition to data for clothing consumption, data for mending, laundry behaviours and disposal will also be collected. Regarding the data collection for mending, the focus is put on:

- Type of and number of garments repaired or remade and whether this was done by a professional or by a household member.

To ease the effort of reporting for the households in the project, we will not collect laundry data for the duration of the three months needed for data collection on clothing consumption. Instead, data will be collected for the last five washes. This data is extrapolated to represent one year. When collecting data for laundry practices, the following aspects is considered:

- Laundry frequency and temperature
- Machine loading
- Mode of drying: e.g., air drying or using a tumbler.

The use of laundry detergent will be approximated using literature data. The questionnaire for the data collection can be found in the supplementary material.

In the same way that the acquisition of clothes is collected, the disposal of clothes focuses on:

- Type and number of garments being disposed of.
- What type of disposal (collection for reuse, collection for recycling or incineration, , private sales, swapped, give away or mixed household waste) was used.
- Type of travel used for the disposal, including distance.

2.2.5 Assumptions for clothing consumption and use

The following section describes the assumptions made in the data collection, including assumptions of categories.

- For the acquisition of clothes, five categories are included:
  1. T-shirt, top or blouse: Include both long and short-sleeved T-shirt, tops and blouses.
  2. Sweater/pullover: Refers to all types of sweaters and pullovers, e.g., knitted.
  3. Dress and skirt: Include both long and short ones.
  4. Pants: Include pants (e.g., jeans, and shorts).
  5. Outerwear: e.g., jackets, coats, vest, ponchos, capes, parkas.

- For disposal, the following five alternatives are included:
  1. **1.** Collection for reuse (e.g., charity): The set for this this type of collection vary depending on the country, but the shared trait is that the clothes being collected are aimed for reuse.
  2. **2.** Collection for recycling or incineration: The set for this this type of collection vary depending on the country, but the shared trait is that the clothes being collected are aimed for recycling or incineration.
  3. **3.** Private sales: Selling clothes through e.g., an online platform.
  4. **4.** Swapping: Refers to swapping of clothes within friend groups or via swapping-events.
  5. **5.** Give away (not to charity): Entails giving away clothes to friends/relatives i.e., not through any charity organisation.
  6. **6.** Mixed household waste: Refers to clothes that are not collected separately and instead end up in the household waste.

In the questionnaire, the households will have the option to answer what type of material the clothes are made of. The following three categories are included: Synthetic (e.g., polyester, nylon, acrylic, spandex), semi-synthetic (e.g., viscose, lyocell, modal, rayon), and natural (e.g., cotton, wool, cashmere, alpaca, mohair, silk, linen, hemp). The reason for including the semi-synthetic alternative is because the water deprivation impact will differ between natural (specifically cotton) and semi-synthetic fibres (Sandin et al. 2019).

There is also an option to choose between adult and children's clothing. The option of children's clothing is used for children between the ages of 0-13. The LCA-data for the children's clothing will be adjusted relative to adult clothing.

2.2.6 Limitations for clothing consumption and use

For this LCA, the following limitations are made:

- Underwear, panties, socks, bras, stockings is excluded from the study.
  - The reason is that the purchase of underwear is considered to not be affected in any substantial way by the interventions included in the study.

  Ironing is excluded from the data collection since ironing behaviour is not be affected by the interventions planned in the study.

2.2.7 Allocation for clothing consumption and use

When considering the reuse of clothing, an allocation issue occurs. This is related to the distribution of the burdens from e.g., manufacturing and the benefits from avoided material production between the clothing life cycle. In this study we conduct an attributional LCA using the cut-off approach. This approach means that all manufacturing related impacts are allocated to the life cycle where they occur (in line with what is suggested by Sohn et al. (2021) and Mora-Sojo et al. (2023)). Impacts related to distribution of the second-hand clothing and any reconditioning will be allocated to the second life cycle.

2.2.8 Selection of impact categories and impact assessment methods for clothing consumption and use

The impact categories chosen for this LCA are climate impact, water deprivation, acidification, eutrophication and energy use. They are chosen since they represent important environmental issues of the textile industry. Additionally, the literature review in D 1.1 showed that these impact categories are the most common ones to use when assessing the environmental impact of textiles and clothing. In addition, toxicity, and land use, in terms of soil quality, is included to avoid any problem shifting. Toxicity (human and aquatic) is included due to the use of solvents and chemicals in clothing production and laundry practices. Land use is included since bio-based textiles, such as cotton, require land when cultivated. The same impact assessment method, the EF method, will be used for the clothing LCA as for the food LCA.

2.3 Measuring sustainable well-being in CARE

The evaluation of well-being effects in CARE is based on the concept of sustainable well-being, defined as "human well-being in the context of nature" (Hirvilammi 2015). It has been described to involve thriving within planetary boundaries: ensuring a just and safe space for humanity and promoting both individual and collective welfare with the least possible environmental impact (Gough 2017). In the CARE project, sustainable well-being is approached at the individual and household level, concentrating on the well-being effects of changing everyday consumption practices in food and clothing. In line with the idea of circular consumption, the emphasis is on environmental sustainability.

The interventions in CARE, along with the practice changes they bring about, can have both positive and negative impacts on various aspects of participants' well-being. For instance, focusing on food waste and the amount of clothing at home can increase feelings of shame and anxiety. However, the new practices carried out can also empower participants and bring enjoyment to daily activities such as caring for clothes or creatively using leftovers.

When conducting circular consumption interventions, our goal is that the overall well-being of households is not compromised. Our long-term goal is to enhance participants' sustainable well-being by, for example, better understanding of preferences and avoiding unnecessary purchases, saving money in household budgets, creating more storage space at home, improving skills in food waste management and fostering care for clothes. Participation in CARE pilot activities could also increase perceived behavioural control related to consumer responsibilities in sustainable living and foster a sense of community belonging.

2.3.1 Developing the theoretical perspective to well-being

The development of evaluation methods for well-being in CARE began with screening assessment methods used in previous literature. A literature review was conducted following the principles of mapping review, which categorises existing literature and assesses its quality to find insights for further research (Grant and Booth 2009). This approach helped us in identifying narrower practice-relevant questions related to assessing sustainable well-being in households.

The literature review was complemented with insights from a researcher workshop. This workshop organised in February 2024 brought together Finnish sustainable well-being researchers to share their views on measuring sustainable well-being at the household level.

Based on earlier literature and the researcher workshop, the well-being assessment in CARE builds on needs-based well-being theory, considers the multidimensionality of well-being including eudaimonic and social elements, and uses a combination of indicators. The elements emphasised in the workshop related to circular practices and considered in the measurement include time (time used, feeling of time well-spent) and distribution of work between genders. Results of the literature review and implications drawn from the researcher workshop are reported in detail in CARE deliverable D1.1 Review report on impact assessment Part 2: Sustainable well-being indicators.

2.3.2 Choosing the indicators for sustainable well-being

In the CARE project, well-being is measured through surveys where members of participating households assess their own well-being experiences before and after the pilots. All adult members of the household will evaluate their own well-being.

The CARE project adopts a pragmatic approach to well-being measurement, focusing on assessing pilots rather than developing or validating new measures. Indicators that have been empirically tested in other contexts are combined with indicators developed by CARE to suit the context of sustainable consumption practices.

The well-being theory applied is the widely referenced HDLB model (Having, Doing, Loving, Being) proposed by Allardt (1993) (see also Helne and Hirvilammi (2015)). It examines well-being from four perspectives:

1. Having: Satisfaction of physical and material needs such as food, shelter, safety and income.
2. Doing: Meaningful activities that individuals engage in voluntarily to feel autonomy and competence.
3. Loving: The need for connection with other people and the environment.
4. Being: A healthy physical and emotional existence and meaningful, fulfilling life.

Having, loving, doing, and being remain on a rather abstract level and more specific human needs can be discerned within each mode. Reviews have identified tens of existing scales to measure well-being, and all the key elements of well-being have been recognized by at least one theory. But none of those cover all these elements, let alone the perspective of sustainability of well-being (Martela 2024). Consequently, the choice of key constructs to be measured and the selected combination of specific indicators to be used in CARE was guided by the attempt to cover the classification by Martela (2024).

The indicators for sustainable well-being applied in CARE can be divided into three parts (see chapters 3.1 and 3.6 for lists of the indicators and scales used):

1. Well-being scale. This part utilizes a validated subjective scale to measure the well-being effects of CARE to participating households. We apply the 8-item Flourishing scale by Diener et al. (2010) which covers three well-being aspects of loving, doing and being (Martela 2024). Each of the eight statements are evaluated by respondents using the scale from 1 (strongly disagree) to 7 (strongly agree). This scale is complemented with satisfaction with standard of living and financial situation (see also Cummins et al. (2003) and CSO (2023)) to cover the well-being aspect of having. Satisfaction is indicated by using the scale from 1 (the lowest satisfaction) to 10 (the highest satisfaction).

2. Sustainable well-being scale. This part seeks to cover the ecological sustainability of well-being. This means that the measurement of well-being as such must be complemented by the measurement of how this well-being can be accomplished sustainably (Martela 2024). In the CARE project, well-being measurement is conducted in parallel with environmental assessment based on life cycle analysis. In addition, we link circular consumption practices and well-being in a set of 15 statements around the well-being aspects of having, loving, doing and being (Allardt 1993). The statements are formed in the CARE project based on previous literature on circular consumption of food and clothing. The same statements are used for both consumption contexts (food waste and clothing), but the wordings are modified according to the context. For example, the statement targeted to measure positive feelings included in Being of HDLB-model is formulated as “Using my clothes as long as possible makes me feel happy” in clothing context and “Reducing food waste makes me feel happy.” in food waste context. To mitigate the problems related to subjectivity, these statements are complemented with questions about the time spent in circular practices.

3. Overall well-being experience. This part serves the goal of measuring overall subjective experience of the participating households. The agreement with five general statements is indicated by a scale from 1 (strongly disagree) to 7 (strongly agree). In the end of the questionnaire, an open text field is given to respondents to describe which activities in CARE affected their well-being most.

Table 3: Summary of well-being measurement in CARE

Goal	Source	Reasoning
To measure the well-being effects of CARE with validated indicators	8-item Flourishing scale (Diener et al. 2010) + satisfaction with standard of living and financial situation	Covers all well-being aspects: having, loving, doing and being
To measure the ecological sustainability of well-being with exploratory indicators	15 statements developed in CARE project	Links circular consumption practices and well-being
To measure the overall well-being experience of CARE	Subjective assessment by the participants	Complements the other parts of the assessment

All indicators and statements used for measuring sustainable well-being in CARE are listed in section 3.

2.3.3 Outcome of the measurement

The well-being measurement’s results and further details of the analysis will be reported at the end of CARE project in D1.3 Evaluation report. These results will be complemented by the qualitative data collected during the CARE pilots. This approach will help achieve a more holistic and nuanced view of the well-being effects of CARE on participating households.

3. Data collection

The assessment will require primary baseline data from participating households before the pilot actions are implemented (MS8) and after the implementation (MS12). The use of household data/indicators is delicate as they can influence the result. On one hand, it is important to choose methods and indicators that are feasible and based on reliably generated data. Particularly in consumer research, there is a tension between the demands for completeness and security of the data and the personal possibilities of data collection. The selection is also depending on the intervention design to be able to assess the success of measures accordingly.

Data is collected with a focus on evaluating the environmental impact both of the status quo and after implementation of the various interventions in the areas of food waste and clothing. Subsequently, a distinction is made between general information relevant to both areas, as well as specific data collections for food waste and the clothing sector and additionally with regard to the effects on the well-being of the participating households.

Data collection will include surveys on

- general background of participating households,
- current food waste in households and general handling of different food groups
- actual clothing consumption and use and
- well-being

3.1 Survey Background questions

3.1.1 Background questions for the household contact member in clothing pilot

Household code:___________

Your household

Where do you live?

- Citycenter
- Suburb
- Countryside

Please describe the composition of your household by answering the following questions:
The number of adults (over 18) in my household: ________
The ages and genders of the adult (over 18) household members

You (Adult 1):
Age: ________ years
Gender:

- Male
- Female
- Other

Adult 2:
Age: ________ years
Gender:

- Male
- Female
- Other

Adult 3:
Age: _______ years
Gender:

- Male
- Female
- Other

Adult 4:
Age: _______ years
Gender:

- Male
- Female
- Other

Adult 5:
Age: _______ years
Gender:

- Male
- Female
- Other

Adult 6:
Age: _______ years
Gender:

- Male
- Female
- Other

Relationship between the adults in my household:

- partners/spouses
- housemates
- adult child(ren) and parent(s)
- Other, specify___________________

The number of minors (under the age of 18) in my household: ________

The ages of the minors (under the age of 18):
Minor 1: _______
Minor 2: _______
Minor 3: _______
Minor 4: _______
Minor 5: _______
Minor 6: _______

What is the current monthly disposable income (money available after tax) of your household? If you don't know the exact figure, please give an estimate.

1. Under 500 euros
2. 500-1499 euros
3. 1500-2499 euros
4. 2500-4999 euros
5. 5000-7499 euros
6. 7500-10000 euros
7. Over 10 000 euros
8. I prefer not to tell

How satisfied are you with the current financial situation of your household? Using the 0-10 scale below, indicate your satisfaction.
(Scale: 0 as the lowest satisfaction level and 10 as the highest)

How satisfied are you with your household's standard of living? This means how well your material needs are met in your everyday life, including aspects like your income, housing quality, access to healthcare and education, and overall comfort and safety. Using the 0-10 scale below, indicate your satisfaction
(Scale: 0 as the lowest satisfaction level and 10 as the highest)

Your background

What is your highest level of education?

- No formal education after compulsory education
- Secondary education (high school or equivalent)
- Vocational training
- Bachelor's degree / undergraduate degree
- Master's degree
- Doctoral degree
- Other: please specify ____________________

Which of the following describes your current employment situation the best? You can choose multiple options if needed.

- Employed full-time (including self-employed)
- Employed part-time (including self-employed)
- Unemployed or laid off
- Student
- Retired
- Homemaker/Stay-at-home parent
- On long-term sick leave
- Other: please specify____

Your clothing management

How much time do you use per week for clothing management (including acquiring, washing, taking care of, storing and disposing clothes)?

___________ hours (If this is less than 1 hour, please insert value less than 1, e.g. 0,5 for 30 minutes)

Please estimate your share of the total clothing management work done in your household.

___________ % of clothing management

How would you evaluate your current skills on how to change your household's clothing consumption to more sustainable? Sustainable clothing consumption means conscious everyday actions that promote sustainable clothing usage and minimize environmental impact. Using the 0–10 scale below, indicate your skill level. (Scale: 0 indicating poor skills and 10 indicating excellent skills)

3.1.2 Background questions for the household contact member in food pilot

Household code: __________

Your household

Where do you live?

- Citycenter
- Suburb
- Countryside

Please describe the composition of your household by answering the following questions:
The number of adults (over 18) in my household: _______

The ages and genders of the adult (over 18) household members
You (Adult 1):
Age: _______ years
Gender:

- Male
- Female
- Other

Adult 2:
Age: _______ years
Gender:

- Male
- Female
- Other

Adult 3:
Age: ________ years
Gender:

- Male
- Female
- Other

Adult 4:
Age: ________ years
Gender:

- Male
- Female
- Other

Adult 5:
Age: ________ years
Gender:

- Male
- Female
- Other

Adult 6:
Age: ________ years
Gender:

- Male
- Female
- Other

Relationship between the adults in my household:

- partners/spouses
- housemates
- adult child(ren) and parent(s)
- Other, specify____________________

The number of minors (under the age of 18) in my household: ________

The ages of the minors (under the age of 18):
Minor 1: ________
Minor 2: ________
Minor 3: ________
Minor 4: ________
Minor 5: ________
Minor 6: ________

What is the current monthly disposable income (money available after tax) of your household? If you don't know the exact figure, please give an estimate.

9. Under 500 euros
10. 500-1499 euros
11. 1500-2499 euros
12. 2500-4999 euros
13. 5000-7499 euros
14. 7500-10000 euros
15. Over 10 000 euros
16. I prefer not to tell

How satisfied are you with the current financial situation of your household? Using the 0-10 scale below, indicate your satisfaction. (Scale: 0 as the lowest satisfaction level and 10 as the highest)

How satisfied are you with your household's standard of living? This means how well your material needs are met in your everyday life, including aspects like your income, housing quality, access to healthcare and education, and overall comfort and safety. Using the 0-10 scale below, indicate your satisfaction. (Scale: 0 as the lowest satisfaction level and 10 as the highest)

Which of the following devices can your household members access easily (you have it in your household or in your building)?

- Refrigerator
- Freezer (if you only have a small freezer compartment in your refrigerator, do not tick this box)
- Oven
- Stove
- Microwave oven
- Airfryer
- Blender and/or mixer
- Toaster
- Biowaste bin
- Compost

<u>**Your background**</u>

What is your highest level of education?

- No formal education after compulsory education
- Secondary education (high school or equivalent)
- Vocational training
- Bachelor's degree / undergraduate degree
- Master's degree
- Doctoral degree
- Other: please specify ____________________

Which of the following describes your current employment situation the best? You can choose multiple options if needed.

- Employed full-time (including self-employed)
- Employed part-time (including self-employed)
- Unemployed or laid off
- Student
- Retired
- Homemaker/Stay-at-home parent
- On long-term sick leave
- Other: please specify ____

Your food management

How much time per week do you use for food management (including planning, shopping, cooking, storing, clean-up and disposal of food)?

___________ hours (If this is less than 1 hour, please insert value less than 1, e.g. 0,5 for 30 minutes)

Please estimate your share of the total food management work done in your household.

___________ % of food management

How would you evaluate your current skills on how to reduce your household's food waste? Using the 0–10 scale below, indicate your skill level. (Scale: 0 indicating poor skills and 10 indicating excellent skills)

3.1.3 Background questions for all adult household members in clothing pilot

Household code: __________

Your background

Gender:

- Male
- Female
- Other

Age: _________ years

What is your highest level of education?

- No formal education after compulsory education
- Secondary education (high school or equivalent)
- Vocational training
- Bachelor's degree / undergraduate degree
- Master's degree
- Doctoral degree
- Other: please specify ___________________

Which of the following describes your current employment situation the best? You can choose multiple options if needed.

- Employed full-time (including self-employed)
- Employed part-time (including self-employed)
- Unemployed or laid off
- Student
- Retired
- Homemaker/Stay-at-home parent
- On long-term sick leave
- Other: please specify____

<u>**Your clothing management**</u>

How much time do you use per week for clothing management (including acquiring, washing, taking care of, storing and disposing clothes)?

___________ hours (If this is less than 1 hour, please insert value less than 1, e.g., 0,5 for 30 minutes)

Please estimate your share of the total clothing management work done in your household.

___________ % of clothing management

How would you evaluate your current skills on how to change your household's clothing consumption to more sustainable? Sustainable clothing consumption means conscious everyday actions that promote sustainable clothing usage and minimize environmental impact. Using the 0–10 scale below, indicate your skill level. (Scale: 0 indicating poor skills and 10 indicating excellent skills)

3.1.4 Background questions for all adult household members in food pilot

<u>**Household code: __________**</u>

<u>**Your background**</u>

Gender:

- Male
- Female
- Other

Age: _________ years

What is your highest level of education?

- No formal education after compulsory education
- Secondary education (high school or equivalent)
- Vocational training
- Bachelor's degree / undergraduate degree
- Master's degree
- Doctoral degree
- Other: please specify ____________________

Which of the following describes your current employment situation the best? You can choose multiple options if needed.

- Employed full-time (including self-employed)
- Employed part-time (including self-employed)
- Unemployed or laid off
- Student
- Retired
- Homemaker/Stay-at-home parent
- On long-term sick leave
- Other: please specify____

<u>**Your food management**</u>

How much time per week do you use for food management (including planning, shopping, cooking, storing, clean-up and disposal of food)?

___________ hours (If this is less than 1 hour, please insert value less than 1, e.g., 0,5 for 30 minutes)

Please estimate your share of the total food management work done in your household.

___________ % of food management

How would you evaluate your current skills on how to reduce your household's food waste? Using the 0–10 scale below, indicate your skill level. (Scale: 0 indicating poor skills and 10 indicating excellent skills)

3.2 Food Waste Diary

Instructions for food waste diary

In order to provide you with the best possible support on your journey to a sustainable lifestyle, we would like to start by learning more about your daily challenges when it comes to food. We therefore ask you to fill out this diary as conscientiously as possible for two weeks! We are only interested in food you throw away at home. The food on your way to work, at your working place, in school or in the restaurant is not relevant for this study. Please only enter values for avoidable food waste, i.e., food that can theoretically be eaten (if used in time). Non-edible parts of food like for example fruit and vegetable peels, bones, coffee grounds, or tea bags are not included in this survey.

Explanation of the individual items in the diary

Product: Please indicate which product (e.g., strawberries, minced meat, butter) you are referring to.

Amount disposed of in grammes: please indicate the amount of the product you disposed of. Best would be, if you weighed it with your kitchen scale (please don't forget to set Tara on zero before weighting).

Main Storage: Please indicate **where you mainly store** the product (room temperature, basement, refrigerator, etc.). For example, if you have 1 kg of apples and normally keep them in the fridge but put out 1 apple a day so it is not that cold when you eat it, select that you store the apples in the fridge because you store them most of the time there. Please choose one of the following options:

- room temperature
- fridge
- freezer
- cellar
- other (please indicate other locations, if there is nothing from above applicable)

Cooked before disposal: Here we want to know, if you disposed of the food without preparing it, or if after purchasing and storage you cooked it. For example, potato soup you could purchase already as soup or you can cook it at home out of fresh potatoes, or the frozen pizza could be disposed of without baking it (because the best before date has passed, or you realised that you don't want to eat this pizza any more) or after baking it, (because it was too much or you burnt it…).

Reason for disposal: Please indicate **why you disposed of** the product. Please try to choose one of the following options:

- Mouldy
- Rotten
- Best before date passed
- Use before (Do not consume after) date passed
- Too much
- Forgotten in the fridge/freezer
- Does not taste well
- Burnt
- Children did not like/eat it
- Pest infestation (e.g., moths)
- Other (please indicate other reasons, if there is nothing from above applicable)

Route of disposal: Please indicate the disposal route

- residual waste (mixed residual waste collection)
- organic waste (separate organic waste collection)
- home composting,
- feeding (to pets or wild animals),
- toilet,
- sink
- Other (please indicate other reasons, if there is nothing from above applicable)

Typical day: Please indicate if this was a typical day regarding the amount of food waste generated in your household or it was a clean-up or other special circumstances like a birthday party.

If you would like to **directly fill out the diary on your device**, it is available for **download** here (link: https://boku.ac.at/wau/abf/downloads) or you can use the QR code on the left to go to the download area.

How can you return the diaries?

By email: scan or photograph with your **cell phone** and send to **elisabeth.schmied@boku.ac.at** or hand it over to your advisory team

If you have any difficulties filling out the form or any other questions, please feel free to contact:

- Local partner
- Elisabeth Schmied // E-Mail: **elisabeth.schmied@boku.ac.at** or ask your advisory team
- You also can find additional **information** on the community page.

Example for the Food Waste Diary

Date	Product	Amount disposed off in gramm	main storage of main ingredients before disposal	cooked before disposal	reason for disposal	route of disposal	share disposed off	Typical day
20.04.	Strawberries	150	fridge	no	mouldy	biowaste	15%	yes
20.04.	Pizza	270	freezer	yes	too much	residual waste	25%	yes
21.04.	Coffee	100	room temperature	yes	too much	sink	20%	yes
21.04.	Carrots	100	fridge	no	dried up	feeding	10%	yes
21.04.	Apples	70	room temperature	no	trotten spot	homecomposting	5%	yes
22.04.	Coffee	270	room temperature	yes	too much	sink	55%	yes
22.04.	Yoghurt	250	fridge	no	best before date passed	residual waste	100%	yes
22.04.	Coffee	70	room temperature	yes	too much	sink	10%	yes
22.04.	Potato soup	400	room temperature	yes	does not taste good	toilet	75%	party
23.04.	Flour	720	room temperature	no	pest infestation	residual waste	72%	clean up

3.3 DIY wardrobe audit questionnaire

Instructions: This questionnaire is to be filled in by each of the adult household members. Please read carefully before starting. You will be asked about all of your own clothing items. Take this questionnaire (either online or paper format) to where you keep your clothes to answer accurately. Reserve enough time for completing the study and take breaks if needed. Thank you for your participation.

Q1: How many of each of the following clothing item types do you have? Include estimations for all items, even those not currently in the wardrobe (e.g., laundry, drying rack, dry cleaner, storage, cabin, at work, or stored elsewhere).

For each category, also note:

- Number of items not used in the past year
- Number of pre-owned/second-hand items (used by someone else before the current user)
- Number of repaired or adjusted items
- Number of items needing repair or adjustment

Complete one survey for each adult household member. If you wish to get an overview of children's clothing too, you can fill in a form for that, but it is voluntary (we would appreciate getting an estimate).

Category name	Total number of items	How many of these have not been used during the past year?	How many of these were acquired pre-owned/ second-hand?	How many of these have been repaired or adjusted?	How many would need repair or an adjustment?
Tops (shirts, blouses, T-shirts, singlets)					
Sweaters, pullovers or hoodies					
Pants, skirts, shorts, leggings					
Dresses, overalls, onesies, and aprons					
Nightwear and robes					
Sportswear including tights, tops and swimwear					
Outerwear: Coats, jackets, blazers and raincoats					
Underwear (panties, boxer shorts, bras, tights and long johns)					
Pairs of socks					
Accessories: headwear, scarves, ties, belts, pairs of gloves/ mittens					
Other, not listed above					

Q2. Which of the following textile care or making related equipment do you have in your household, or can access easily, for example in shared housing building?

- Washing machine
- Tumble drier
- Drying rack
- Drying cabinet
- Shoe drier
- Steamer
- Iron
- Ironing board
- Heat press machine or textile calender/roller
- Sewing machine
- Overlock machine
- Lint remover apparatus
- Lint roller
- Textile brush
- Sewing needles and thread
- Knitting needles
- Crochet hooks
- Repair patches that can be glued or ironed on holes in garments
- Darning mushroom
- Carpet beater
- Selection of buttons to replace missing ones
- Other equipment not given in the list, which: _______________

Q3. How much space do you use for storing all your clothes? Estimate in number of furniture units like closets, dressers or chests, and smaller units like shelfs, drawers, racks or cardboard boxes. Alternatively, if it is easier for you, you can estimate the space in square meters.

____ Closets, dressers or chests AND _________ shelves, drawers, racks or cardboard boxes
OR
___ Square meters

Q4. After going through all your clothing, do you plan to donate, sell or discard something that you would not have done otherwise?

- Yes. How many items? ____
- Maybe
- No
- Don't know

Q5. After going through all your clothing, did you find any items that you had forgotten you had and would like to take into use again that you would not have done otherwise?

- Yes. How many items? ____
- Maybe
- No
- Don't know

3.3.1 Additional questions for Germany and Estonia only:

Thank you for filling in the number of clothes in your wardrobe! To finish, we have a few questions related to your previous answers.

Q6. What are the most common reasons for why you have not worn some of your clothes during the past year? Please select up to three of the most common reasons.:

- The garments do not fit me (wrong size)
- I have not had occasions to wear them
- The garments are not my style (anymore)
- The garments are out of fashion
- The garments would need repair
- The garments start to look too worn out
- I just prefer the other garments in my wardrobe

Other reasons, please specify: ____

Q7. What do you think about the amount of clothing you have in each category?

	Far too little	Too little	Just the right amount	Too many	Far too many
Tops (shirts, blouses, T-shirts, singlets)	☐	☐	☐	☐	☐
Sweaters, pullovers or hoodies	☐	☐	☐	☐	☐
Pants, skirts, shorts, leggings	☐	☐	☐	☐	☐
Dresses, overalls, onesies, and aprons	☐	☐	☐	☐	☐
Nightwear and robes	☐	☐	☐	☐	☐
Sportswear including tights, tops and swimwear	☐	☐	☐	☐	☐
Outerwear: Coats, jackets, blazers and raincoats	☐	☐	☐	☐	☐
Underwear (panties, boxer shorts, bras, tights and long johns)	☐	☐	☐	☐	☐
Pairs of socks	☐	☐	☐	☐	☐
Accessories: headwear, scarves, ties, belts, pairs of gloves/ mittens	☐	☐	☐	☐	☐

3.3.2 Last question for all five countries:

Q6/Q8. Do you have any other comments? Here you can fill in more information concerning your previous answers.

____

____

3.4 Survey Food waste

Where do you store the following foods?

Please think about the following products and allocate according to a rough estimation where you **generally store** these products over the year.

1. In the freezer
2. in the fridge
3. in the cellar
4. at room temperature
5. are immediately used up
6. I do not consume this at all

Product category	**1 – in the freezer**	**2 – in the fridge**	**3 – in the cellar**	**4 – at room temperature**	**5 – are immediately used up**	**6 – I do not consume this at all**
European/local fruits (e.g., apples, pears)						
Bananas						
Berries						
Exotic fruits except bananas (ananas, citrus fruit)						
Root vegetables (Carrots, celery) or onion vegetables						
Leafy vegetables (Salads, spinach, chard,..)						
Fruit vegetables (eggplants, pumpkins, cucumbers, zucchini)						
Tomatoes						
Exotic vegetables (Avocado)						
Legumes, pulses						
Potatoes						
Bread and Pastry						
Cereals (including flour, rice, pasta)						
Milk / dairy products (e.g., yoghurt, cream cheese, sour cream)						
Cheese (excl. cream cheese)						
Eggs						

Product category	1 – in the freezer	2 – in the fridge	3 – in the cellar	4 – at room temperature	5 – are immediately used up	6 – I do not consume this at all
Meat						
Fish						
Processed meat and fish products (sausages, etc.)						
Vegetarian or vegan products (e.g., tofu or soy cutlets)						
Cooked food (e.g., casseroles, stews, soups)						
Take-away food (e.g., pizza) or other ready meals ((packed) food ready to be eaten as it is) e.g., from supermarkets						
Pickled products (pickled fruit, pickles, etc.)						
Sugar and baking ingredients						
Sweet or sour spreads (jam, hummus, etc.)						
Salty snacks (e.g., potato chips, nuts etc.)						
Sweet snacks (chocolate, cookies, fruit gums etc.)						
Beverages						

Amount of food waste in the households

Please think about the following products and give an estimation how much have you **disposed** of within **the last week**. Enter the amount of food you have thrown away in portions, whereby one portion is roughly equivalent to a handful (approx. 1/8 l or size of a tennis ball) of food.

1. four or more portions
2. two to three portions
3. one portion
4. half a portion
5. Less than half a portion
6. I don't know

Product category	**1 – four or more portions**	**2 – two to three portions**	**3 – one portion**	**4 – half a portion**	**5 – less than half a portion**	**6 – I do not know**
European/local fruits (e.g., apples, pears)						
Berries						
Bananas						
Exotic fruits except bananas (e.g., pineapple, citrus fruit)						
Root vegetables (e.g., carrots, celery) or onion vegetables						
Leafy vegetables (e.g., lettuce, spinach, chard)						
Fruit vegetables (e.g., eggplants, pumpkins, cucumbers, zucchini)						
Tomatoes						
Cabbage vegetables (e.g., cabbage, kohlrabi)						
Exotic vegetables (e.g., avocado)						
Legumes and pulses						
Potatoes						
Bread and pastry						
Cereals (including flour, rice, pasta)						
Milk / dairy products (e.g., yoghurt, cream cheese, sour cream)						
Cheese (excluding cream cheese)						
Eggs						
Beef (bovine meat)						

Product category	**1 – four or more portions**	**2 – two to three portions**	**3 – one portion**	**4 – half a portion**	**5 – less than half a portion**	**6 – I do not know**
Other meat and fish						
Processed meat and fish products (e.g., sausages)						
Vegetarian or vegan products (e.g., tofu or soy cutlets)						
Cooked food (e.g., casseroles, stews, soups)						
Take-away food (e.g., pizza) or other ready meals ((prepacked) food ready to be eaten as it is) e.g. from supermarkets						
Pickled products (e.g., pickled fruit, pickles)						
Sugar and baking ingredients						
Sweet or sour spreads (e.g., jam, hummus)						
Salty snacks (e.g., potato crisps, nuts)						
Sweet snacks (e.g., chocolate, cookies, fruit gums)						
Coffee (already prepared)						
Other beverages						
Other						

Frequency of food waste in the households

Please think about the following products and give an estimation **how often you dispose** of the listed food categories:

1. Never
2. Once a year
3. Less than once a month
4. Less than once a week
5. Once a week
6. Twice a week
7. Three or more times a week
8. I don't know

Product category	**1 – never**	**2 – once a year**	**3 – less than once a month**	**4 – less than once a week**	**5 – once a week**	**6 – twice a week**	**7 – three or more times a week**	**8 – I do not know**
European/local fruits (e.g., apples, pears)								
Berries								
Bananas								
Exotic fruits except bananas (e.g., pineapple, citrus fruit)								
Root vegetables (e.g., carrots, celery) or onion vegetables								
Leafy vegetables (e.g., lettuce, spinach, chard,								
Fruit vegetables (e.g., eggplants, pumpkins, cucumbers, zucchini)								
Tomatoes								
Cabbage vegetables (e.g., cabbage, kohlrabi)								
Exotic vegetables (e.g., avocado)								
Legumes and pulses								
Potatoes								
Bread and pastry								
Cereals (including flour, rice, pasta)								
Milk / dairy products (e.g., yoghurt, cream cheese, sour cream))								
Cheese (excluding cream cheese)								

Product category	**1 – never**	**2 – once a year**	**3 – less than once a month**	**4 – less than once a week**	**5 – once a week**	**6 – twice a week**	**7 – three or more times a week**	**8 – I do not know**
Eggs								
Beef (bovine meat)								
Other meat and fish								
Processed meat and fish products (e.g., sausages)								
Vegetarian or vegan products (e.g., tofu or soy cutlets)								
Cooked food (e.g., casseroles, stews, soups)								
Take-away food (e.g., pizza) or other ready meals ((prepacked) food ready to be eaten as it is) e.g., from supermarkets								
Pickled products (e.g., pickled fruit, pickles)								
Sugar and baking ingredients								
Sweet or sour spreads (e.g., jam, hummus)								
Salty snacks (e.g., potato chips, nuts)								
Sweet snacks (e.g., chocolate, cookies, fruit gums)								
Coffee (already prepared)								
Other beverages								
Other								

Disposal routes of food waste

Please indicate the proportion of the usual disposal routes for the product groups mentioned in general over the year. What proportion ends up in organic waste, what percentage is disposed of in the toilet, etc.?

E.g., it could be for:

- Bread (Bread and Pastry): 50% biowaste, 30% pets or other animals, 20% residual waste
- Milk: 100% sewerage system
- Lasagna: 50% biowaste, 50% sewerage system (Toilet) (e.g., depending on the consistency, your mood, which family member disposes of the lasagna).

Rough estimates are sufficient. The total must add up to 100%.

1. residual waste
2. biowaste (separate collected organic waste)
3. home composting
4. feeding to pets or other animals
5. through the sewerage system
6. other

Product category	**1 – residual waste**	**2 – biowaste**	**3 – home composting**	**4 – feeding to pets or other animals**	**5 – sewerage system**	**6 – other**
European/local fruits (e.g., apples, pears)						
Berries						
Exotic fruits (e.g., pineapple, citrus fruit)						
Vegetables						
Legumes and pulses						
Potatoes						
Bread and pastry						
Cereals (including flour, rice, pasta)						
Milk						
Dairy products (e.g., yoghurt, cream cheese, sour cream)						
Cheese (excluding cream cheese)						

Product category	1 – residual waste	2 – biowaste	3 – home composting	4 – feeding to pets or other animals	5 – sewerage system	6 – other
Eggs						
Meat fresh						
Fish fresh						
Other meat and fish cooked						
Processed meat and fish products (e.g., sausages)						
Vegetarian or vegan products (e.g., tofu or soy cutlets)						
Leftover food (mixed cooked food homemade or take away) liquid (e.g., soups)						
Leftover food (mixed cooked food homemade or take away) Semi-liquid (e.g., stews, lasagna)						
Leftover food (mixed cooked food homemade or take away) firm consistency (e.g., schnitzel)						
Pickled products (e.g., pickled fruit, pickles)						
Sugar and baking ingredients						
Sweet or sour spreads (e.g., jam, hummus)						
Salty snacks (e.g., potato crisps, nuts)						
Sweet snacks (e.g., chocolate, cookies, fruit gums)						

Consumer travel for purchases

Please think about how you travel when you purchase food. What means of transport do you use when you purchase food? How are your purchases distributed among the means of transportation listed (please give a % estimate - the total must add up to 100%).

- by foot
- by car
- by motorcycle
- by public transportation
- by bicycle
- by scooter
- delivery after online purchase

How often do you purchase food?

- Daily
- Every 2nd day
- 2 times a week
- Weekly
- 2 times a month

Sometimes grocery shopping is combined with other activities (commuting to work, other shopping, etc.). Estimate what percentage of your grocery shopping is exclusively for the purchase of food.

- <5 %
- 5-10%
- 11-25%
- 26-50%
- 51-75%
- >75%

3.5 Survey Clothing consumption and use

The questions asked in the survey for the clothing consumption and use are presented in the following tables. They relate to clothing acquisition, mending, washing, drying and disposal. The survey ends with an open question where the household can fill in if they have anything else they want to add.

Questions related to clothing acquisition:

Question	Alternatives	Explanation
How many clothing items did your household acquire during the last **three months (**see explanation**)**?	Open-ended response	Include acquisition through purchase (new or second-hand), swapping, gift or hand me down, rental
Question	**Alternatives**	**Explanation**
Provide details for each garment acquired during the last **three months**.	N/A	N/A
Category of clothing (see explanation)	Adult clothes/children’s clothing	Children’s clothing is chosen for garments for children of ages 0-13.
Type of garment (see explanation)	T-shirt, top or blouse/sweater or pullover/dress/skirt/pants/outerwear	Outerwear includes e.g., jackets, coats, vest, ponchos, capes, parkas
Type of fabric (see explanation)	Synthetic/Semi-synthetic/Natural/Don't know	**Synthetic:** e.g., polyester, nylon, acrylic, spandex (lycra, elastane) **Semi-synthetic**: e.g., viscose, lyocell (tencel), modal, rayon **Natural:** e.g., cotton, wool, cashmere, alpaca, mohair, silk, linen, hemp
Type of acquisition	New purchase/Second-hand purchase/Swapped/Gift or hand me down/Rental	N/A
If acquisition of a used garment, did the garment replace a new garment?	Yes/No/Partially	N/A
If purchase, specify type of purchase	Online, domestic shipping/Online, international shipping/Retail shop/ Don't know	N/A
Type of travel for acquisition	Foot/Bike/Public transport/Car/Other	N/A
If public transport, specify type	N/A	N/A
If other, specify type	N/A	N/A
Approximate distance (in km) for acquisition	N/A	N/A

Questions related to mending of clothes:

How many items have been repaired/remade during the last **three months**?	N/A	N/A
Question	**Alternatives**	**Explanation**
Provide details for each garment repaired/remade during the last **three months**.	N/A	N/A
Category of clothing (see explanation)	Adult clothes/children's clothing	Children's clothing is chosen for garments for children of ages 0-13.
Type of garment (see explanation)	T-shirt or blouse/Sweater or pullover/Dress/Skirt or pants/Outerwear	Outerwear includes e.g., jackets, coats, vest, ponchos, capes, parkas
Type of fabric (see explanation).	Synthetic/Semi-synthetic/Natural/Don't know	If the fabric contains multiple types of fibre, choose the alternative that represents the main fibre in the garment. **Synthetic:** e.g., polyester, nylon, acrylic, spandex (lycra, elastane) **Semi-synthetic**: e.g., viscose, lyocell (tencel), modal, rayon **Natural:** e.g., cotton, wool, cashmere, alpaca, mohair, silk, linen, hemp
Type of repair/remake	By household member/By professional/Other	N/A
If other, specify type of repair	Open-ended response	N/A

Questions related to laundry habits – washing and drying:

Question	**Alternatives**	**Explanation**
Do you have a private washing machine?	Yes/No	N/A
If yes, what is the maximum capacity of your washing machine (in kg)?	Open-ended response	N/A
If yes, how old is the washing machine?	Open-ended response	N/A
Do you have a private dryer?	Yes/No	N/A
If yes, what is the maximum capacity (in kg) of your dryer?	Open-ended response	N/A
If yes, how old is the dryer?	Open-ended response	N/A
Approximately how many times did your household wash clothes over the last **month**?	Open-ended response	N/A
Approximately how many times did you dry clothes over the last **month**?	Open-ended response	N/A

Provide details about your last **five washing occasions**.		
Question	**Alternatives**	**Explanation**
Type of washing	Private washing machine/Shared washing machine/Dry cleaning/Other	N/A
If other, specify type	Open-ended response	N/A
If dry cleaning, what type of travel was used?	Foot/Bike/Public transport/Car/Other	N/A
If public transport, specify type	Open-ended response	N/A
If other, specify type	Open-ended response	N/A
Load level (see explanation)	Fully loaded/Partially loaded/Nearly empty	The share of full capacity for each alternative: - **Fully loaded**: more than 70 % - **Partially loaded**: Between 30-70 % - **Nearly empty**: less than 30 %
Temperature or program	Hand wash/Wool program/Eco-program/30 °C/40 °C/60 °C/90 °C	N/A

Provide details about your last **five drying occasions**.		
Question	**Alternatives**	**Explanation**
Type of drying	Private dryer/Shared dryer/Drying cabinet/Drying room/Hanging laundry indoors/Hanging laundry outside/Other	N/A
If other, specify type	Open-ended response	N/A
Load level (see explanation)	Fully loaded/Partially loaded/Nearly empty	The share of full capacity for each alternative: - **Fully loaded**: more than 70 % - **Partially loaded**: Between 30-70 % - **Nearly empty**: less than 30 %

Questions related to disposal of clothes:

Question	Alternatives	Explanation
How many garments did your household dispose of during the last **three months** (see explanation)?	Open-ended response	Include disposal through collection for reuse/recycling/incineration, private sales, swapping, give away (not charity), mixed household waste
Question	**Alternatives**	**Explanation**
Provide details for disposal of clothing during the last **three months**.	N/A	N/A
Category of clothing (see explanation)	Adult clothes/children's clothing	children's clothing is chosen for garments for children of ages 0-13.
Type of garment (see explanation)	T-shirt, top or blouse/sweater or pullover/dress/skirt/pants/outerwear	Outerwear includes e.g., jackets, coats, vest, ponchos, capes, parkas
Type of fabric (see explanation)	Synthetic/Semi-synthetic/Natural/Don't know	If the fabric contains multiple types of fibre, choose the alternative that represents the main fibre in the garment. **Synthetic:** e.g., polyester, nylon, acrylic, spandex (lycra, elastane) **Semi-synthetic**: e.g., viscose, lyocell (tencel), modal, rayon **Natural:** e.g., cotton, wool, cashmere, alpaca, mohair, silk, linen, hemp
Type of disposal	Collection for reuse (e.g., charity)/Collection for recycling or incineration/Private sales /Swapping/Give away (not charity)/Mixed household waste	N/A
Type of travel for disposal	Foot/Bike/Public transport/Car/Other	N/A
If public transport, specify type	Open-ended response	N/A
If other, specify type	Open-ended response	N/A
Approximate distance (in km) for disposal	Open-ended response	N/A

3.6 Well-being questions

3.6.1 Well-being questions for all adult household members in clothing pilot

<u>**Your well-being**</u>

[The text in brackets will be removed from the version sent to respondents. Codes: FS=Flourishing scale by Diener et al., L=Loving by Allardt, D=Doing by Allardt, B=Being by Allardt, H=Having by Allardt, R=reversed]

Below are 8 statements with which you may agree or disagree. Using the 1–7 scale below, indicate your agreement with each item. (Scale: 1. Strongly disagree 2. Disagree 3. Slightly disagree 4. Mixed or neither agree nor disagree 5. Slightly agree 6. Agree 7. Strongly agree)

1. I lead a purposeful and meaningful life. [FS1]
2. My social relationships are supportive and rewarding. [FS2]
3. I am engaged and interested in my daily activities [FS3]
4. I actively contribute to the happiness and well-being of others [FS4]
5. I am competent and capable in the activities that are important to me [FS5]
6. I am a good person and live a good life [FS6]
7. I am optimistic about my future [FS7]
8. People respect me [FS8]

Below are 15 statements with which you may agree or disagree. Using the 1–7 scale below, indicate your agreement with each item. (Scale: 1. Strongly disagree 2. Disagree 3. Slightly disagree 4. Mixed or neither agree nor disagree 5. Slightly agree 6. Agree 7. Strongly agree)

1. People closest to me support my efforts to buy second-hand clothing instead of new ones. [L1]
2. By giving away clothes that no longer have use, I show care for other people. [L2]
3. I enjoy being a good example for other people by avoiding shopping for new clothes. [L3]
4. I feel ashamed by my current clothing consumption. [L4, R]
5. I feel that the time I invest in caring for my clothes is time well spent. [D1]
6. Taking care of clothing in my household is a burden to me. [D2, R]
7. I am confident that I can repair my clothes or get them repaired if I want to. [D3]
8. By not buying more clothes, I have a positive impact on the environment. [D4]
9. My current sustainable clothing consumption efforts are meaningful to me. [B1]
10. Using my clothes as long as possible makes me feel happy. [B2]
11. I feel anxious about the clothing waste in the world. [B3, R]
12. I feel guilty if I shop for clothes on the spur of the moment. [B4, R]

13. My home provides good opportunities for caring for my clothes. [H1]
14. When I use my clothes longer, I save money. [H2]
15. I'm afraid that buying second-hand items can cause health problems for me or my family. [H3, R]

Following questions only to questionnaire after CARE pilots

Below are 5 statements with which you may agree or disagree. Using the 1–7 scale below, indicate your agreement with each item. (Scale: 1. Strongly disagree 2. Disagree 3. Slightly disagree 4. Mixed or neither agree nor disagree 5. Slightly agree 6. Agree 7. Strongly agree)

1. I have been highly involved with the activities of CARE
2. I feel that participation in CARE has improved my overall well-being.
3. I feel that participation in CARE has improved my financial well-being.
4. I will continue practices I have learnt during CARE in my daily life.
5. I will encourage people around me to adopt the same practices I have learnt during CARE.

Please describe which activities in CARE have improved your well-being. (open field)

3.6.2 Well-being questions for all adult household members in food pilot

Your well-being

[The text in brackets will be removed from the version sent to respondents. Codes: FS=Flourishing scale by Diener et al., L=Loving by Allardt, D=Doing by Allardt, B=Being by Allardt, H=Having by Allardt, R=reversed]

Below are 8 statements with which you may agree or disagree. Using the 1–7 scale below, indicate your agreement with each item. (Scale: 1. Strongly disagree 2. Disagree 3. Slightly disagree 4. Mixed or neither agree nor disagree 5. Slightly agree 6. Agree 7. Strongly agree)

1. I lead a purposeful and meaningful life. [FS1]
2. My social relationships are supportive and rewarding. [FS2]
3. I am engaged and interested in my daily activities [FS3]
4. I actively contribute to the happiness and well-being of others [FS4]
5. I am competent and capable in the activities that are important to me [FS5]
6. I am a good person and live a good life [FS6]
7. I am optimistic about my future [FS7]
8. People respect me [FS8]

Below are 15 statements with which you may agree or disagree. Using the 1–7 scale below, indicate your agreement with each item. (Scale: 1. Strongly disagree 2. Disagree 3. Slightly disagree 4. Mixed or neither agree nor disagree 5. Slightly agree 6. Agree 7. Strongly agree)

1. People closest to me support my efforts to reduce food waste at home. [L1]
2. By sharing leftover food, I show care for other people. [L2]
3. I enjoy being a good example for other people by avoiding food waste. [L3]
4. I feel ashamed by the current amount of food waste I/we produce in my household. [L4, R]
5. I feel that the time I invest in reducing food waste is time well spent. [D1]
6. Reducing food waste in my household is a burden to me. [D2, R]
7. I am confident that I can reduce food waste at home if I want to. [D3]
8. My actions in reducing food waste have a positive impact on the environment. [D4]
9. My current efforts to reduce food waste are meaningful to me. [B1]
10. Reducing food waste makes me feel happy. [B2]
11. I feel anxious about the food waste in the world. [B3, R]
12. I feel guilty if I throw away food. [B4, R]
13. My home provides good opportunities for food waste reduction. [H1]
14. When I reduce food waste, I save money. [H2]
15. I'm afraid that using expired food items can cause health problems for me or my family. [H3, R]

<u>Following questions only to questionnaire after CARE pilots</u>

Below are 5 statements with which you may agree or disagree. Using the 1–7 scale below, indicate your agreement with each item. (Scale: 1. Strongly disagree 2. Disagree 3. Slightly disagree 4. Mixed or neither agree nor disagree 5. Slightly agree 6. Agree 7. Strongly agree)

1. I have been highly involved with the activities of CARE
2. I feel that participation in CARE has improved my overall well-being.
3. I feel that participation in CARE has improved my financial well-being.
4. I will continue practices I have learnt during CARE in my daily life.
5. I will encourage people around me to adopt the same practices I have learnt during CARE.

Please describe which activities in CARE have improved your well-being. (open field)

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