

## REFRESH Interim Results

### The REFRESH Project: Resource Efficient Food and dRink for the Entire Supply cHain

REFRESH is an EU research project taking action against food waste. 26 partners from 12 European countries and China work towards reducing food waste at the retail and consumer level and reducing food losses along production and supply chains. Specifically, the project aims to:

- Develop strategic agreements to reduce food waste with governments, business and local stakeholders in five pilot countries: Spain, Germany, Hungary, the Netherlands and China. Within pilots, the participating stakeholders will test new approaches to reduce food waste.
- Build a pan-EU evidence base exploring and explaining the factors influencing current 'sub-optimal' consumer and business behaviour and practice, in order to support effective and targeted interventions.
- Formulate EU policy recommendations and support national implementation of food waste policy frameworks.
- Provide better estimations of the environmental impacts of food waste reduction.
- Design and develop technological innovations to improve valorisation of food waste, e.g. from food processing.

The REFRESH team can build on the results and experience of the FUSIONS project ("Food Use for Social Innovation by Optimising Waste Prevention Strategies"). REFRESH runs from 2015 to June 2019. Since its beginning, REFRESH has published 16 reports, established 4 voluntary Frameworks for Action in pilot countries and organised a Food Waste Solution Contest.

This document provides information on selected results of REFRESH and the work undertaken in the project until May 2017.

**A full list of the results from the project is available on the REFRESH website: [eu-refresh.org/results](http://eu-refresh.org/results)**

### Brochure

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**E-Mail:** [info@eu-refresh.org](mailto:info@eu-refresh.org)

**Website:** [www.eu-refresh.org](http://www.eu-refresh.org)

**Twitter:** [@EUrefresh](https://twitter.com/EUrefresh)

All project results can be found on the REFRESH website:  
<http://eu-refresh.org/results>

#### Project Coordinator:

**Toine Timmermans**  
Wageningen University and Research  
[toine.timmermans@wur.nl](mailto:toine.timmermans@wur.nl)

#### Communication Partner:

**Stephanie Wunder**  
Ecologic Institute  
[stephanie.wunder@ecologic.eu](mailto:stephanie.wunder@ecologic.eu)

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## Interim Project Results

### Understanding Consumer Behaviour and Household Relationships with Food and Food Waste

REFRESH is conducting quantitative and qualitative research to better understand consumer behaviour in relation to waste generation, handling, reuse, and by-product valorisation. This research will help clarify what factors influence consumer food waste and the up-take of on-pack information and ICT-based tools designed to help prevent food waste at the household level.

The initial phase of data collection focused on qualitative data from four pilot countries. The information collected evaluated the relationship households have with food, how food is valued, and the important issues related to food waste in a day-to-day context. Research was conducted through focus groups organized in Hungary, Germany, the Netherlands, and Spain to understand food waste at different stages of household management (planning, provisioning, storing, preparing, consuming, disposal). The research found different household management practices, as well as non-causal determinants (age, gender, education, household size and composition and income) as relevant factors. The resulting report, *National, Qualitative Insight on Household & Catering Food Waste*, shows that awareness about food waste is on the rise in all four countries. However, there are distinct differences among households and countries in the motivations for preventing or accepting food waste. For example, in Germany and the Netherlands the problem of food waste was generally viewed as a moral problem. In Spain and Hungary, financial factors were also indicators of household relationships with food and food waste. In Spain and Hungary, shortages in food supply as well as the cost of food and feeding a household were found to be important incentives to avoid waste. Food preferences, especially those by young people and an overall accelerated lifestyle, were also found relevant in the decisions around food and food waste.

One of the important objectives within REFRESH is to develop practical and easy to implement approaches for food waste measurement at different stages of the consumption lifestyle. The report, *Best Practice Assessment Consumer level Food Waste* consolidates existing and new understanding at the in-home level into a research framework and methodology that allows cross country comparisons. It includes REFRESH best practice to measure household level food waste, and builds on results from the report, *Consumption Life-Cycle Contributions: Assessment of Practical Methodologies for In-Home Food Waste Measurement*.

**Upcoming results:** In the next year, a large-scale survey in the four countries will quantify the influence of factors related to consumer motivations, consumers' skills and knowledge, and opportunities, on household food waste levels. In addition, qualitative and quantitative research will help guide development of effective on-pack information and ICT Tools for use by households. Preliminary research on existing ICT Tools shows that there are already many web-applications available (i.e. web/mobile applications that address food waste via suggested recipes, shopping list, storage advice etc.). Rather than develop more web-applications, REFRESH aims to generate a 'platform for synergy' to make the most out of existing tools.

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### National Pilot Working Platforms in Hungary, Germany, the Netherlands, Spain, and China

A main ambition of the REFRESH project is to develop an adaptable 'Framework for Action' (FA) model that promotes collaboration along the whole food and drink value chain to address food waste at a national level.

A Framework for Action can be understood as a collaborative agreement between a number of key public and private organisations to take action against an agreed ambition or target. They are based on voluntary action by the organisations involved without the need for legislation.

In order to better understand success factors in collaborative agreements and FAs and to design a blueprint for replication, REFRESH conducted an extensive evaluation and inventory of existing approaches and alliances in the EU and internationally. Results can be found in the report *Inventory and Evaluation of Effectiveness of Existing Approaches to Voluntary Alliances*.

REFRESH has established four national “Pilot Working Platforms” or ‘steering groups’, in Hungary, Germany, the Netherlands and Spain to implement Frameworks for Action. Each platform includes a combination of major retailers, national government ministries, large and small NGOs and other organisations relevant to the focus or sector structure of each country. The platforms will contribute to the development of a Framework for Action which reflects the priorities in their country and will undertake different pilot projects to support the aims of the national FA. In November 2016, a pilot working platform was also launched in Beijing China, with over 100 participants attending a multi-stakeholder conference.

**Upcoming results:** The next steps in the project are the implementation of pilot projects within the FAs and evaluation of the FAs in the four pilot countries and China. More about the National Pilot Working Platforms: [eu-refresh.org/national-platforms](http://eu-refresh.org/national-platforms)

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### Food Waste Policy - Recommendations

REFRESH will provide evidence-based policy recommendations to improve the overall policy framework for preventing, reducing, reusing and valorizing food loss and waste. So far REFRESH has analysed the different stages of the food value chain in order to identify the numerous drivers that cause food loss and waste (both directly and indirectly). This resulted in a series of system maps for a selection of food products of different levels of complexity (ranging from fresh produce represented by potatoes and tomatoes, to bread, dairy, ready meals, and meat) in different countries (UK, France, Germany, Italy and Sweden). They provide the basis to further explore the factors influencing food waste and how these link to different policies acting along the food chain.

**Upcoming results:** REFRESH will provide a review of EU policies for the prevention and valorisation of food waste. Within a report on policy mixes it will also analyze the interaction of different policies on national level. In order to provide specific policy recommendations for EU public policies there will be a focus on sectoral policy areas. The priority policy areas will consider REFRESH’s main objectives: valorisation of food waste (e.g. food to feed); successful development of voluntary agreements to reduce food waste, and supporting consumer behaviour change through EU policies (e.g. best before date labeling). Recommendations will be discussed within policy workshops and summarized in policy briefs.

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### Behavioural Economic Approaches

Using behavioural economics approaches, REFRESH aims at providing new information on consumer and business behaviours. Studying the behavioural dynamics of consumers and businesses can help design better-framed policy and market interventions to prevent and reduce food waste.

In a first step, REFRESH developed a model framework for applying behavioural economic approaches to the study of food waste. Using Agent-Based Models (ABM) and Bayesian Networks (BN), as well as iterative synergies between these two methodological approaches, REFRESH aims at bringing forward a unique integrated model.

The work conducted in the first two years of the project led to the identification and analysis of the socio-economic conditions and driving factors that influence businesses' and consumers' choices in the creation and/or reduction of food waste.

Quantifying and understanding inconsistency in the generation of consumers' food waste is particularly important to target intervention strategies where they are most efficient. The report *Consumers behavioural economic interrelationships and typologies* analyses two of the largest available datasets to define consumer behavioural typologies and develop a map to illustrate potential linkages between consumer behaviour and the creation/reduction of food waste. The size of the household, the age of its head individual and their level of education are identified as significant determinants of the amount of food waste. There is, however, high variation across countries, implying the need for more adjustments when results regarding one country are applied to another. It also became evident that there is a high incoherence between self-reported waste and actual waste in the garbage bin. Upcoming work will continue to measure the influence that key tangible drivers exert on consumers' choices.

REFRESH is also working to provide an overview of the economic and behavioural factors that determine the successful uptake of innovations to prevent or reduce food waste by businesses. Firms' adoption of innovations to address food waste is a complex phenomenon, because it may be driven also by non-economic factors. REFRESH has identified a set of behavioural typologies and interrelationships that influence firms' adoption of innovations in the report *Socio-economic implications of food waste: Business behavioural typologies and interrelationships*, while economic factors were identified in the report *Socio-economic implications of food waste: Economics of innovation*. The ultimate reason for innovating is related to economic factors such as improving firm performance, productivity and international competitiveness. Therefore, costs and risks are key drivers of technological and organisational innovation. However, the behavior of every single business is influenced by its idiosyncratic characteristics, its structural and managerial features, and the environment where they operate, so that the sharing information and inter-firm coordination may generate uncertain outcomes. Overall, the adoption and diffusion of innovation to address food waste is an on-going and businesses will divide into frontrunners and laggards.

**Upcoming results:** By means of an integrated ABM-BN model, REFRESH will analyse business behaviours and their modifications over time, and test the findings within the four REFRESH pilot countries to identify conditions and impacts of food waste-related innovation.

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### Environmental and Life Cycle Costing Dimensions of Food Waste

REFRESH work will provide recommendations for evaluating the environmental impact, as well as life cycle costs, of prevention, valorisation and waste management options for food waste.

On life cycle costs of food waste, few examples for assessment exist. The report *Methodology for Evaluating Life Cycle Costs (LCC) of Food Waste* reviewed existing methods for the evaluation of LCC of food waste. A comprehensive literature review was conducted to identify major methodological challenges related to cost modeling and externalities.

The report *Methodology for evaluating environmental sustainability*, found that there is literature on environmental assessments of products and services, and food systems, however, there is a need to bridge the gap and bring existing guidance and standards into use by



practitioners, who may be experts on the systems they are assessing but not life cycle assessments.

To close this gap, the report *Generic Strategy LCA and LCC* provides guidance on how to apply Life Cycle Assessment (LCA) and Life Cycle Costs (LCC) for studies that specifically explore questions on handling side flows from the food supply chain.

**Upcoming results:** REFRESH will apply the developed methodology assessing environmental impacts and life cycle costs for promising waste prevention activities and valorisation options as identified within REFRESH. A simplified excel tool is under development aimed to give a *first indication* of hotspots and pinpoint important information needed to properly assess environmental and life cycle costing dimensions of new/novel valorisation routes.

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### Valorisation of Waste Streams and Co-products

The REFRESH project aims to increase the exploitation of unavoidable food chain waste. To do this, it aims to provide support to business stakeholders to identify waste streams that are appropriate to valorize.

REFRESH has evaluated the key EU waste streams having significant environmental impact. In the report, *Medium List of Waste Streams Appropriate for Valorisation*, over 290 waste streams were identified, scored and reviewed to produce a list of priority waste streams for further study. It focuses on those waste streams which are present in high volumes with high environmental impact. These waste streams – often used as animal feed – can be further studied and evaluated to see if these impacts can be reduced.

The project is also developing a *Food Waste Compositional Database* that brings together compositional information on the macro-nutrients, micronutrients and bioactive components present in the top food co-product streams in a searchable format. It is being demonstrated at the REFRESH Food Waste Conference 2017.

**Upcoming results:** Case studies are underway that 1) incorporate dietary fibre (from processing side-streams) into food products 2) develop a decision support tool for valorisation as animal feed and guidance to policy makers, and 3) research on the potential viability of conversion of putrescible waste to fuels and chemicals.

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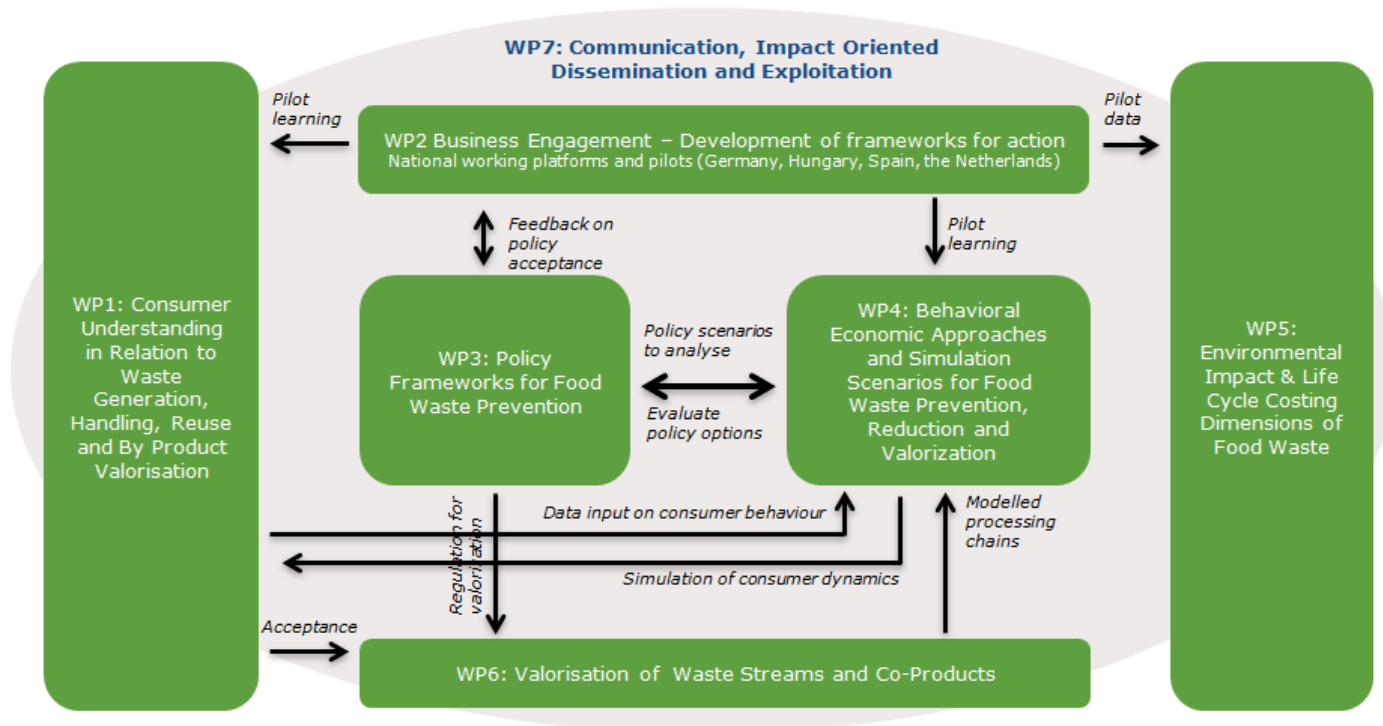
### REFRESH Food Waste Solution Contest

In autumn of 2016, the REFRESH project launched the REFRESH Food Waste Solution Contest, calling on food waste innovators to submit their projects and ideas. The objective of the Contest was to bring much-deserved recognition to these ideas and encourage their spread. Contest submissions were made by individuals, organisations, start-ups and large companies.

Wastewatchers (NL) and Transition Surplus Food Project (UK) were selected by the jury of experts, and Zero Waste Aiud (RO) gathered over 17,000 votes to win the Public Award. During the Public Award in February 2017 some 61,000 votes were cast in total for all projects competing in the Contest.

Several participating projects join the REFRESH Food Waste 2017 Conference to present their ideas as part of the **Innovator Fair**. More information about the Contest is available at: [eu-refresh.org/contest](http://eu-refresh.org/contest)

## Project Structure and Responsibilities



**WP1:** Consumer understanding in relation to waste generation, handling, reuse and by-product valorization – Wageningen University & Research (Hans van Trijp & Erica van Herpen)

**WP2:** Business engagement: Frameworks for Action – WRAP (David Rogers & Kate Bygrave)

**WP3:** Policy framework for food waste prevention, recycling, and reuse – Deloitte Development Durable (Manuela Gheoldus)

**WP4:** Behavioural economic approaches and scenarios for food waste prevention, reduction and valorization – University of Bologna (UNIBO) (Matteo Vittuari)

**WP5:** Environmental and life cycle costing dimensions of food waste – RISE Research Institute of Sweden (Karin Ostergren)

**WP6:** Valorisation of waste streams and co-products – Quadram institute (Graham Moates & Keith Waldron)

**WP7:** Communication, impact oriented dissemination, and exploitation – Ecologic Institute (Stephanie Wunder)

**WP8:** Project management – Wageningen University & Research (Hilke Bos-Brouwers & Toine Timmermans)

## Project Partners



University of Natural Resources and Life Sciences, Vienna



COLLABORATING CENTRE ON SUSTAINABLE CONSUMPTION AND PRODUCTION



## About the REFRESH project

**REFRESH ("Resource Efficient Food and dRink for the Entire Supply cHain") is an EU funded project taking action against food waste. 26 partners from 12 European countries and China work towards the project's goal to contribute towards Sustainable Development Goal 12.3 of halving per capita food waste at the retail and consumer level and reducing food losses along production and supply chains, reducing waste management costs, and maximizing the value from unavoidable food waste and packaging materials. REFRESH runs from July 2015 until June 2019.**