LIFE17 GIE/IT/000579

LIFE FOSTER

Rationale of the LIFE FOSTER strategy to prevent and reduce food waste in the restaurant sector

DELIVERABLE 1
A1-0 Literature and scientific research
A1-1 Food expert interviews

Elaborated by:
Nadia Tecco and Franco Fassio
University of Gastronomic Sciences

LIFE17 GIE/IT/000579

Training, education and communication to reduce food waste in the food service industry

Rationale of the LIFE FOSTER strategy to prevent and reduce food waste in the restaurant sector

DELIVERABLE 1

A1-0 Literature and scientific research

A1-1 Food expert interviews

The opinions expressed in this Report are those of the authors and do not necessarily reflect the opinions of the European Commission, or any other organization mentioned. As a result, these will be verified before implementation of any of the recommendations contained herein.

Version: 01 Final Date*: 30.01.2020*
Developed by: Franco Fassio, University of Gastronomic Sciences
Nadia Tecco, University of Gastronomic Sciences

Contact details: info@lifefoster.eu

LIFE FOSTER project is co-funded by LIFE's European Union Programme | info@lifefoster.eu – www.lifefoster.eu

EXECUTIVE SUMMARY

The report "**Rationale of the LIFE FOSTER strategy to prevent and reduce food waste in the restaurant sector"** presents the main findings and results of the preparatory actions (Action A) of the project and how they contributed to the construction and definition of the LIFE FOSTER strategy to address the challenge of food loss and wastage in the food restaurant sector.

The **"Literature and scientific research review"** (Action A1-0) and the **"Food Expert Interviews"** (Action A1-1) have been used to collect, organize and systematize the existing and more relevant information about projects, best methods and technologies for food waste reduction and quantification. A1-0 and in particular A1-1 also work to collect from beneficiaries and relevant stakeholder information about obstacles and barriers that limit the effectiveness of the existing solutions and actions to fight food waste in this sector.

The picture that emerges is quite rich in projects, reports, actions, tools and technologies to reduce and prevent food waste, but it is still fragmented at the national level (with Italy, Spain, France and Malta being the country of origins of the project's beneficiaries). This picture is still scattered at the sectorial level, when the focus is on restaurants and it is even more so along the different phases characterizing their model (from food management during purchasing and storage, passing through food preparation and finally to food consumption).

More than a lack of solutions, it is evident that **the restaurant sector needs to find a way to adapt the solutions depending on their specific needs and to structure them according a proper use of the food waste hierarchy.**

This insight is confirmed also by the analysis of the interviews conducted with restaurant operation team and specialists in food waste prevention and management. Despite the awareness of the economic, environmental and social relevance of the topic of food waste by the subjects interviewed and a series of actions already adopted what emerges is the difficulty in managing the intrinsic complexity of food waste. It is necessary to consider the **high diversity of the sector**: each restaurant site is different, with its nuances, challenges and restrictions. Thus, for each restaurant's needs, is not possible to have a "one solution fits all approach" but the **feasible and ideal set of solutions has to be customized**. This aspect was highlighted by the cross-cutting analysis of the needs from the answers from the individual respondents of team operation and experts.

Training and education can support the understanding of the most appropriate solutions to avoid as a priority food waste generation.

Another need that emerges from the interviews is to ready to anticipate the evolution of the sector in order to prepare operators capable of applying innovative methods and techniques attentive to changes and challenges for the restaurants. **Alongside innovation related to cooking techniques, cultural and behavioral changes in the kitchen must be promoted**. Food waste in the restaurant sector is an issue that goes beyond the profession and involve citizenship education. It is essential to valorize the restaurant sector and its operators, to increase the customers awareness to recognize the value of food from farm to fork. In order to

support this perspective **training and education should also consider and work on the cultural/behavioral change dimension**.

These inputs have informed and shaped the development of the LIFE FOSTER **Food Waste Tool (FWT)**: **a solution-oriented strategy** to prevent and reduce food waste as a roadmap for VET centers and restaurant, that at the same time is configured as **a methodological framework for training**. The FWT combines actions for preventing and reducing food waste, based **on food waste problem identification** (in general dealing with the food supply chain and for the restaurants), the planning of a strategy development to **fix and contextualize the problem according to the different setting**, the **implementation of solutions**, **evidences collection and progress evaluation**. For each step of the project strategy as well of FWT section, **guidelines** have been provided with an array **of didactical materials and tools to design and implement a plan of action to achieve food waste prevention and reduction** (namely the Food Waste Solutions Toolbox).

The way of working of the project strategy is to find and set up the problem of the food waste in the restaurant sector as a way to **reduce and disentangle its complexity and diversity of causes,** as a process of **selection of critical variables and their cause-effect connections** to define a path that aims at solving the problem itself but all the while provides economic, environmental and social benefits. It pays attention to **foster skills and competencies during routine kitchen operations**, as a way to deals with the long-term professional path of the VET students, it aims at **bridging the gap between what VET centers/restaurant are actually doing to prevent/manage food waste and what they can do to minimize food waste by choosing the most suitable solutions**.

In the LIFE FOSTER project **chefs and all the restaurant staff represent a bridge between farm and fork** and they can play a significant role in reducing food waste but also in creating a **new awareness about the value of food at the restaurant, in our kitchens, classrooms and communities**. Beyond creating fashion and new market trends, chefs have the potential to help to **reframe food system challenges** and **get people to rethink** their eating habits, including how and why they waste food.

CONTENTS

1. LITERATURE AND SCIENTIFIC REVIEW (A1-0)

This section reconstructs the framework of the most relevant projects, scientific literature, best methods and technologies for food waste reduction and quantification of possible benefits. The review has been focused on food waste and in particular on food waste into the food service industry.

The outcomes from action A1-0 activity integrated with the results from the action A.1-1 (Food experts' interviews) (section 2) have been crucial for the following steps of the LIFE/FOSTER implementation, since they have provided the contents and the strategy for the activities foreseen in action B, C and D. The objective of mapping out the project and the most relevant literature about food waste was propaedeutic to identify the most relevant results (in terms of barriers/challenges identification and in finding the best solutions for preventing food waste) achieved so far by project and research and use/adapt them for training the trainers of professional centers and students' training (B1 Activity), supporting in this way the initial and continuing training of future food professionals.

1.1. WORK METHODOLOGY

The responsible of the implementation of the Action A1-0 was the University of Gastronomic Sciences (UNISG). All the other project's beneficiaries supported UNISG in collecting data and information. For supporting the process of data collection and guarantee the standardization of the information, UNISG elaborated and shared a repository with the partners. The repository was made of 4 sheets that corresponds to the different areas of analysis for the Action A.1-0 Literature and scientific research (Fig. 1. Breakdown structure of action A.1-0)

For each sheet, UNISG has identified a list of criteria to facilitate the selection accompanied by a glossary, that defines the kind of information/data requested (see Annex 1). The repository was designed as an implementable tool during the project.

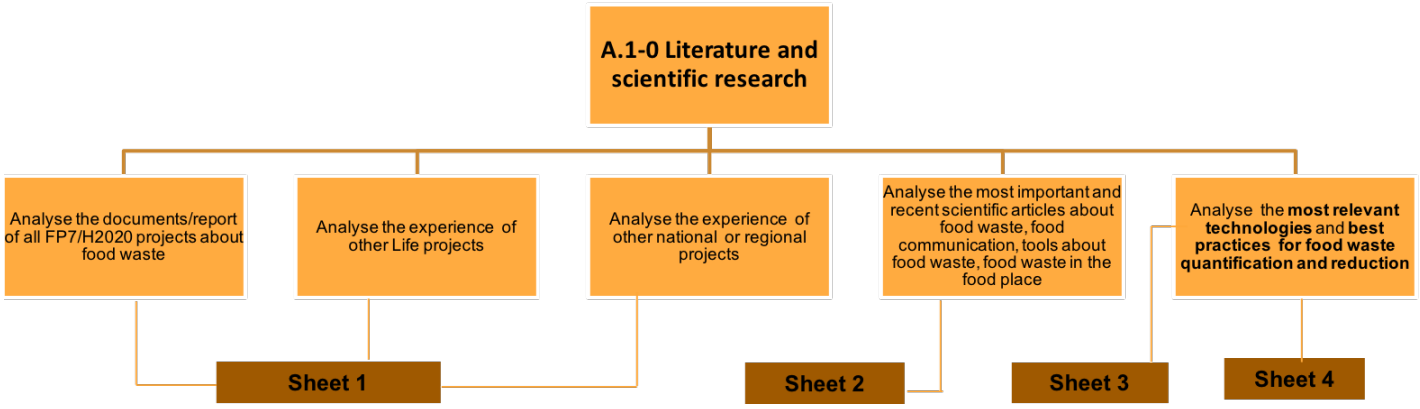

Figure 1. A1-0 Breakdown structure and repository's structure

UNISG asked to all the partners to fill the repository, focusing in particular on their local (national and regional) network of knowledge of projects, researchers committed in the topic of food waste, best practices and technologies.

UNISG asked to each partner to identify from 2007 onwards, at least 5 items (5 projects, 5 publications, 5 technology, 5 best practices) for each sheet. In the meanwhile, that the project's beneficiaries were filling the repository, UNISG went on with the collection of data and information focusing in particular on H2020 and 7FP projects by using mainly the Community Research and Development Information (CORDIS) portal and EU-funded research projects' repository. UNISG also looked for the collection of other Life projects on the topic of food waste/food system sustainability still ongoing and already ended. For this purpose, UNISG has consulted the search project tool on the webpage of the Life Program. For H2020, 7FP and Life program UNISG selected several key words related to the food waste and the food service industry. UNISG focused in particular on the considerable reports and data produced by the EU project FUSION (7FP) and REFRESH (H2020 and still ongoing) along with projects and literature specifically devoted to the food service industry.

UNISG with the ENAIP-NET, CECE, AFPA, MBB and FIC contribution has filled the repository with 96 items, according to the following sheets division (Figure 2. Data collection for typology of sheet).

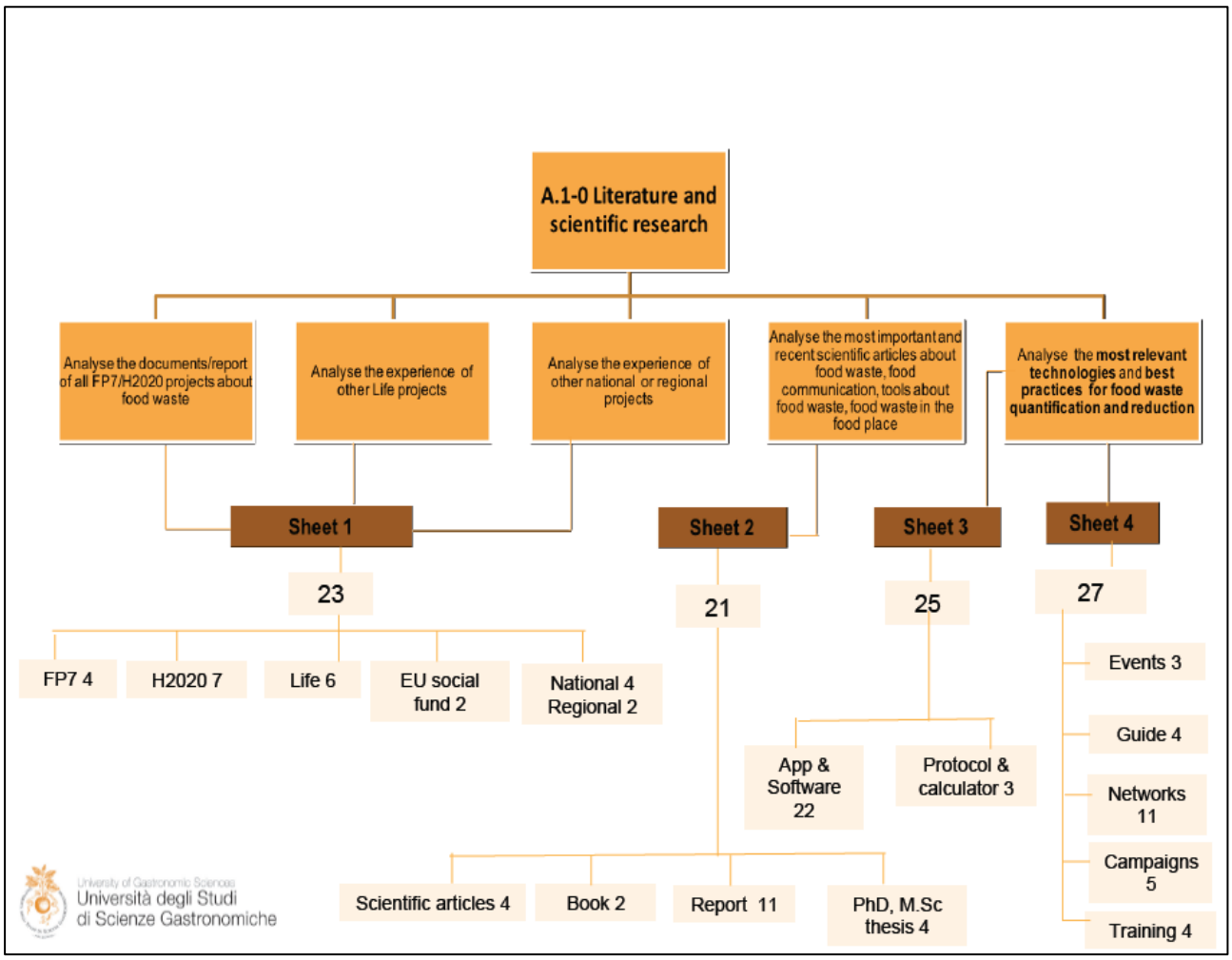

Figure 2. A1-0 Data collection for typology of sheet (UNISG elaboration)

1.2. FIRST DATA COLLECTION AND ORGANISATION THROUGH THE REPOSITORY

1.2.1 PROJECTS

TITLE	FUNDING SCHEME	PERIOD	WEBSITE
Bio-SURFEST	FP7-SME	2011-2013	http://www.biosurfest.com
FUSIONS (Food Use for Social Innovation by Optimising Waste Prevention Strategies	FP7	2012-2016	https://www.eu-fusions.org/index.php
REFRESH: Resource Efficient Food and dRink for the Entire Supply cHain	H2020	July 2015 - June 2019 The REFRESH team was built on the results and experience of the FUSIONS project.	https://eu-refresh.org
LIFE-F4F (food for feed)	LIFE15 ENV/GR/000257	2016-2020	https://life-f4f.gr/en/
LIFE TRiFOCAL London - TRiFOCAL London - Transforming City FOod hAbits for LIFE	LIFE15 GIE/UK/000867	2016-2019	http://trifocal.eu.com/
VALORGAS	FP7-ENERGY	2010-2013	http://www.valorgas.soton.ac.uk/index.htm
LIFE-Food.Waste.StandUp	LIFE15 GIE/IT/000887	2016-2019	http://www.lifefoodwastestandup.eu/it
SU-EATABLE LIFE	Life	2018-2021	https://www.sueatablelife.eu/en/about/

LIFE FOSTER project is co-funded by LIFE's European Union Programme | info@lifefoster.eu – www.lifefoster.eu

CSR for food service business ecosystem (Responsabilità sociale d'impresa per l'ecosistema del business della ristorazione)	D.G.R. n. 948 del 22/06/2016 D.D.R. n. 236 of 28/09/2016. Training and internship were selected in the framework of the Operational Programme co-financed by the European Social Fund in synergy with the European Regional Development Fund (POR 2014-2020, Objective "Investments to favour emplyment growth")	2016-2018	No project website
“Buoni oggi e anche domani!” "(Good today and even tomorrow!")	Italian Ministry of Environment, Unioncamere Veneto and CONAI	2016	No project website
Regional project: “Una Buona Occasione per 4 Stagioni" (A good chance for 4 Seasons)	Piedmont Region, Val d'Aosta Region and the Ministry of Economic Development	2017	http://www.unabuonaoccasione.it
"T4F Training for Food"	European project - Erasmus + KA2	2017	http://www.ucmed.it/progetto-t4f-training-for-sustainable-food/ http://www.transition-europe.eu/en/news/training-

			sustainable-food-system-development-lets-go http://www.fondazionetriulza.org/it/page/t4f-sustainable-food-system/1177/
Pacte national de lutte contre le gaspillage alimentaire National pact to fight against food waste	Ministre de l'Agriculture, de l'Agroalimentaire et de la Forêt	2016-2025	http://agriculture.gouv.fr/pacte-national-de-lutte-contre-le-gaspillage-alimentaire-les-partenaires-sengagent
EAThink2015	Development Cooperation Instrument	2015-2017	https://eathink2015.org/en/
Noshan	FP7	2012-2014	http://www.noshan.eu/index.php/en/
SavingFood	H2020	2016-2018	https://savingfood.eu/
Strefowa	Interreg	2016-2019	http://www.reducefoodwaste.eu/#
PLATAFORMA APROFITEM ELS ALIMENTS (PAA)	Municipality funds	2014 - NOW	http://aprofitemelsaliments.org/
Refood	National	2011- NOW	https://www.re-food.org/en
Agrimax	H2020	2016-Now	http://agrimax-project.eu/
ITENE Easy Fruit	European Social Fund Project	2015-NOW	http://www.easyfruit.eu / http://www.itene.com
Agrocycle	H2020	2016-2019	http://www.agrocycle.eu/
SEA FOOD TOMORROW	H2020	November 2017 – October 2020	https://seafoodtomorrow.eu/

1.2.2. SCIENTIFIC LITERATURE AND INSTITUTIONAL REPORT

Papargyropoulou, E., Lozano, R., K. Steinberger, J., Wright, N., Ujang, Z. Bin, 2014. The food waste hierarchy as a framework for the management of food surplus and food waste. J. Clean. Prod. 76, 106–115. https://doi.org/10.1016/j.jclepro.2014.04.020
Principato, Ludovica, 2018. Food waste at consumer level: A comprehensive literature review. https://doi.org/10.1007/978-3-319-78887-6
Corbo, C., Fraticelli, F., 2015. The use of web-based technology as an emerging option for food waste reduction, in: Envisioning a Future Without Food Waste and Food Poverty: Societal Challenges. https://doi.org/10.3920/978-90-8686-820-9_15
Just, D.R., Wansink, B., 2011. The flat-rate pricing paradox: Conflicting effects of “all-you-can-eat” buffet pricing. Rev. Econ. Stat. https://doi.org/10.1162/REST_a_00057
Mourad, M., 2016. Recycling, recovering and preventing “food waste”: Competing solutions for food systems sustainability in the United States and France. J. Clean. Prod. https://doi.org/10.1016/j.jclepro.2016.03.084
LE Europe, VVA Europe, Ipsos, ConPolicy and Trinomics, 2018, Behavioural Study on Consumers' Engagement in the Circular Economy – Report, Luxembourg: Publications Office of the European Union, https://ec.europa.eu/info/sites/info/files/ec_circular_economy_executive_summary_0.pdf
Gillet, V., 2015. Quelles solutions envisageables face au gaspillage alimentaire ? Analyse par une approche « multicritères, multi-acteurs, Universite Catholique De Louvain, https://dial.uclouvain.be/memoire/ucl/fr/object/thesis%3A2621/datastream/PDF_01/view
Le Borgne, G., 2015. Sensibilité du consommateur au gaspillage alimentaire: conceptualisation, antécédents, et conséquences. Economies et finances. Université Montpellier. Français. NNT. https://tel.archives-ouvertes.fr/tel-01514924/document
Attard, K., 2016. Breaking the foodberg : a socio-ecological study of food waste production in Maltese households, University of Malta, Faculty of Education. M.Sc. Thesis https://www.um.edu.mt/library/oar/handle/123456789/15546
Engerer Z., C., 2016. Attitudes and practices towards food waste by households in the Maltese islands, University of Malta, Faculty of Education. M.Sc. Thesis https://www.um.edu.mt/library/oar/handle/123456789/15557

Kallbekken, S., Sælen, H., 2013. "Nudging" hotel guests to reduce food waste as a win-win environmental measure. Econ. Lett. https://doi.org/10.1016/j.econlet.2013.03.019
Lipinski, B., Hanson, C., Lomax, J., Kitinoja, L., Waite, R., Searchinger, T., 2013. Creating a Sustainable Food Future: Reducing Food Loss and Waste. World Resour. Inst. https://www.wri.org/publication/reducing-food-loss-and-waste
Food Waste Working Group, 2014. Recommendations to MSDEC (Ministry for Sustainable Development, Environment and Climate Change) - October http://3c3dbeaf6f6c49f4b9f4-a655c0f6dcd98e765a68760c407565ae.r86.cf3.rackcdn.com/5265204cf0897ce810e13dab2f70adc421d55f42.pdf
Ministerio de Agricultura, Pesca y Alimentación (MAPA), 2014. Guía práctica para reducir el desperdicio alimentario en centros educativos "Buen Aprovecho". MAGRAMA. 2014. https://www.menosdesperdicio.es/sites/default/files/documentos/relacionados/guia_centros_educativos_2014_0.pdf
Ministerio de Agricultura, Pesca y Alimentación (MAPA), 2015. Guía práctica para reducir el desperdicio alimentario en el comercio minorista (sector de frutas y hortalizas, https://www.menosdesperdicio.es/sites/default/files/documentos/relacionados/guia_comercio_minorista_2015_0.pdf
Ministerio de Agricultura, Pesca y Alimentación (MAPA), 2016. Guía práctica para reducir el desperdicio alimentario en la restauración https://www.menosdesperdicio.es/sites/default/files/documentos/relacionados/guia_restauracion_web_2017.pdf
UNEP, 2014. Prevention and reduction of food and drink waste in businesses and households - Guidance for governments, local authorities, businesses and other organisations, Version 1.0 https://europa.eu/capacity4dev/unep/document/thinkeatsave-guidance-version-10
WWF, 2017., HOTEL/KiTCHEN, Lucha contra el desperdicio de alimentos en los hotels, https://hotelkitchen.org/wp-content/uploads/2018/02/HotelKitchen_toolkit_Spanish.pdf
Barilla BCFN and The Economist intelligence Unit, 2018. Fixing Food 2018 - Best Practices Towards The Sustainable Development Goals, https://foodsustainability.eiu.com/wp-content/uploads/sites/34/2016/09/FixingFood2018.pdf
Barilla BCFN, 2012. Lo Spreco Alimentare - Cause, Impatti E Proposte, https://www.barillacfn.com/m/publications/spreco-alimentare-cause-impatti-proposte.pdf

Barilla BCFN, 2012. L'Alimentazione nel 2030 - Tendenze e Prospettive. https://www.barillacfn.com/m/publications/alimentazione-2030.pdf

1.2.3. TECHNOLOGIES

NAME OF TECHNOLOGY	TOPICS (key words)	TYPE OF TECHNOLOGY	WEBSITE
WINNOW	food waste reporting, food waste tracking, kitchen	Software+hardware	https://www.winnowsolutions.com
Ratatouille	sharing extra food, virtual fridge	App (iOS)	http://www.ratatouille-app.com
Lean Path	food waste tracking, food waste reporting	Software	https://www.leanpath.com/solutions/
It's Fresh	food waste calculator	Calculator	http://www.itsfresh.com/food-waste-calculator/people-counter.html
FLW CALCULATOR	food waste calculator	Protocol	http://flwprotocol.org/about-flw-protocol/
Tenzo	Sales forecasting	Software+hardware+App	https://www.gotenzo.com
EWWR			
UBO - App	food conservation, consumers, advise	App	www.unabuonaoccasione.it
Too good to go	Buy cheap unsold products	App (iOS and Androïd)	https://toogoodtogo.fr/fr
Zero-gachis	Discounts on fresh products	App (iOS and Androïd)	https://zero-gachis.com/

HopHop Food	Food donation between individuals	App (iOS and Androïd)	http://www.hophopfood.org/
Olio	Food sharing, leftovers, donation	App (iOS & Android)	https://olioex.com/
Karma	Re-selling, leftovers, Discounts	App (iOS & Android)	https://karma.life/
Waste Cooking	Leftovers, Upcycling, Recipes	Website Web-series	http://www.wastecooking.com/en/
Too Good To Go	Selling Surplus Food, Discount,	App (iOS & Android)	https://www.toogoodtogo.co.uk/en-gb
Copia	Food sharing	Website	https://www.gocopia.com/
No Food Waste	Food Waste,	App (Android)	www.nofoodwaste.in
Tapper	Food Waste	App (iOS and Android)	https://tapper.es
To Good to Go	Food Waste, Circular Economy	App (iOS and Android)	https://www.toogoodtogo.com/en
Yo no Desperdicio	Food Waste, Awareness, Application, Community	App (iOS and Android)	https://yonodesperdicio.org/?locale=es
Ni las Migas	Food Waste, Circular Economy	App (iOS and Android)	http://nilasmigas.com/
Orogel	Optimization of processing of plant products, storage systems and reduction of food waste in industrial processing	Industrial tecnology	www.istitutosurgelati.it/orogel-innovazione-innovazione-innovazione/
Kitchen Hub. EMPOWER PEOPLE (Finalist Electrolux design lab 2013)	Purchase Optimization, reduction of food waste in the food market,	Device + App (iOs and Android)	http://www.franciscobarboza.com/kitchen-hub-empower/

	both for domestic use and restaurants		
BringTheFood	measures and reduces food waste, helps those in need	App (iOS and Android)	http://www.bringfood.org/landing/
MyFoody	Purchase optimization, reduction of food waste in the supermarket and food market	App (iOS and Android)	http://myfoody.it

1.2.4. BEST PRACTICES, INITIATIVES

NAME OF THE INITIATIVE/BEST PRACTICE	RESPONSIBLE ENTITY	SCALE	INITIATIVES OBJECTIVE	WEBSITE
UBO, Una Buona occasione/ A good opportunity	Piedmont Region	ITALY, PIEDMONT	FW reduction	http://www.unabuonaoccasione.it/en/the-project/what-about-it
Food Waste Atlas	Wrap & World Resource Institute	International	Food waste data collection	https://www.thefoodwasteatlas.org/home
SITICIBO	Fondazione banco Alimentare ONLUS	Italy	Donation of the food surplus from restaurants	https://www.bancoalimentare.it/it/siticibo2012
FARESHARE	FARESHARE	UK	Food surplus redistribution, also from restaurants	https://fareshare.org.uk
Il buono che avanza	Associazione Cena dell'Amicizia Onlus	ITALY	Doggie bag for food & wine	http://www.ilbuonocheavanza.it/ristoranti/

WRAP	Resource pack for hospitality and Food Service Sector: Engaging with consumers to help reduce plate waste	International	Guide for restaurants	http://www.wrap.org.uk/sites/files/wrap/UK%20LFHWHospitalityResourcePack_0.pdf
REFED	Restaurant Food waste Action Guide	USA	Guide for restaurants about solutions to reduce food waste	https://www.refed.com/downloads/Restaurant_Guide_Web.pdf
Rimpiattino	Federazione Italiana Pubblici Esercizi (FIPE) and COMIECO (Consorzio Nazionale Recupero e Riciclo degli Imballaggi a Base Cellulosica, Italian Consortium for Recovery and Recycling of Cellulose-based Packaging)	Around Italy	Food waste reduction, awareness raising	http://www.ansa.it/canale_terraegusto/notizie/in_breve/2018/10/10/rimpiattino-nasce-la-doggy-bag-in-versione-italiana_b85520d9-9570-43e6-82c5-1c2820723c96.html
Prevention of food loss and food waste in DDIF* courses	ENAIP Lombardia	Lombardy	Prevention of food loss and food waste through training	https://goo.gl/wpTHHL
IFTS Alta cucina e pasticceria (High cusine and bakery)	ENAIP Lombardia	Lombardy	Improve the use of food products	http://www.enaiplombardia.eu/index.php?option=com_k2&view=item&id=322:scuola-di-alta-cucina&Itemid=147
Saving Food - Horizon 2020	ViLabs	Europe	- Develop a bottom up solution for reducing food waste by harnessing	https://savingfood.eu/food-waste-calculator/

			the collaborative powers of ICT networks. - Improve awareness and engagement across multiple stakeholders. - Create a more effective operational model for food redistribution that will increase current levels of engagement. - Drive behaviour change towards food waste reduction. - Understand the processes of collective awareness, collective intelligence and online networks. - Offer a Europe-wide social innovation solution to food waste.	
STREFOWA - Interreg Central	UNIVERSITY OF NATURAL RESOURCES OF LIFE SCIENCES VIENNA, ABF- BOKU	Europe	•the prevention of food waste generation •the donation and use of food surpluses •the promotion of proper food waste management	https://www.interreg-central.eu/Content.Node/STREFOWA.html https://www.interreg-central.eu/Content.Node/STREFOWA.html https://www.interreg-central.eu/Content.Node/STREFOWA.html#accordionaccordion612Collapse1914
Fight against the food waste	AFPA	France, Rennes, Training center	FW reduction	http://association-alimentation.fr https://www.vertlejardin.fr https://metropole.rennes.fr

Greencook	ENO (Europe north west)	France, Hauts de France, Pas de Calais	FW reduction	https://www.green-cook.org/. https://green-cook.org/Outils-pour-la-restauration.html
Don't Waste Waste	Malta's Ministry for Sustainable Development, Environment and Climate Change (MSDEC) and Wasteserv Malta	Malta	Awareness on waste and the importance of waste management	http://dontwastewaste.gov.mt/
Launch of food waste reduction booklet and seminars as part of Pre-Waste project national event	WasteServ Malta	Malta	Greater public knowledge on methods to reduce food waste through correct storage, portion control, and recipes based aroung leftovers	http://www.ewwr.eu/docs/case_studies/EWWR_2011-Case%20studies_Administration_Malta.pdf
We Eat Responsibly!	Glopolis (CZ)	European	* Education for a sustainable lifestyle. * Students lead change. * Teachers are key players to guide and facilitate the learning experience of youth. * Local community involvement * Sharing of best practices * Publication of Menu for change, on how our food changes the world.	https://www.eatresponsibly.eu/en
The Pig Idea	Tristram Stuart & Feeding the 5000,	UK	*Restore public confidence in the safe, efficient, cost-effective and	http://www.thepigidea.org/

	Thomasina Miers, Wahaca, and Stepney City Farm		environmentally friendly practice of feeding surplus food to pigs. * Encourage more use of already legally permissible food waste as pig feed – for example, bread, dairy, fruit and vegetables that are unfit for human consumption – by raising awareness and understanding of this option amongst supermarkets, food businesses, Animal Health officials and pig farmers. * Change European law to allow food waste including catering waste to be diverted for use as pig and chicken feed; and to introduce a robust legal framework for its safe processing and use to prevent the outbreak of animal diseases.	
smart KITCHEN - wasteless cooking!	pulswerk GmbH, and Envicient OG	Austria	* Minimize food waste * Development of a training course for cooks and kitchen staff * Raising awareness about the problem of food waste	http://www.smart-kitchen.at/
La Alimentación no tiene desperdicio	AECOC - ASOCIACIÓN DE FABRICANTES Y DISTRIBUIDORES	SPAIN	FW reduction	https://www.alimentacionsindesperdicio.com/
wastED	BlueHill	UK, US	FW reduction	https://www.wastedlondon.com/

Imperfect Produce	Imperfect Produce	US	FW reduction	https://www.imperfectproduce.com/about-us
Think.Eat.Save	UNEP, FAO and Messe Düsseldorf, and in support of the UN Secretary-General's Zero Hunger Challenge	World-wide	FW information platform	http://www.thinkeatsave.org
Open your eyes to waste: Unilever Food Solutions	FEHR	National	FW reduction	http://www.fehr.es/documents/guias/abra-los-ojos-ante-los-desperdicios.pdf
Share a Meal	Unilever food solution - WFP italia (world Food Program)	ITALY	education on the FW reduction	https://shareameal.it/
"CIBO NOSTRUM" Editions 2016, 2017, 2018 Taormina Promotion for consumption of bluefish and surplus fish species in restaurants	MIPAAF (FEAMP e PEMAC) - FIC (Federazione Italiana Cuochi)	ITALY	comunication on the FW reduction and use neglected fish in the offer of restaurants	https://cibonostrum.eu/ www.govserv.org/XX/Unknown/23594192 0240917/FEAMP-Cibo-Nostrum-2017
Institutional conference: DO NOT WASTE FOOD AND PROMOTE THE ECONOMY: PROPOSALS AND BEST PRACTICES A COMPARISON	Order of Food Technologists	Italy	comparison on regulations, best practices and proposals on the reduction of food waste	http://www.tecnologialimentari.it/it/news/download/286/

LIFE FOSTER project is co-funded by LIFE's European Union Programme | info@lifefoster.eu – www.lifefoster.eu

1.3. REPOSITORY DATA ANALYSIS

1.3.1 OVERVIEW ABOUT FOOD WASTE AT THE CONSUMPTION LEVEL: LET'S NOT FORGET AND NEGLECT THE ROLE OF RESTAURANTS

As a first step, the repository was used for the purpose of collecting data and information useful to contextualize the theme of food waste from the restaurant sector in the wider context of food waste as a starting point for the planning of training. Documentation of scientific origin and project reporting have been predominantly used for this purpose. Where the documentation in the repository was not considered of sufficient quality, other sources were consulted. It is interesting to note that the restaurant sector has been the subject of attention only in more recent times. The data are therefore tendentially current, even if still not very representative. The fragmentation of the sector into very different models and subjects makes the operation of gathering information certainly more difficult.
Furthermore, the future projection of restaurant consumption, destined to rise in the next decade, should not be overlooked, considering the increase in the consumption of meals outside the home and the evolution of the same catering model (just think of the growth in the phenomenon of delivery) and the its hybridizations with the medium and large distribution sector.
Within this transition, the role and meaning assumed by the chef, in his functions as manager, front man, team leader, communicator of information and values related to the sustainability of products and transformations, cultural ambassador and his role in relation to the use and respect of personnel and raw materials.
Data were collected around the following main topics:

Food waste at the UE level and quality of the data

The collection and analysis of data from across Europe from the FP7 project FUSIONS (2016) generated an estimate of food waste in the EU-28 of 88 million tonnes. This estimate was for 2012 and included both edible food and inedible parts associated with food. This equates to 173 kilograms of food waste per person in the EU 28. The total amounts of food produced in EU for 2011 were around 865 kg/person, this would mean that in total we are wasting 20 % of the total food produced.

Food waste at the consumption level

For what concerns the production of food waste during the consumption, the attention has been focused mainly on what happens at household level as the sector contributing the most (53%) to food waste with 47 million tonnes tonnes (± 4 million) (Quested & Luzecka, 2014; Stancu et al., 2016; Visscher et al., 2016).

Food waste in the restaurant sector

It is only more recently that even the food waste generated during the *"away from home"* phase (Principato, 2018) has gained momentum by means of the projects set up for tackle food waste in it, along with the development of a relevant dedicated scientific literature.

Food industry produces 10.5 million ton of food waste (equivalent to 21 kg per person) each year in Europe.

The food service sector contributes to 12% of the total food waste (FUSIONS, 2016). Other studies estimate its contribution by 4 to 10% of the total wood waste (ADEME, 2013), 11% (Garot, 2014), 13% (Waste Watcher Report, 2015), 14% (Ministerio de Agricoltura, Alimentacion y Medio Ambiente, 2013).

According to a study made in UK (WRAP, 2013), food waste in restaurants happens during the preparation phase (45%) or for food deterioration (21%) or due to client's leftovers 34%).

Food Waste costs (visible and invisible) and benefits on the triple bottom line and SDGs related with food waste prevention and reduction

Reduce food waste presents a unique opportunity to reduce business costs, create social and environmental benefit, increase consumers' savings working into the direction of the Sustainable Development Goals and in particular toward Goal 12 "Ensure Sustainable consumption and production pattern", target 3.1 "Halve per capital global food waste at the retail and consumer level and reduce food losses along production and supply chains, including post-harvest losses" and by cascading effect also the Goals 1, 2, 9, 10, 11, 13, 14 and 15 (Principato, 2018).

The reduction of food waste hence enforces the economic outcome of a catering business, restaurant and the benefit-to-cost ratio of food waste reduction is compelling: for every dollar invested in food waste reduction, restaurants can realize 8$ of savings (REFED, 2018). In a typical restaurant, up to 35-40% of sales is attributed to food costs and approximately 12% of food cost is attributed to food waste.

Tracking food thrown away system could cut food cost by 2 to 6% by increasing awareness of food waste within the company and focusing attention on front and back of house prevention activities (REFED, 2018).

1.3.2 KEY ELEMENTS TO KEEP IN MIND DEALING WITH FOOD WASTE IN THE RESTAURANT SECTOR

As second step, the repository was used with the aim of codifying the problem of food waste in the restaurant, focusing on the specificities of the sector. In this case, the main inputs came to us from the specialist literature on the subject. The generation of food wastes during this phase shares many facets with the household one. Food wastes happens at the household and away from home as the outcome and concatenation of multiple factors, deeply rooted in the decision making and consumer food management processes. However, the food service industry is characterized by a greater (or it could be defined at least different) complexity given by a larger potential scale for food waste generation (also considering the increasing rate of food consumption away from home), the sharing of responsibility among restaurants managers, chefs and the clients/food service consumers, the different models of food administration (restaurants, bar, cafeterias, hotels, catering services, quick service restaurants). Unlike the household context consumers has a lower a sense of ownership or responsibility about the food they leave and the amount of food they get is considered to be out, with any leeway for change. This complexity makes a challenge to find a solution to the problem of food waste into the food service industry. This same complexity determines that there is no solution to food waste in restoration sector but a multitude of solutions, as well evidenced by the

availability of initiatives and best practices on the subject and the recent development of a series of technologies, which range from forecasting customers to managing leftovers and surplus food.

Moving from these assumptions, UNISG tried to elaborate a synthetic vision starting from the inputs collected through the repository (especially by using the scientific literature), but at the same time simple and representative of the drivers behind the creation of food waste, as well as the possible solutions. For this purpose, UNISG has reworked all the information and data collected in the repository by creating a schema according to the 5W formula. UNISG has selected this formula because these 5 questions are basic and strategic in information-gathering and in mapping an outline for all the collected content.

For what concerns the challenge of food waste in the food service industry (what), the schema identifies the place of waste production (where), the main producers (who) and in what time of the food chain from the supply to the final disposal.

The main drivers (why) are represented according to the different supply chain stages (when) and going up the diagram from the bottom to the up also with the who and where sections. The generation of food waste into the food service industry can be represent therefore as the outcome of the food waste generated by two different but bounded up macro-phases, that happens in the kitchen and what in the food dining area. The first one goes from the restaurant supply planning, provision and storing managed usually by restaurants' managers to the chefs' food preparation, while the second goes from the food presentation and administration to the food consumption by restaurants' clients, till the final disposal. Each ring of the sequence contributes to the food waste generation, in which factors of demographic and socio-economic nature interact alongside with psychological, social and situational aspects.

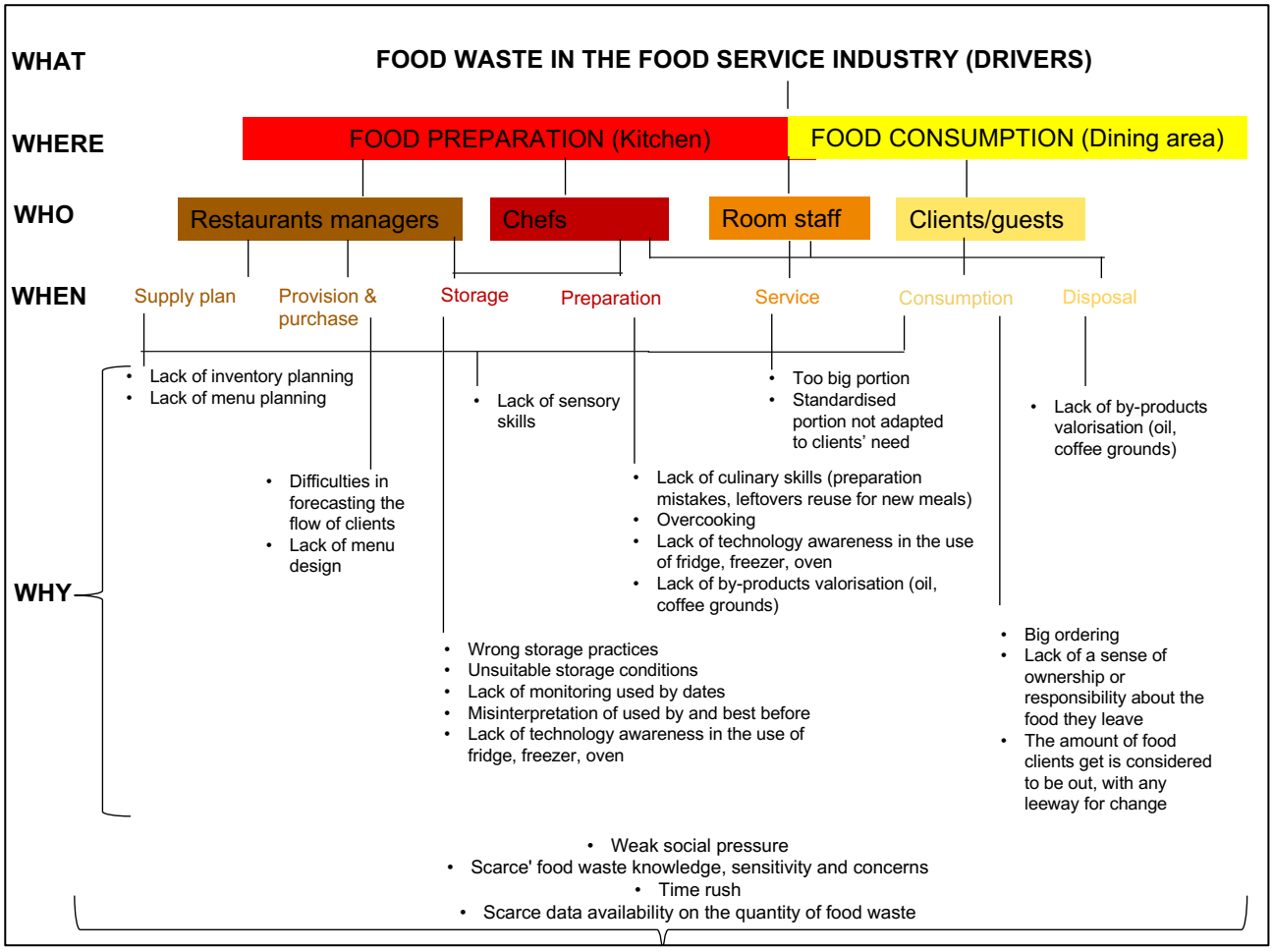

Figure 3. A1-Drivers of the Restaurant food waste (UNISG elaboration)

The 5W schema makes it clear that the problem of food waste in the food service industry is a very systemic one, result of multiple actions that imply many actors where at the moment is difficult to carry out a separation between the drivers and the consequence of the different actions and their relationship (Fig. 4).

The areas of intervention (HOW in substitution to the WHY) are therefore multiple and open the way to different types of solutions (Fig. 5), operating on the different fronts of the reduction, the re-use/recovery and the recycle of the food waste based on environmental, social and economic goals. They include e.g. proposals for technological innovation, reorganization processes, food waste audit and monitoring, training for the acquisition of the missing skill, redistribution of the food surplus, awareness campaigns, creation of communities of practices, recommendations.

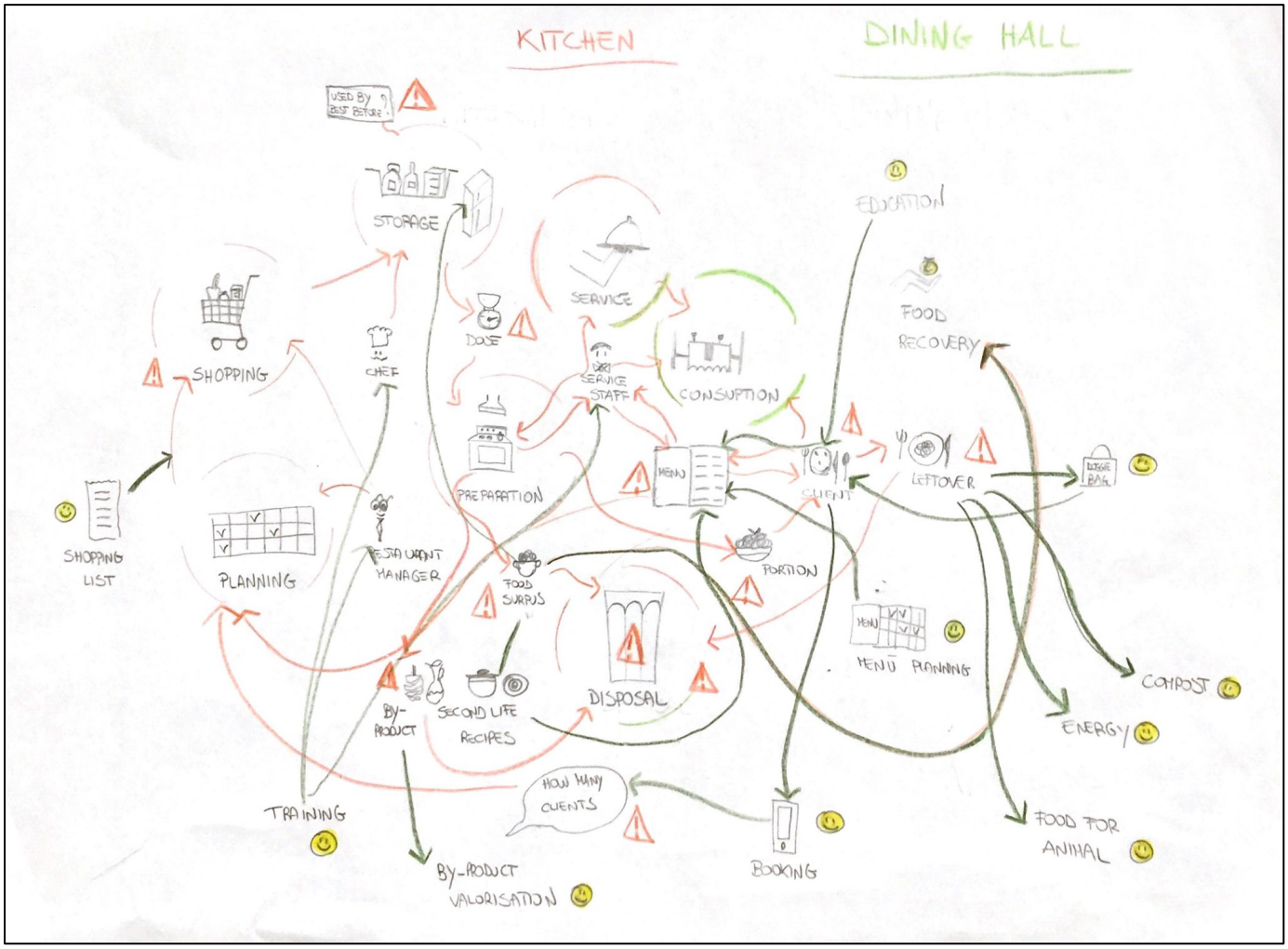

Figure 4. Food waste restaurant system (UNISG elaboration)

These are solutions, which beyond differ in terms of type, differ for their degree of feasibility, profit and saving potential, implementation effort, social and environmental spill overs (with a further distinction between weak and strong sustainability). Such a rich availability of solutions risks however to turn into a competing context without achieving “win-win-win” benefits for all actors and at all scales. FOSTER approach by operating upstream the food value chain to reduce its production according to the Waste Hierarchy and following the principles of the Circular Economy will work in the promotion of a proper ration in the combination of these solutions.

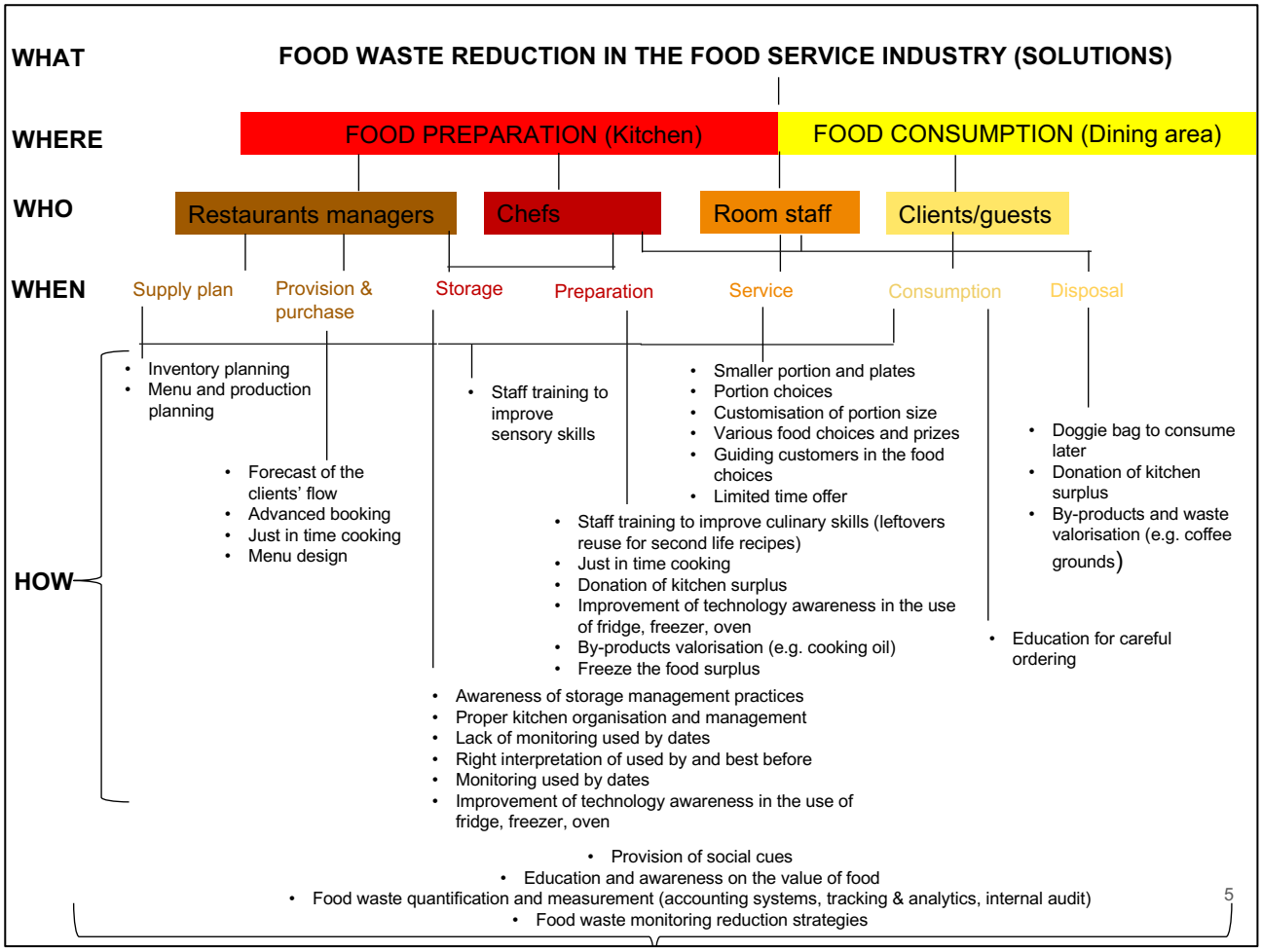

Figure 5. Solutions for the reduction of restaurants food waste (UNISG elaboration)

1.3.3 FINDINGS FROM THE CROSS-SECTIONAL ANALYSIS OF THE REPOSITORY

The picture that emerges from a cross-sectional analysis of the repository is quite rich in projects, reports, actions, tools and technologies to reduce and prevent food waste, but it is still fragmented at the national level (with Italy, Spain, France and Malta being the country of origins of the project's beneficiaries). In particular if we refer to the pieces of information collected in sheets 1 (projects), 3 (technologies) and 4 (best practices and initiatives) show how the theme of food waste (more widely understood and more specifically for the restaurants), has so far been tackled with a precise approach, oriented to deal with single issues or certain phases of the supply chain (favoring downstream actions) to the detriment of a holistic change and not necessarily in line with the waste hierarchy.

This picture is still scattered at the sectorial level, when the focus is on restaurants and it is even more so along the different phases characterizing their model (from food management during purchasing and storage, passing through food preparation and finally to food consumption) as highlighted by the matrix below (Table 1. Matrix of the collected data and information typology for thematic issue).

At the moment, the food service industry has mostly been integrated into actions to fight food waste as one of the many rings in the food supply chain. Only more recently specific initiatives for the sector are emerging, which could enhance the capital of information and solutions already developed to counter waste at household level or be included in projects involving the distribution and retail phase.

This preliminary analysis confirms the need of intervention in the food industry by fostering this missing chain link and the role of FOSTER to be complementary to these previous and on-going initiatives about food waste along the food system. The training activities, so far still not very interested in the topic, could play this role of connection and systematise and enhance the cognitive and experiential heritage of what has already been achieved so far.

Table 1. Matrix of the collected data and information typology for thematic issue (UNISG elaboration)

	7FP & H2020	LIFE	NATIONAL AND REGIONAL PROJECTS EUROPEAN SOCIAL FUND	PROTOCOL & CALCULATOR FOR AUDIT/MONITORING/FORECAST	APP & SOFTWARE	EVENTS & PERFORMANCES	GUIDE	PLATFORM & NETWORK	CAMPAIGNS
FOOD WASTE QUANTIFICATION	FUSION		Fight against the food waste	WINNOW **Leanpath** It's fresh FLW Calculator			Restaurant Food Waste Action Guide	Food Atlas	
PLANNING & MENU DESIGN		TRIFOCAL		TENZO			Restaurant Food Waste Action Guide Open your eyes to waste: Unilever Food Solutions		
SHOPPING LIST		TRIFOCAL			Kitchen Hub. EMPOWER PEOPLE (Finalist Electrolux design lab 2013)		Restaurant Food Waste Action Guide		

STORAGE		TRIFOCAL	ITENE Easy Fruit	Optimization of processing of plant products, storage systems and reduction of food waste in industrial processing (Orogel)	Una buona occasione		Restaurant Food Waste Action Guide Open your eyes to waste: Unilever Food Solutions		
PREPARATION	T4F TRAINING FOR FOOD		Fight against the food waste		Una buona occasione	Wastecooking	Resource pack for Hospitality and Food Service Sector: engaging with consumers to help reduce plate waste Restaurant Food Waste Action Guide Open your eyes to waste: Unilever Food Solutions	Wast-ED	
BY-PRODUCT & FOOD WASTE UPCYCLING	Bio-SURFEST VALORGAS NOSHAN Agrimax Agrocycle	LifeF4F					Restaurant Food Waste Action Guide		The Pig Idea

TAKE HOME LEFTOVER			Buono oggi e anche domani RIMPIATTTINO					Il Buono che avanza	
PRICE DISCOUNTS AND DONATION FOR FOOD CLOSE TO THE EXPIRY DATE OR HAS NO FOUND A FINAL CONSUMER					Karma Tapper Ni la Migas Zero Gachis. Olio MyFoody			SITICIBO. Imperfect produce	
FOOD SURPLUS REDISTRIBUTION	SavingFood		La Alimentacion no tiene desperdicio		Ratatouille Too good to go HopHop Food Copia No Food Waste Yo no Despedicio BringTheFood		Restaurant Food Waste Action Guide	FARESHARE Wast-ED	
COMMUNICATION & CSR			CSR for food service business ecosysem (Italy)				Restaurant Food Waste Action Guide		
RECYCLYING OF UNAVODABLE WASTE		TRIFOCAL	Fight against the food waste				Restaurant Food Waste Action Guide Open your eyes to waste:		

							Unilever Food Solutions		
RECOMMENDATION & GUIDELINES, POLICY FRAMEWORK	FUSION REFRESH Strefowa		Pacte National de lutte contre le gaspillage alimentaire (France)*			DO NOT WASTE FOOD AND PROMOTE THE ECONOMY: PROPOSALS AND BEST PRACTICES A COMPARISON		Plataforma Aprofitemels Alimentes (Spain). Refood. Greencook	Don't Waste Waste
CONSUMERS' AWARENESS & SUSTAINABLE DIETS	EATThink2015. We eat responsibly SEA FOOD TOMORROW	TRIFOCAL Food.Waste.Standup SU-EATABLE LIFE	Una buona occasione per 4 Stagiomi			CIBO NOSTRUM	Resource pack for Hospitality and Food Service Sector: engaging with consumers to help reduce plate waste Food waste reduction booklet		Think.EAt.Save

LIFE FOSTER project is co-funded by LIFE's European Union Programme | info@lifefoster.eu – www.lifefoster.eu

2. FOOD EXPERT INTERVIEWS (A1-1)

2.1. THE PANEL OF THE INTERVIEWEES: COMPOSITION, ROLE AND PROVENIENCE

UNISG with the support of the other beneficiaries from the LIFE FOSTER (ENAIP-NET, AFPA, CECE, MBB and FIC) collected 25 interviews from November 2018 to July 2019 in order to understand the nature of the problem of the food waste in the restaurant sector (difficulties, limits and availability of solutions to prevent/reduce/quantify the food waste). The purpose of the questionnaire was in particular to collect data and information to understand in deep the causes of food waste, to catalyze ideas and inspire actions that will lead to shape the development of a proper framework for the prevention/reduction of food waste in the food service industry for the training content of the project (Action B1 and B2), as well valuable inputs for monitoring actions (C1 and C2).

The interviews have collected the voices both from members from operation team at restaurants (60%) and from experts/specialists about food waste management and prevention in the restaurant sector (40%) (see Figure 6).

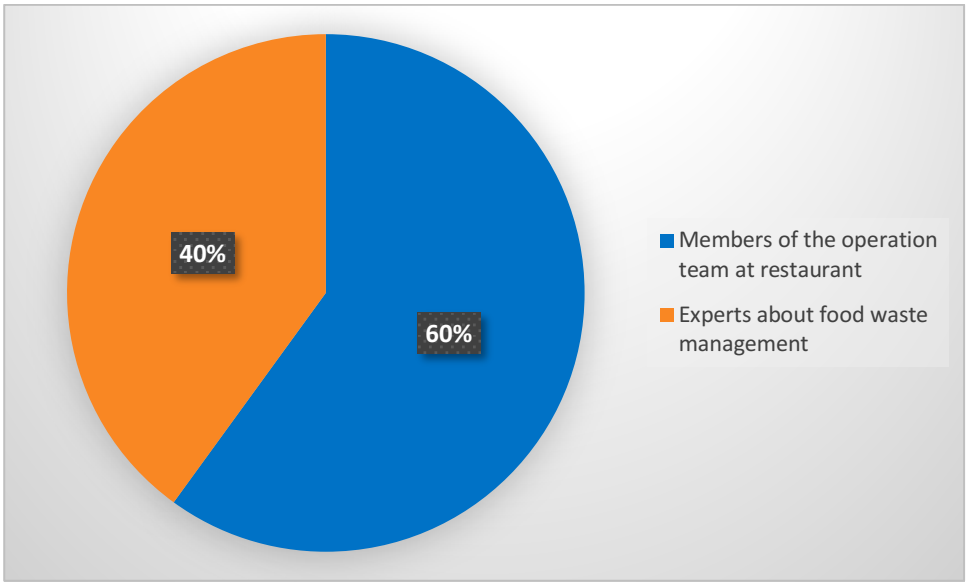

Figure 6: Composition of the panel of the interviewees (UNISG elaboration)

These two categories were selected to represent the transversality of roles across the restaurant sector[1] and to grasp as much as possible elements from different stakeholders' perspective. Restaurant managers, chefs and waiters have been interviewed among members from operation team. More than half of them also owns the restaurant and in 20% of cases the interviewee plays several roles simultaneously (chef and restaurant manager or restaurant manager and waiter). They are all representative of indipendent[2] and sit-down restaurants. However, the restaurants differ considerably for types[3], size[4], target[5], prize[6]) and menù concepts (menù of the day, a la carte, buffet). Experts about wood waste prevention and management play diverse roles, including food waste activists and bloggers, professor and lectures on this subject matter and trainers of the VET centers.

The provenience of the interviewees coincides with that of the project beneficiaries in Italy, France, Spain and Malta. Each beneficiary, under the coordination and supervision of UNISG took care of administering a certain amount of interviews. The greatest presence of Italian beneficiaries (UNISG, ENAIP-NET and FIC) explains the greater representativeness of Italy by number of interviews carried out (see figure 8)

The interview has also proved to be a useful tool for building and/or consolidating the relationship with the interviewing subject and with the LIFE FOSTER project. Thanks to the creation of a first contact through the exchange of information on the topic of food waste in the restaurant, some relationships/collaborations have been started or have been consolidated over the course of the project (eg. with Slow Food, Tempi di Recupero project…).

1 The questionnaire is unique with the possibility to administer it to the different targets. There were some questions identified in the questionnaire with the symbol * dedicated to the restaurant operation team.

2 With the possibility to act alone, without corporate or shareholder oversight. These restaurants have the freedom to act alone and a greater flexibility to adopt food waste solutions, even with less human and capital resources (Cochran et al., 2018). In the project, UNISG has decided to focus on this category of restaurants to better investigate the full array of possibilities in food waste managements. Usually corporate or shareholder adopt standardized and replicable solutions.

3 Trattoria, brasserie, bistro, tapas bar, international/national /regional cooking restaurant.

4 Small with less than 30 seaters, medium with more than 30 seaters but less than 100, big with more than 100 seaters.

5 For family, tourists, workers or a combination of the different target.

6 From very cheap (less than 10 euro for an average meal) to quite pricey (more than 50 Euro for an average meal).

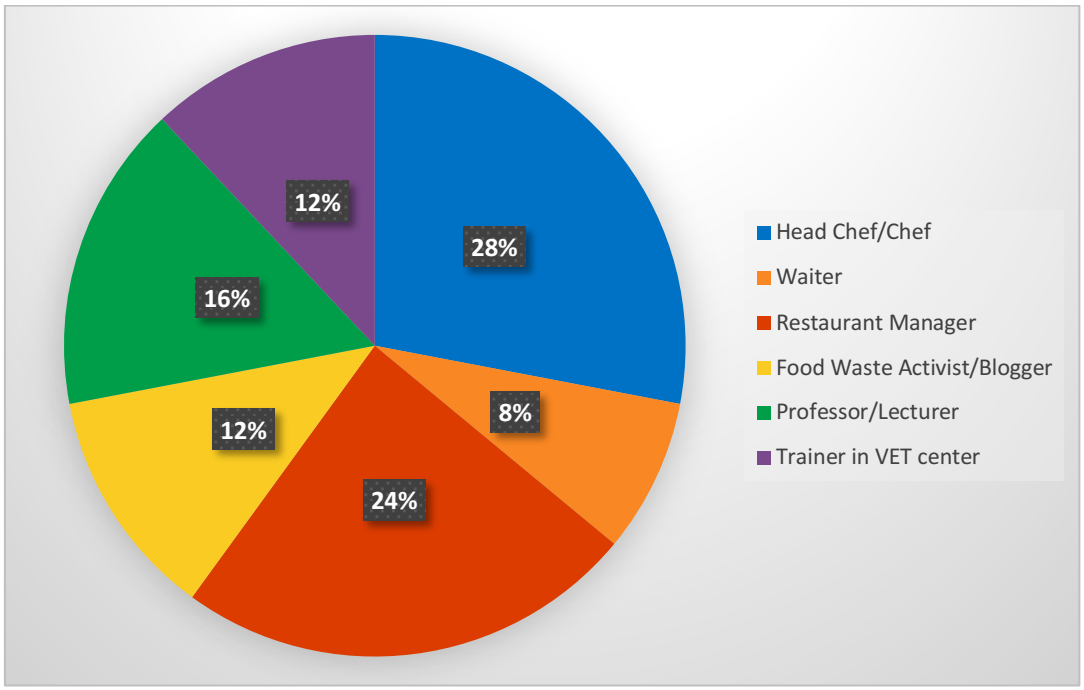

Figure 7: Specific roles of the interviewees (UNISG elaboration)

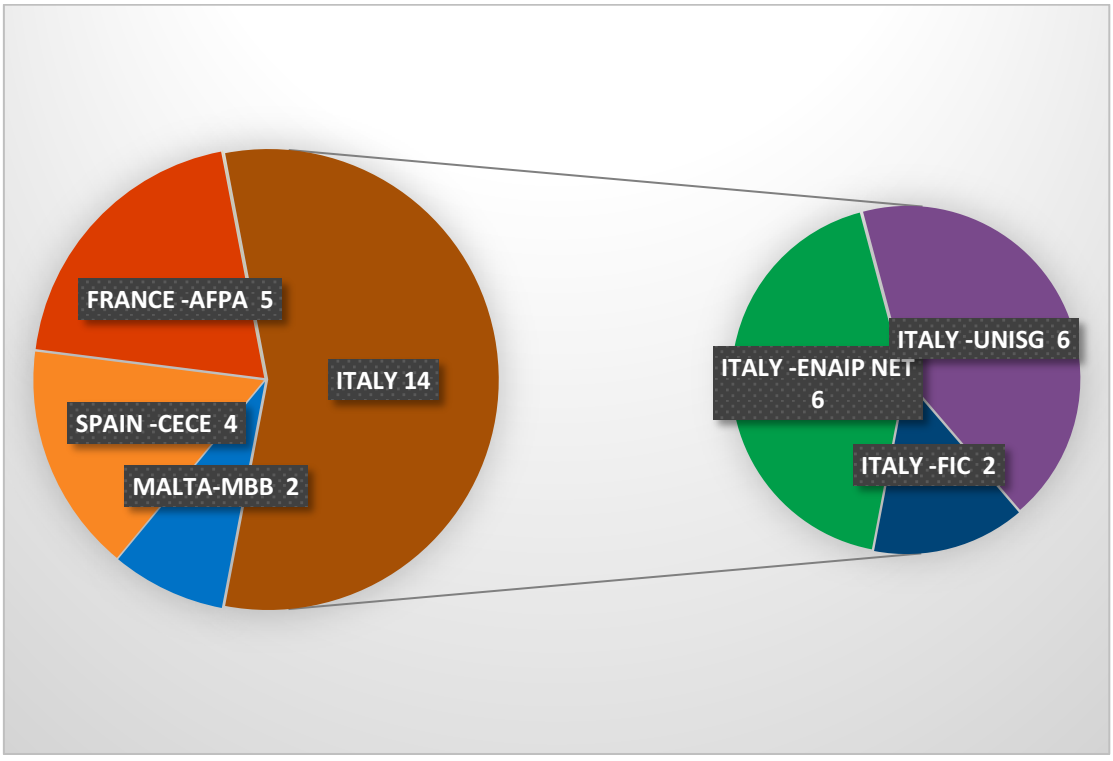

Figure 8: Country of origin of the interviewees (UNISG elaboration)

2.2. RESEARCH DESIGN AND INTERVIEWS METHODOLOGY

As a first step, to create the proper panel of operation team/experts to be interviewed, UNISG identified as a list of criteria to support the beneficiaries of the project in the correct selection of the persons to be interviewed. In particular, each beneficiary was asked to identify persons belonging to different categories (chefs, experts, restaurant food managers, bloggers, training center managers, ...) and recognized as particularly active in the fight against food waste in local and / or regional catering /national[7]. The choice to carry out interviews on individuals from organizations with a discreet / high level of awareness was going in the direction of understanding, in addition to the main problems, even the solutions already adopted and feasible to make them as replicable and scalable as much as possible. Partners have completed the template for the creation of the panel of experts, activists, chefs to be interviewed. A list of 36 names have been collected. On the meanwhile, UNISG has completed tested the questionnaire and elaborated a guide for the beneficiaries in order to properly manage the interview to minimize observer error, subject error and bias.

The interview was a combination of semi-structured and in-depth interview. This format provides a degree of structure in order to cover specific key questions relevant for the LIFE-Foster and maintain the comparability among the respondents' answer.

The questionnaire has been structured into 4 parts;

Interviewer & organization profile: to identify the role of the interviewee within its organization, the ongoing actions, projects, collaborations for the prevention and management of food waste, actions already implemented to minimize food waste;

Drivers & motivations: relevance of the triple bottom line in the decision to prevent and manage food waste, internal and external incentives/pressures, direct/indirect benefits.

Opportunities, solutions and suggestions: knowledge of the solutions to prevent and manage food waste, degree of understanding and competence about the food waste hierarchy and circular economy principle in the restaurant sector;

Barriers & constraints: map of the causes and responsibilities in food waste generations, limits in the adoption of the available solutions

7 Within the research of the people to be interviewed it was possible to include, if considered appropriate, also persons inside the organizations benefiting from the LIFE FOSTER project.

Each beneficiary has then provided the interviews in their language starting from the interview model provided by UNISG[8].

2.3. INTERVIEWS' DATA ANALYSIS, FINDINGS AND DISCUSSION

The qualitative and quantitative data collected during the interviews were analyzed through a series of analytical processes linked to the grounded theory research approach (Glaser and Strauss, 1967; Martin and Turner, 1986).

The data collected from the interview were classified into meaningful categories/themes, partially derived from the interview framework and from the data themselves.

The findings from the interviews are presented below. The discussion is structured under the main meaningful themes that emerged from the interviews, namely:

- An asymmetry in the relevance of the dimension of the triple bottom line related to the challenge of the food waste;
- The need of identifying the leakages point and of quantification the amount of food waste;
- Many solutions and options, but difficulties in prioritizing them;
- Edible vs inedibility: a slippery difference

2.3.1 An asymmetry in the relevance of the dimension of the triple bottom line related to the challenge of the food waste

The knowledge of the triple bottom line is widespread in relation to the topic of food waste. In general, among the interviewees food waste minimization represent an opportunity to reduce business costs and create environmental and social benefits. Within the triple bottom line, the three dimensions are nonetheless perceived in a different/unbalanced way. The attention toward a containment of the food waste results mainly as the results of a business philosophy of managing restaurants according to the principles of economy and culture of money saving. The food waste reduction presents a unique opportunity to reduce business costs and to adopt a save money-make money strategy. According to the interviewees, a percentage that goes from the 3% to the 10% of food cost can be attributable to food waste. Considering an average food cost value of the 30% of sales in restaurant, food waste can represent a value between 1% and 3% of sales in an average

[8] The interview model has been realized by UNISG in English. AFPA and CECE have translated the interview respectively on French and Spanish. The translation from the Italian version to the English one was provided by UNISG to ENAIP-NET and FIC.

restaurant. However, as highlighted by an interviewee, it is not always easy to maintain attention to food waste “in certain occasions we have to focus more in the speed of serving our customers than to take into consideration the food we waste. If a service takes too long the customer won't come back again”.

As regards the environmental dimension, there is certainly sensitivity and awareness of the relevance of the challenge related to the health both of planet and people. However, for many of the interviewees, the direct impact of a reduction of waste from an environmental point of view is not immediate too see even in its connections with the use in kitchen of resources such as water, gas and electricity and or/packaging and would mainly be in terms of reputation and as an opportunity to reach new customers.

Furthermore, the perception of the environmental complexity of the problem of food waste in the restaurant with the bigger problem of food waste along all the food chain by the world of the operation team is almost missing. The connections highlighted with the theme of global warming, the loss of biodiversity, the inefficient use of resources (water, energy, soil) are weak.

The social dimension is also relevant, but perceived as an effect that can be achieved mainly outside the restaurant sector, for example on the upstream by guarantying the respect of product and producers/farmers and on the downstream by activating initiatives and projects with subjects that deal with the collection of food surpluses and their redistribution to those most in need.

Little internal social effects are perceived inside the restaurant, except for some with respect to the possibility of using the theme as a tool to strengthen the group's internal team spirit and engagement. One of the interviewe said “food waste management could turn in a better staff management as a result of a more efficient work flow”.

Advice: it is necessary to give more space in training to the environmental, ethical and social dimension of food waste, in addition to the economic one. It is necessary to anticipate the evolution of the sector in order to prepare operators capable of applying innovative methods and techniques attentive to changes and challenges in the sector. Alongside innovation related to cooking techniques, cultural and behavioral changes in the kitchen must be promoted. Food waste in the restaurant sector is an issue that goes beyond the profession and. involve citizenship education. It is essential to valorize the restaurant sector and its operators to promote respect for food from farm to fork.

2.3.2. The need of identifying the leakage points sand of quantification the amount of food waste

There is a shared need to identify the different sources and leakages point of food that contribute to the generation of food waste, as well as to quantify their amount and value. There is a still an approximate knowledge, especially in complex structures. When asked to identify the main problems within the value chain (Figure 9) and specifically within the menu (Figure 10), a complex and broad set of causes emerges. Some of these are less frequent, as evidenced by the two word-clouds processed, but not for this reason are to be considered negligible. Food waste, as confirmed by the results of the interviews, must be interpreted as summation and concatenation of factors. The structure of the causes and their frequency appears consistent with the attribution in percentage terms of the contribution they represent to the production of food waste (Figure 11). Bad planning (in the inventory and menu) and the difficulty of predicting the number of customers

are responsible for more than a third of food waste in the restaurant sector. However, even here it emerges how each phase of the food value chain is responsible for a certain share of food waste.

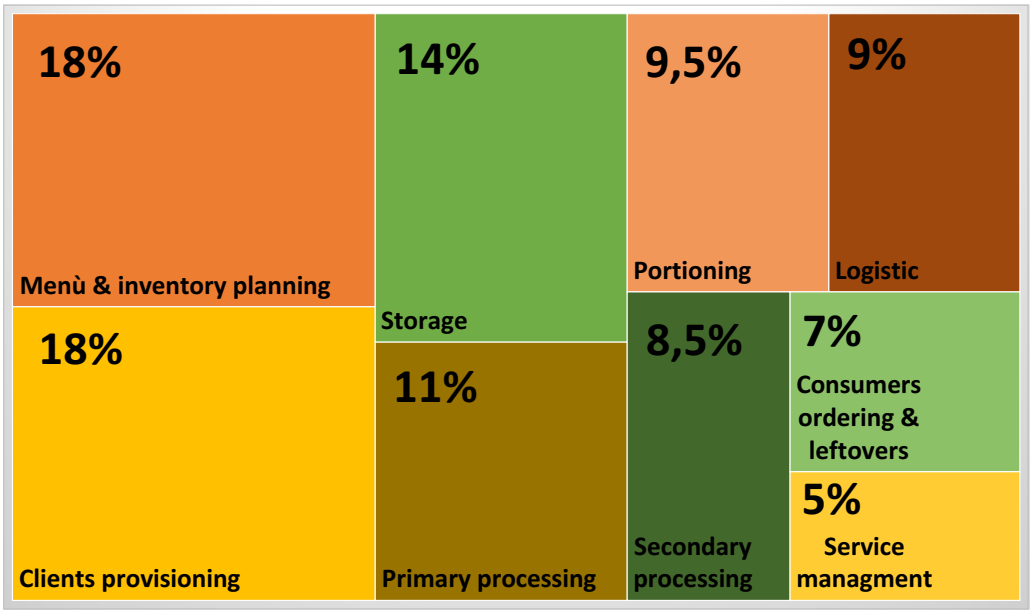

Figure 11: % of the food waste attributed to the different phase of the food value chain in the restaurant (UNISG elaboration)

The distribution of the percentages, higher in the initial stages of the process, shows positive growth margins for the adoption of food waste prevention systems instead of its management.

The quantification of food waste was hypothetically carried out by most people, linking it to practices and experience. Among the interviewees it emerged that no specific tool/technology is currently used for the quantification and often for a lack of time this operation is not carried out with accuracy. The interviewees from the kitchen staff feel, especially restaurant owners and managers the potential to realize an additional profit potential per year by adopting prevention solutions such as Waste Tracking & Analytics, but at the moment there is not a clear idea about their extent.

Advice: it is necessary to identify tools that support restaurateurs in making a diagnosis of the leakage points of their activity alongside their precise quantification. It is important that a suitable amount of time is allocated for this type of analysis. The quantity of food waste generated must be weighed as well as in kg for its economic value.

2.3.3. Many solutions and options, but difficulties in adopting and prioritizing them

At the moment there is a wide array of solutions for the restaurant sector, across all the phases of the food value chain. Nonetheless these are also very different solutions in terms of financial capital requirements, feasibility, required, level of the effort (time, personnel, know-how) needed to implement it, potential cost savings as already highlighted by the collection carried out for the A1-0 Literature and scientific research review activity. In front of this diversity, the dominant perception found in the interviewees is to be in the presence of a lot of scattered actions, which despite the efforts and creativity of the market and institutions, are unable to make evident the possible benefits and impacts (in the first economic) resulting from a reduction in food waste.

It also needs to be considered the intrinsic diversity of the sector: each restaurant site is different, with its nuances, challenges and restrictions. Thus, for each restaurant's needs, is not possible to have a "one solution fits all approach" but the feasible and ideal set of solutions has to be customized. This aspect was highlighted both by the individual responses and by the cross-cutting analysis of the needs highlighted by the individual respondents and experts.

Figure 11: Word cloud realized by the identification of the main solutions to prevent and manage food waste in the restaurant sector (UNISG elaboration)

The food waste hierarchy and the implementation of actions inspired to the circular economies have a great potential and they need to be adopted and incorporated in the road map toward the food waste prevention and reduction. However, the food waste hierarchy and circular economy principles are still too far away to be widely and systematically used in restaurant practices. At the moment among the actions already adopted by the restaurants involved in the survey and according to the opinion of the specialists, waste is more managed than prevented. Composting and anaerobic digestion, the adoption of doggie bag, exhaustive oils

management are the more frequent actions already underway. Only a minority of the interviewees say they adopt preventive measures such as inventory management, unsold recycling.

Even by dealing with solutions, the best known, but even considered more feasible as well innovative are those ones referring once waste has already been generated.

Advice: What could be useful, it is a way/a tool to support the select among a portfolio of solutions those that fit with the different restaurant context and to organize/prioritize them to challenge the food waste problem.

Advice: Training and education can support the understanding of the most appropriate solutions to avoid as a priority food waste generation. Circular economy principles on the same way have to be adopted by focusing on the upstream phases of the food value chain by reducing the volume of surplus toward a zero-waste strategy and then with a recycle-reuse perspective and only as ultimate choice to energy recover and disposal solution. In order to support this perspective training and education should also consider and work on the cultural/behavioral change dimension.

2.3.4 Edible vs inedibility: a slippery difference

An important distinction that emerged from the interviews is the one between edible and inedible food. Both the categories are encapsulated in the concept of food waste according the definition provided by XXX. Nonetheless the difference between edibility and inedibility is arguable and embedded in the culture and experiential background of the catering staff, as well as common practices, religious beliefs and personal preferences.

Advice: Education and training could foster to clear the difference and to increase the radius of what is considered edible. In this way, as a preventive strategy, it could be possible to avoid a part of the food waste amount. However, possible tradeoffs must be taken into account; the transition from inedible to edible food must however take into account an appropriate and careful use of the resources (energy, water, time, personnel, economic ..).

3. THE LIFE FOSTER PROJECT STRATEGY AND THE FOOD WASTE TOOL (FWT)

Based on these preliminary finding and by the integration of the results from action A.1-0 (Literature and scientific research review and A.1-1 (Food experts' interviews), LIFE FOSTER proposes a solution-oriented strategy to prevent and reduce food waste as a roadmap for VET centers and restaurant, that at the same time is configured as a method for the training activities with these subjects.

The way of working of project strategy is to find and set up the problem of the food waste in the restaurant sector as a way to reduce and disentangle its complexity and diversity of causes, as a process of selection of critical variables and their cause-effect connections to define a path that aims at solving the problem itself but all the while provides economic, environmental and social benefits. It pays attention to foster skills and competencies during routine operations, as a way to deals with the long-term professional path of the VET students, it aims at bridging the gap between what VET centers/restaurant are actually doing to prevent/manage food waste and what they can do to minimize food waste by choosing the most suitable solutions.

The strategy is made of four consecutive areas of actions:

1. **Problem recognition and definition:** conceptualization of the food waste challenge as a "wicked" problem in the food supply chain as well in the restaurant sector;
2. **Strategy development to fix the problem in your organization:** identification of the leakage points, map of the involved actors, root causes, connections and feedback loops of one's own restaurant context of reference;
3. **Adopt and implement a solution plan:** research and prioritization of the most appropriate solutions/options for waste prevention and management of food waste by applying the food waste hierarchy and circular economy principles;
4. **Progresses and results monitoring:** data collection and recording of the results of the implemented solution plan, food waste quantification, actions' adjustment.

The same four area also form the structure for the Food Waste Tool according to which the training was organized.

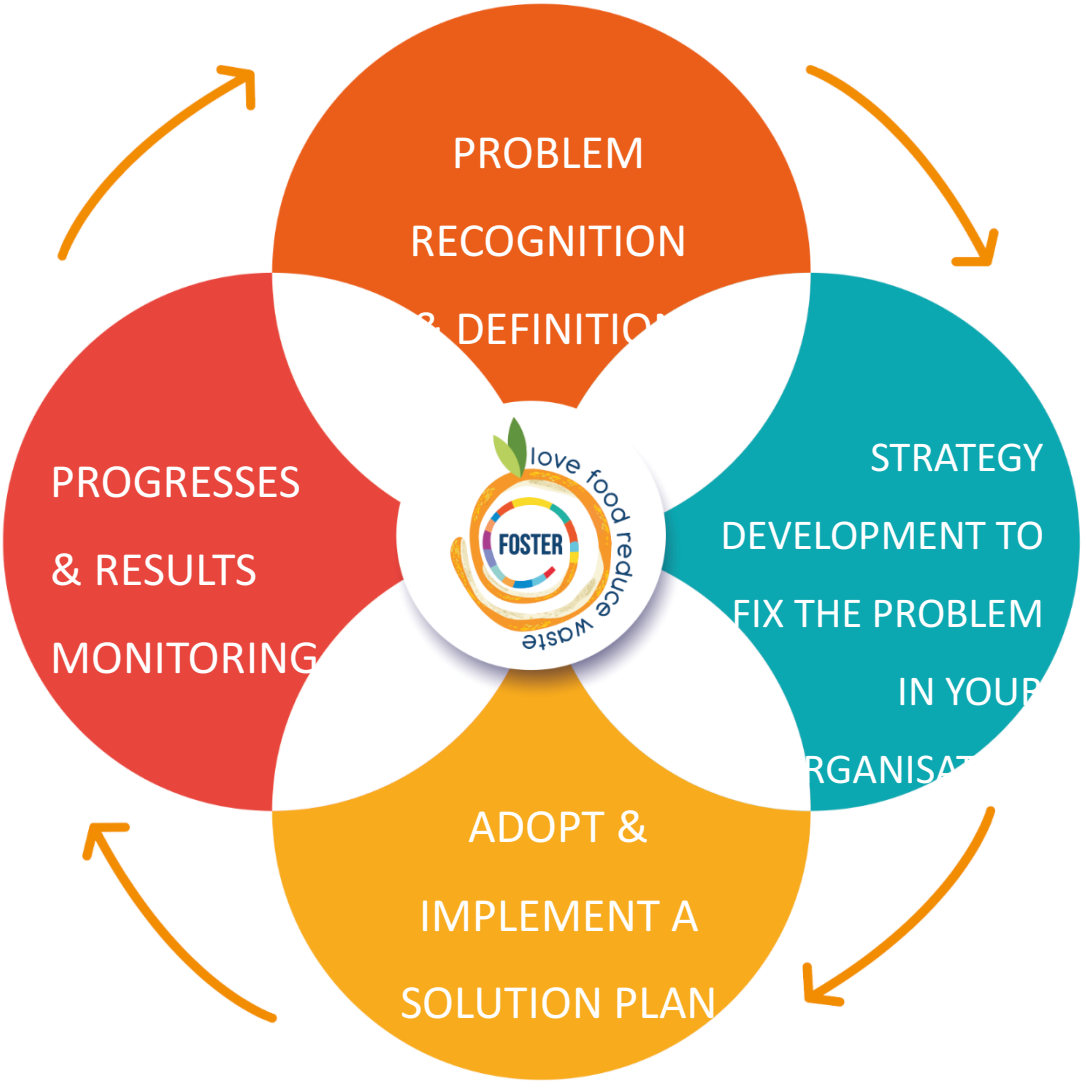

Figure 13: The 4 areas of the LIFE FOSTER project model and the FOOD WASTE TOOL

For the implementation of the Food Waste Tool during the training, three guidelines for each area have been proposed with the purpose of identifying the key concepts from which the training modules have been descended.

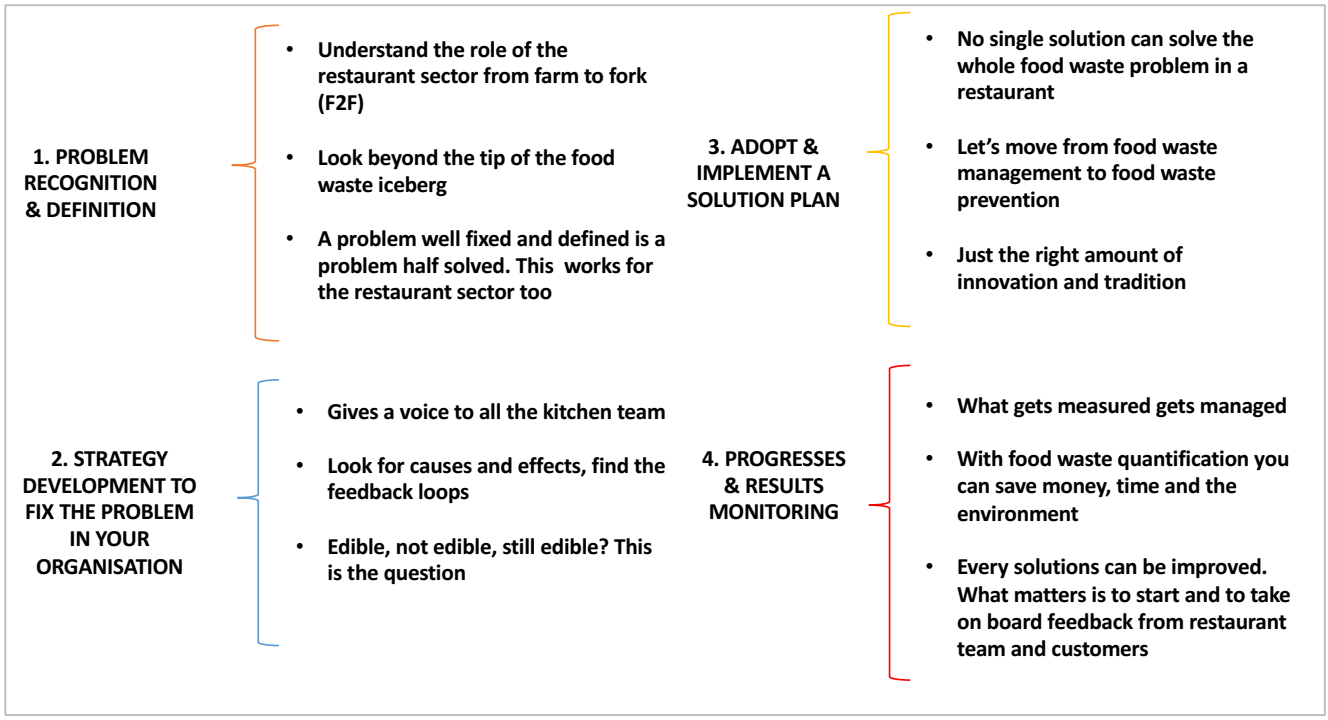

Figure 14: Guidelines related to the 4 areas of the Food Waste Tool

In every compartment is possible to find a wide array of tools to realize a plan of action design to achieve food waste prevention and reduction: activities, best practices, resources to share, that should be used to set a lesson/training to get results in the waste prevention and reduction in VET kitchen laboratories as in restaurants. These 4 compartments configuration will allow to the FWT to be implemented during the project with new resources and with the materials that will be elaborated during the trainers' training B1-1 and the students/adults training by UNISG and the other project's beneficiaries. Where possible, the resources collected in the repository for Action A1-0 will be reallocated in the reference compartment.

References (beyond the repository)

Cochran, C., Goulbourne, E., Hunt, C., Veza, A., 2018. Restaurant Food Waste Action Guide 2018. Rethink Food Waste Through Econ. Data 44.

Glaser, B., Strauss, A., 1967. The discovery of grounded theory. 1967. Weidenf. Nicolson, London.

Martin, P.Y., Turner, B.A., 1986. Grounded Theory and Organizational Research. J. Appl. Behav. Sci. https://doi.org/10.1177/002188638602200207

ANNEX 1. CRITERIA AND GLOSSARY FOR THE SELECTION OF THE DATA

A. FP7, H2020, LIFE, OTHER EU PROJECTS, NATIONAL AND REGIONAL PROJECTS

ISTRUCTIONS & CRITERIA
Please select a project that answer at least to one of the following criteria:
* it is relevant for the food service industry
* it contains methods/proposals for the food waste quantification (environmental, social, economic dimensions)
* it contains solutions for the upcycling of the waste from the food service industry
* It explains the drivers of food waste production in the food service industry
* It contains/collects proposals, strategies, technologies for waste reduction
* It formulates EU policy recommendations
* It quantifies the benefits from waste reduction
* It is not strictly connected to the food service industry, but it could be replicable/adapt in it (explain why)

LIFE FOSTER project is co-funded by LIFE's European Union Programme | info@lifefoster.eu – www.lifefoster.eu

GLOSSARY	
PARTNERS ID	It is necessary to understand which is the partners who provide the information
COUNTRY SCALE	Define projects among the following criteria: EU, National, Regional
FUNDING SCHEME	Define projects among the following criteria: FP7, H2020, LIFE, Other EU funding schemes such as ALCOTRA, ERASMUS. UNISG ask the partners contribution in particular for national and regional projects
PERIOD	Select projects starting from 2007
KEYWORDS-TOPICS	Identify at least 3 keywords that describe the project content
SHORT DESCRIPTION	Insert the project's abstract or a short description of it, no more than 300 words
CRITERIA OF SELECTION	Explicit the criteria of selection among the list in "Instructions & criteria"
COORDINATOR	Insert the coordinator's name (es. ICLEI, ENAIP, …)
NATIONALITY OF COORDINATOR	Insert the coordinator's country of origin (es. Spain, France)
PARTNERS	List of the projects' partners or insert a link where is possible to have information about them
PARTNERS' NATIONALITY	List the country of provenience of the partners
CONTACT	Insert a contact, preferably an e-mail address
WEBSITE	Insert the project's website address
LINK TO RELEVANT DOCUMENT	Insert link to relevant documents) (project's report, deliverables)

LIFE FOSTER project is co-funded by LIFE's European Union Programme | info@lifefoster.eu – www.lifefoster.eu

B. SCIENTIFIC AND GREY LITERATURE

ISTRUCTIONS & CRITERIA
Please select a scientific article/report/book that answer at least to one of the following criteria:
* it is relevant for the food service industry
* it contains methods/proposals for the food waste quantification (environmental, social, economic dimensions)
* it contains solutions for the upcycling of the waste from the food service industry
* It contains/collects proposals, strategies, technologies for waste reduction
* It explains the drivers of food waste production in the food service industry
* It formulates EU policy recommendations
* It quantifies the benefits from waste reduction
* It is not strictly connected to the food service industry, but it could be replicated/adapted in it or broadened in scale (explain why)

GLOSSARY	
PARTNERS ID	It is necessary to understand which is the partner who provide the information
AUTHORS	Insert the authors of the publication
YEAR OF PUBLICATION	Select publications starting from 2007
TITLE	Insert the title of the publication (article, book, book's chapter)
KEYWORDS-TOPICS	Identify at least 3 keywords that describe the publication content
SHORT DESCRIPTION/ABSTRACT	Insert the publication's abstract or a short description of it, no more than 300 words
CRITERIA OF SELECTION	Explicit the criteria of selection among the list in "Instructions & criteria"
JOURNAL/VOLUME/EDITORS	Insert the name of the scientific journal if it is a research article, Insert the name of the Volume and Editor in the case of a book
PAGES	Insert the number of the pages
URL	Insert link to the document (if available)

C. TECHNOLOGIES FOR WASTE QUANTIFICATION AND REDUCTION

ISTRUCTIONS & CRITERIA
Please select a technology that answer at least to one of the following criteria:
* it is relevant for the food service industry
* it is helpful to quantify the food waste (environmental, social, economic dimensions)
* it represents a solution for the upcycling of the waste from the food service industry
* It is helpful in changing bad habits
* it is helpful in understanding the drivers of food waste
* It is helpful to prevent the drivers of food waste production in the food service industry
* It quantifies the benefits from waste reduction
* It is not strictly connected to the food service industry, but it could be replicated/adapted in it or broadened in scale (explain why)

GLOSSARY	
PARTNERS ID	It is necessary to understand which is the partner who provide the information
NAME OF TECHNOLOGY	Insert the name of the technology
KEYWORDS-TOPICS	Identify at least 3 keywords that describe the technology
SHORT DESCRIPTION	Insert a short description of it, no more than 300 words
CRITERIA OF SELECTION	Explicit the criteria of selection among the list in "Instructions & criteria"
TYPE OF TECHNOLOGY	Describe the type of the technology (App, website, software, new product)
TYPE OF TRANSACTION	Insert the type of transaction to use it (commercial, donation, a hybrid between the two)
WEBSITE	Insert the website
PLACE OF IMPLEMENTATION	Insert where the technology has been implemented

D. BEST PRACTICES AND INITIATIVES FOR WASTE QUANTIFICATION AND REDUCTION

ISTRUCTIONS & CRITERIA
Please select a best practices/initiative that answer at least to one of the following criteria:
* it is relevant for the food service industry
* it is helpful to quantify the food waste (environmental, social, economic dimensions)
* it represents a solution for the upcycling of the waste from the food service industry
* It is helpful in changing bad habits
* It is helpful to prevent the drivers of food waste production in the food service industry
* it is helpful in understanding the drivers of food waste
* It quantifies the benefits from waste reduction
* It is not strictly connected to the food service industry, but it could be replicated/adapted in it or broadened in scale (explain why)

GLOSSARY	
PARTNERS ID	It is necessary to understand which is the partner who provide the information
NAME OF THE INITIATIVE/BEST PRACTICE	Insert the name of the name of the initiative/best practices
RESPONSIBLE ENTITY	Insert the name of the organisation who promotes the initiative
PLACE/SCALE	Place and scale of adoption
KEYWORDS-TOPICS	Identify 3 keyword that describe the initiative
INITIATIVE'S OBJECTIVE	Insert a classification of the objective: redistribution, reduction, awareness raising campaign, reuse, sale of short-date products
SHORT DESCRIPTION	Insert a short description of it, no more than 300 words
TIMESCALE	Insert ongoing practices or terminated after 2010
CRITERIA OF SELECTION	Explicit the criteria of selection among the list in "Instructions & criteria"
TARGET GROUP	Describe the target group (millennials, chefs, schools, teachers)
CONTACT	Insert the e-mail of the initiative's coordinator
WEBSITE	Insert the website