

# Collection and evaluation of food waste prevention actions

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science and knowledge service**  
Joint Research Centre



European  
Commission

# Content

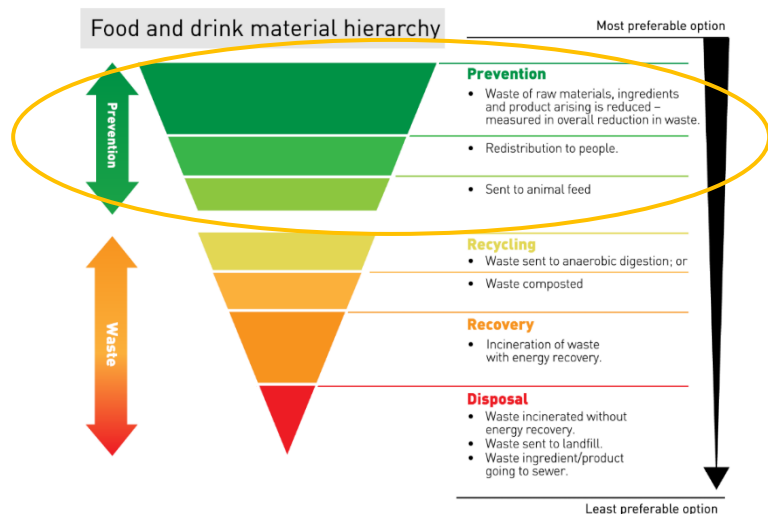
1. Food waste prevention actions evaluation framework
2. Overview of the collected actions
3. The actions evaluation process
4. Results and suggestions to improve the evaluation
5. Conclusions

# Context of the work

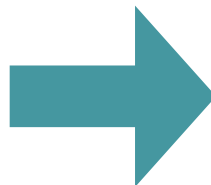
## SDG 12



**TARGET 12.3** - By 2030, halve per capita global **food waste** at the retail and consumer levels and reduce **food losses** along production and supply chains, including post-harvest losses

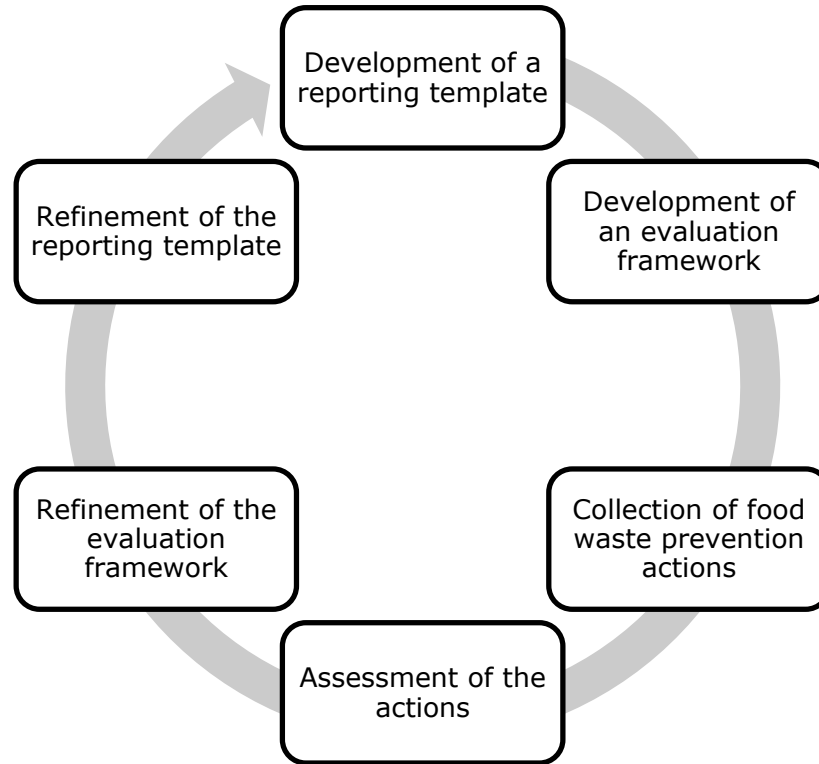


Performance of the prevention actions?



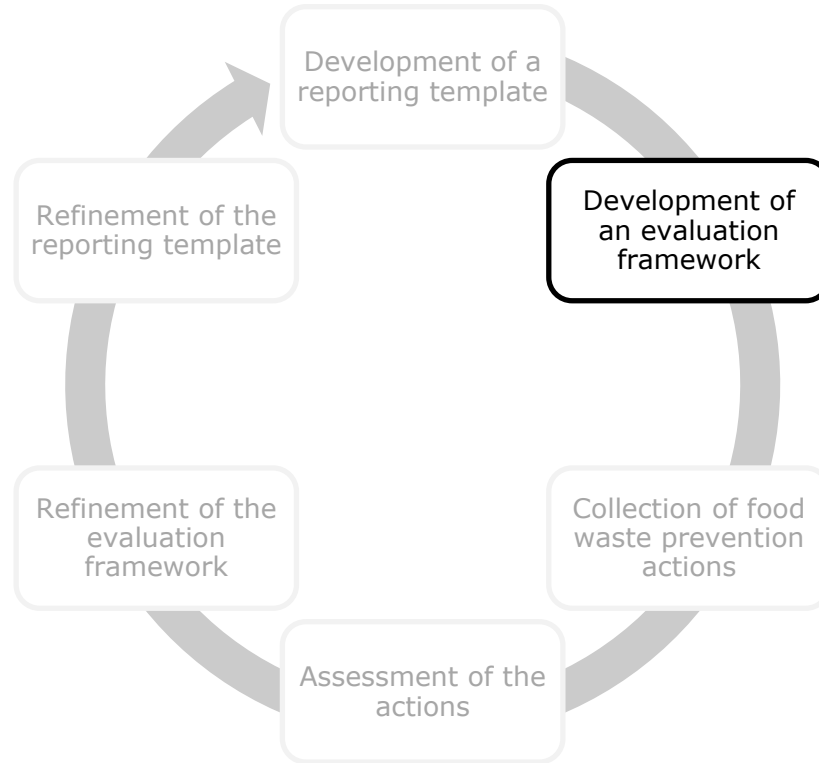
**EC Pilot exercise**  
**Collection and evaluation of food waste prevention actions**

# Food waste prevention actions evaluation Development process



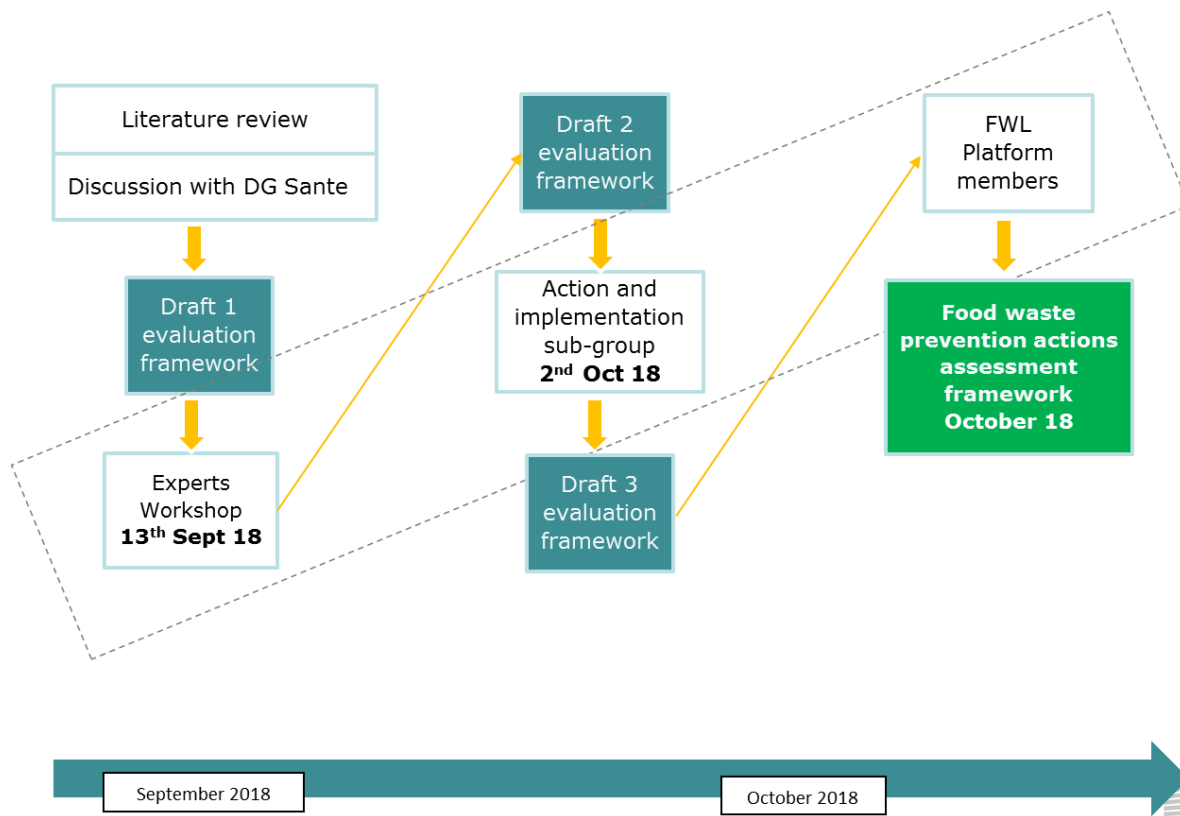
# Food waste prevention actions evaluation

## Development process



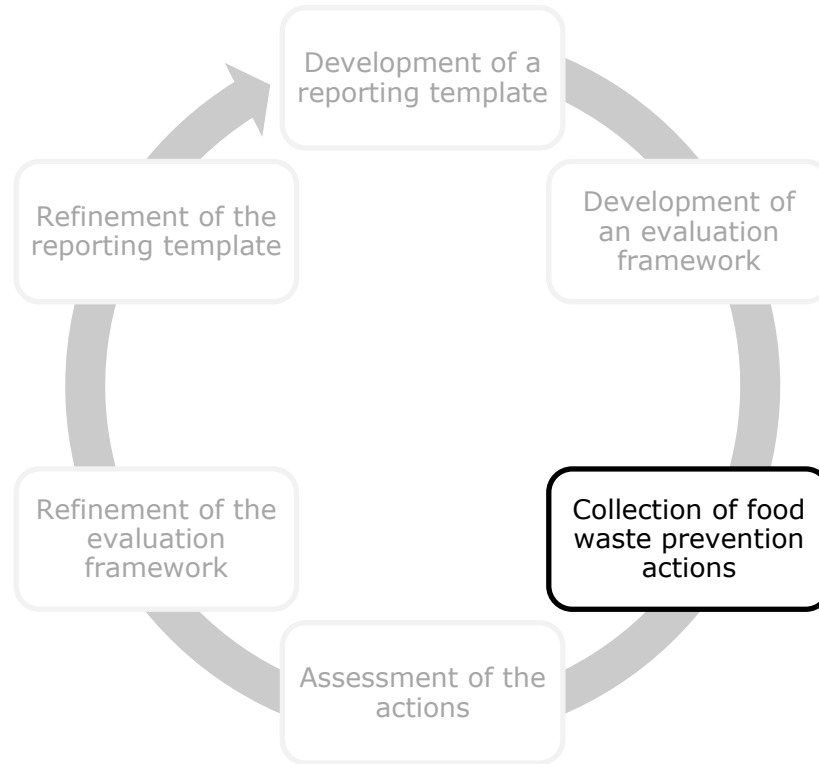
# Food waste prevention actions evaluation framework

## Development process



# Food waste prevention actions evaluation

## Development process



Redistribution

Food valorisation

Consumers behaviour change

Supply chain efficiency

Food waste prevention governance

# EVALUATION FRAMEWORK



# Food waste prevention actions evaluation framework:

## Criteria selected



### QUALITY OF THE ACTION DESIGN

- Problem identification, definition of aim, objectives and KPIs
- Implementation of a monitoring system

### SUSTAINABILITY OVER TIME

- Existence of a long term strategy to ensure the continuity of the action (e.g. organizational support, economic sustainability)

### EFFECTIVENESS



- Monitor the KPI before (baseline), during and after the action to measure if the objective has been met

### TRANSFERABILITY AND SCALABILITY

- Degree to which transferability and scalability were considered in the design of the action or implemented

### EFFICIENCY



- Accounting for the resources used to implement the action
- Monitor KPIs defined to measure efficacy

### INTERSECTORIAL COOPERATION

- Existence of cooperation between different sectors of the society
- How is this cooperation is organized



# Food waste prevention actions evaluation framework:

## Effectiveness

The effectiveness of a prevention action reflects to which degree the action is **successful** in producing the desired result, i.e. **in reaching the objectives**

**S**pecific – target a specific area for improvement.

**M**easurable – quantify or at least suggest an indicator of progress.

**A**ssignable – specify who will do it.

**R**ealistic – state what results can realistically be achieved, given available resources.

**T**ime-related – specify when the result(s) can be achieved.'

(Doran, 1981 p .36)

### EXAMPLE OF SMART OBJECTIVE

to obtain a 10% decrease of the

**amount of food waste generated**

in 2018 compared with 2017

**Key Performance Indicator**

# Food waste prevention actions evaluation framework:

## Effectiveness

'**Input objectives**', that refer to something the practitioner has done and are largely a measure of the effort/activity of putting in place the prevention actions (e.g. to distribute 5000 leaflets in one month);

'**Outcomes objectives**', that relate to an intermediate change that happens as a result of the actions one has taken (e.g. to ensure that 2500 households are aware of the campaign);  
and,

'**Impact objectives**' that reflect a tangible change that has occurred because of the inputs and outcomes (e.g. to achieve a 20% reduction in the food waste generated in the households).

# Food waste prevention actions evaluation framework:

## Efficiency

**Food waste prevented**

Food waste prevented

**Economic**

Net economic benefit (benefit for society minus cost)

**Environmental**

Net environmental savings (avoided environmental impacts)

**Social**

Social benefits (e.g. the number of meals donated, people learning new skills etc.)

**Outreach/  
Behavior  
change**

Input or outcome indicators associated to e.g. number of people reached by a campaign, number of people that changed behaviour towards food waste

# Food waste prevention actions evaluation framework:
















## Efficiency

$$\text{Economic efficiency} = \frac{\text{Net economic benefits}}{\text{Cost of the action}}$$

$$\text{Environmental efficiency} = \frac{\text{Net environmental savings}}{\text{Cost of the action}}$$

# Food waste prevention actions evaluation framework:

$$\text{Economic efficiency} = \frac{\text{Net economic benefits}}{\text{Cost of the action}} = \frac{A+B-C}{C} \text{ or } \frac{R+B-C}{C}$$

	Supply chain efficiency	Consumer behavior change	Redistribution (donating surplus food)	Redistribution (selling surplus food)
Cost savings from food waste prevention	A = avoided purchase of raw material  B = avoided food waste disposal 	A = avoided purchase of groceries  B = avoided food waste disposal 	A = avoided purchase of groceries  B = avoided food waste disposal 	B = avoided food waste disposal 
Revenue				R = revenue from selling surplus food 
Cost of the action	C = fixed and variable costs 	C = fixed and variable costs  	C = fixed and variable costs   	C = fixed and variable costs 

Who pays/benefits:



Food manufacturers, retailers, food services



National and local government



Households



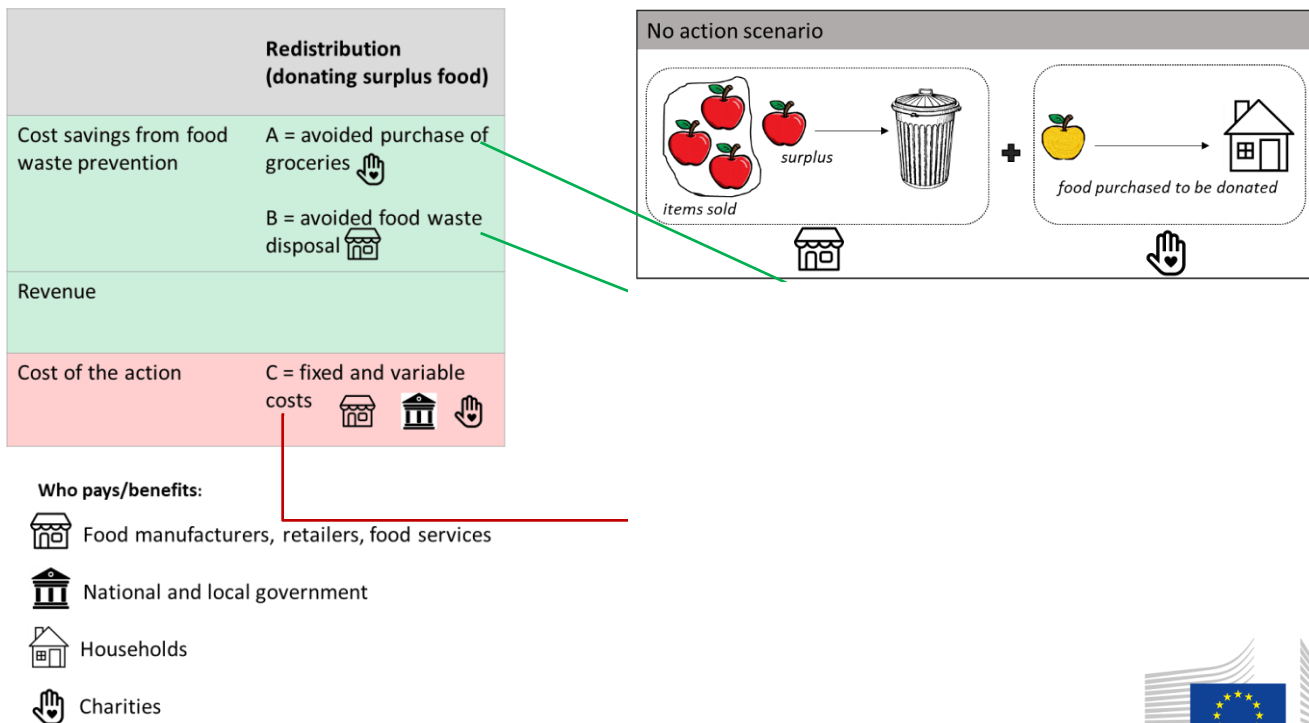
Charities



European Commission

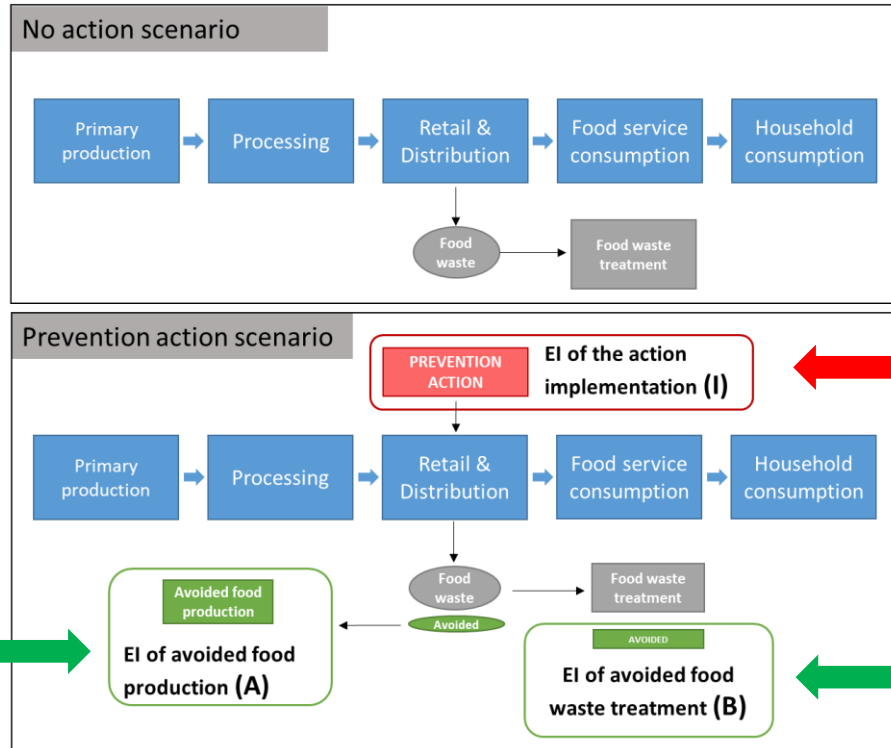
# Food waste prevention actions evaluation framework

$$\text{Economic efficiency} = \frac{\text{Net economic benefits}}{\text{Cost of the action}} = \frac{A+B-C}{C} \text{ or } \frac{R+B-C}{C}$$



# Food waste prevention actions evaluation framework:

$$\text{Environmental efficiency} = \frac{\text{Net environmental savings}}{\text{Cost of the action}} = \frac{A+B-I}{\text{Cost of the action}}$$



Consumers behaviour change

Supply chain efficiency

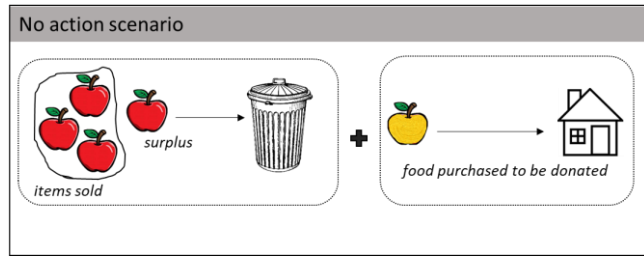
EI: Environmental Impact



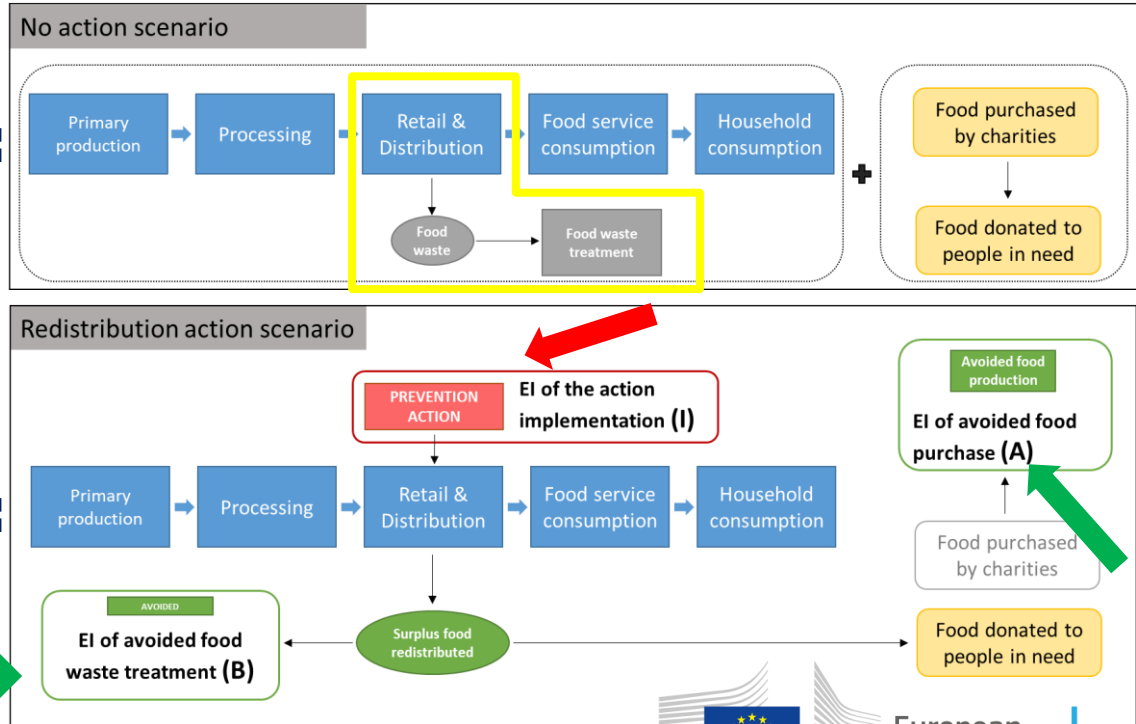
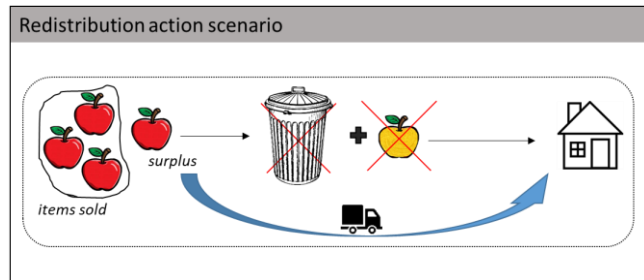


# Food waste prevention actions evaluation framework:

$$\text{Environmental efficiency} = \frac{\text{Net environmental savings}}{\text{Cost of the action}} = \frac{A+B-I}{\text{Cost of the action}}$$



## Redistribution



# Food waste prevention actions evaluation framework:

## Environmental Efficiency

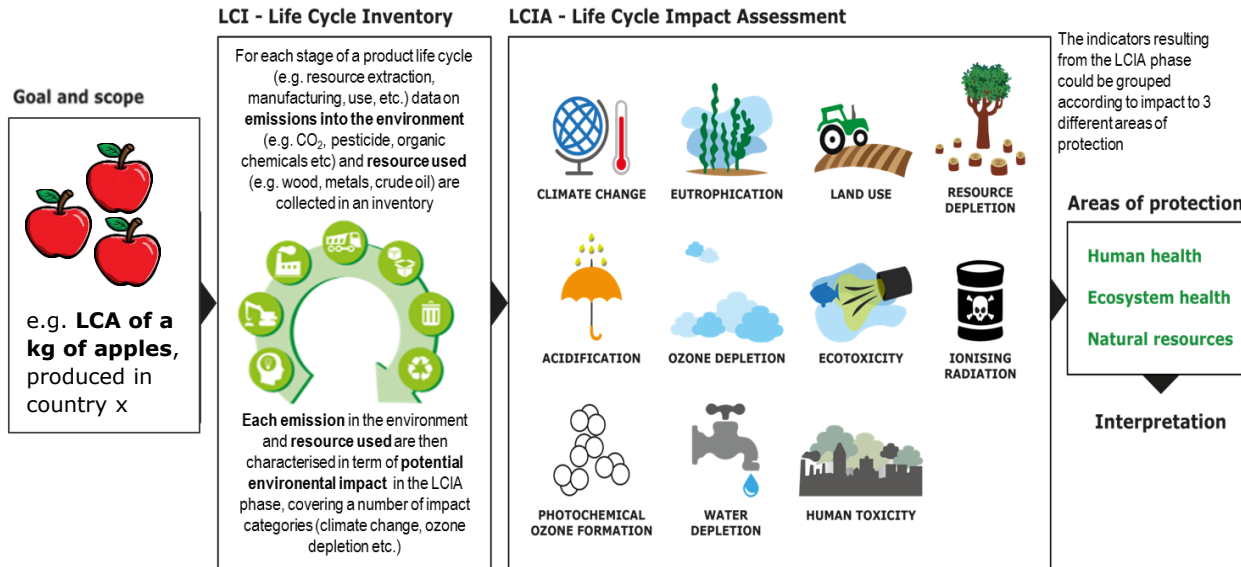
Environmental impacts calculated using life cycle assessment (LCA):



# Food waste prevention actions evaluation framework:

## Environmental Efficiency

Environmental impacts calculated using life cycle assessment (LCA):



Impact categories as proposed by the **Environmental Footprint method** (EC, 2013)



# Calculator for costs/environmental impacts calculation

**Action name** Stop Food Waste **Country** Spain **Action type** Consumer behaviour change **Stage of the supply chain** Households **Action cost in €** **Waste treatment option** Other/Unknown

**Food waste prevented**

Type	Amount
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>

**Environmental savings** Climate Change

**Value of food waste prevented**  Euros

**Action resources**

Paper used (leaflets, letters)  Approximate number




Transport distances  Km

Electricity use  kWh

**Consumer behaviour change analysis**

- Kg
- Tonnes
- Mega Tonnes

\* for liquids assume 1 litre = 1 kg

**GO** **RESET**   

# Calculator for costs/environmental impacts calculation

**Action name** Stop Food Waste **Country** Spain **Action type** Consumer behaviour change **Stage of the supply chain** Households **Action cost in €** 100000 **Waste treatment option** Other/Unknown

GO RESET   

### Food waste prevented

Type	Amount
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
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<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>

**Select Unit \***

Kg

Tonnes

Mega Tonnes

*\* for liquids assume  
1 litre = 1 kg*

**Value of food waste prevented**  Euros

### Action resources

Paper used (leaflets, letters)  Approximate number

Transport distances  Km

Electricity use  kWh

### Cost benefit analysis

Environmental savings  Climate Change

# Calculator for costs/environmental impacts calculation

**Action name** Stop Food Waste **Country** Spain **Action type** Consumer behaviour change **Stage of the supply chain** Households **Action cost in €** 100000 **Waste treatment option** Other/Unknown



## Food waste prevented

Type	Amount
bread	
CEREAL PRODUCTS	
bread	
pasta	
rice	
FRUIT	
apples	
bananas	
oranges	

Select Unit \*

- Kg
- Tonnes
- Mega Tonnes

\* for liquids assume 1 litre = 1 kg

**Value of food waste prevented**  Euros

**Action resources**

Paper used (leaflets, letters)  Approximate number

Transport distances  Km

Electricity use  kWh

## Cost benefit analysis

**Environmental savings** Climate Change

# Calculator for costs/environmental impacts calculation

Action name: Stop Food Waste | Country: Spain | Action type: Consumer behaviour change | Stage of the supply chain: Households | Action cost in €: 100000 | Waste treatment option: Other/Unknown



### Food waste prevented

Type	Amount
bread	100
FRUIT	500
VEGETABLES	500

Select Unit \*

Kg

Tonnes

Mega Tonnes

\* for liquids assume 1 litre = 1 kg

Value of food waste prevented: 300000 Euros

### Action resources

Paper used (leaflets, letters): 2000 Approximate number

Transport distances: Km

Electricity use: kWh

### Cost benefit analysis

Environmental savings: Climate Change



# Calculator for costs/environmental impacts calculation

Action name: Stop Food Waste | Country: Spain | Action type: Consumer behaviour change | Stage of the supply chain: Households | Action cost in €: 100000 | Waste treatment option: Other/Unknown

GO (green button) | RESET (red button) | Print icon | Refresh icon | Save icon



Environmental savings dropdown menu:

- Climate Change
- Climate Change (highlighted)
- Ozone depletion
- Human toxicity, non-cancer effects
- Human toxicity, cancer effects
- Particulate matter
- Ionizing radiation, human health
- Photochemical ozone formation, human health
- Acidification

### Food waste prevented

Type	Amount
bread	100
FRUIT	500
VEGETABLES	500

Select Unit \*  
 Kg  
 Tonnes  
 Mega Tonnes

\* for liquids assume 1 litre = 1 kg

Value of food waste prevented: 300000 Euros

### Action resources

Paper used (leaflets, letters): 2000 Approximate number  
Transport distances: Km  
Electricity use: kWh













### Cost benefit analysis

Environmental savings



# Calculator for costs/environmental impacts calculation

## Environmental savings of one action reported

 <p><b>CLIMATE CHANGE</b></p>	<p>3.49E+06 <i>kg CO<sub>2eq</sub></i></p>	 <p><b>IONISING RADIATION</b></p>	<p>7.36E+04 <i>kBq U<sup>235</sup></i></p>	 <p><b>ECOTOXICITY</b></p>	<p>2.26E+07 <i>CTUe</i></p>
 <p><b>OZONE DEPLETION</b></p>	<p>6.47E+00 <i>kg CFC-11<sub>eq</sub></i></p>	 <p><b>PHOTOCHEMICAL OZONE FORMATION</b></p>	<p>5.83E+03 <i>kg NMVOC<sub>eq</sub></i></p>	 <p><b>LAND USE</b></p>	<p>2.93E+08 <i>Pt</i></p>
 <p><b>HUMAN TOXICITY</b></p>	<p>Non-cancer effect 3.11E+00 Cancer effect 4.88E-02 <i>CTUh</i></p>	 <p><b>ACIDIFICATION</b></p>	<p>4.68E+04 <i>mol H<sup>+</sup><sub>eq</sub></i></p>	 <p><b>WATER DEPLETION</b></p>	<p>7.11E+06 <i>m<sup>3</sup> world eq. deprived</i></p>
 <p><b>PARTICULATE MATTER</b></p>	<p>3.41E-01 <i>Disease incidence</i></p>	 <p><b>EUTROPHICATION</b></p>	<p>Terrestrial 1.98E+05 <i>mol N<sub>eq</sub></i> Freshwater 9.15E+02 <i>kg P<sub>eq</sub></i> Marine 2.16E+04 <i>kg N<sub>eq</sub></i></p>	 <p><b>RESOURCE DEPLETION</b></p>	<p>Fossil 2.00E+07 MJ Minerals and metals 3.75E+00 <i>kg Sb<sub>eq</sub></i></p>

Calculated with the **Environmental Footprint (EF)** method (EC, 2013)

# Calculator for costs/environmental impacts calculation

		Impact of avoided	Impact of saved		
	Unit	Impact of action	treatment	food	
				Total	
Climate Change	kg CO <sub>2</sub> eq	-2.62E+02	6.91E+05	1.49E+06	<b>2.18E+06</b>
Ozone depletion	kg CFC-11 eq	-1.76E-05	4.19E-03	8.06E+00	<b>8.07E+00</b>
Human toxicity, non-cancer effects	CTUh	-4.24E-05	1.31E+00	1.01E+00	<b>2.32E+00</b>
Human toxicity, cancer effects	CTUh	-3.14E-06	2.23E-02	1.93E-02	<b>4.16E-02</b>
Particulate matter	Disease incidences	-1.89E-05	3.74E-03	7.36E-02	<b>7.73E-02</b>
Ionizing radiation, human health	kBq U <sup>235</sup>	-1.42E+01	2.62E+03	5.89E+04	<b>6.16E+04</b>
Photochemical ozone formation, human health	kg NMVOC eq	-7.69E-01	4.02E+02	3.44E+03	<b>3.84E+03</b>
Acidification	mol H+ eq	-1.67E+00	4.34E+02	1.06E+04	<b>1.10E+04</b>
Terrestrial eutrophication	mol N eq	-2.62E+00	1.51E+03	3.84E+04	<b>3.99E+04</b>
Freshwater eutrophication	kg P eq	-1.56E-02	3.71E+01	3.93E+02	<b>4.30E+02</b>
Marine eutrophication	kg N eq	-2.51E-01	1.59E+03	7.07E+03	<b>8.66E+03</b>
Freshwater ecotoxicity	CTUe	-2.93E+02	9.65E+07	2.28E+07	<b>1.19E+08</b>
Land use	Pt	-2.21E+04	1.11E+06	6.85E+07	<b>6.96E+07</b>
Water use	m <sup>3</sup> world eq. deprived	-1.40E+02	1.71E+04	5.92E+06	<b>5.94E+06</b>
Resource use, fossil	MJ	-4.34E+03	2.82E+05	1.38E+07	<b>1.41E+07</b>
Resource use, minerals and metals	kg Sb eq	-5.43E-04	1.73E-02	4.09E+00	<b>4.11E+00</b>

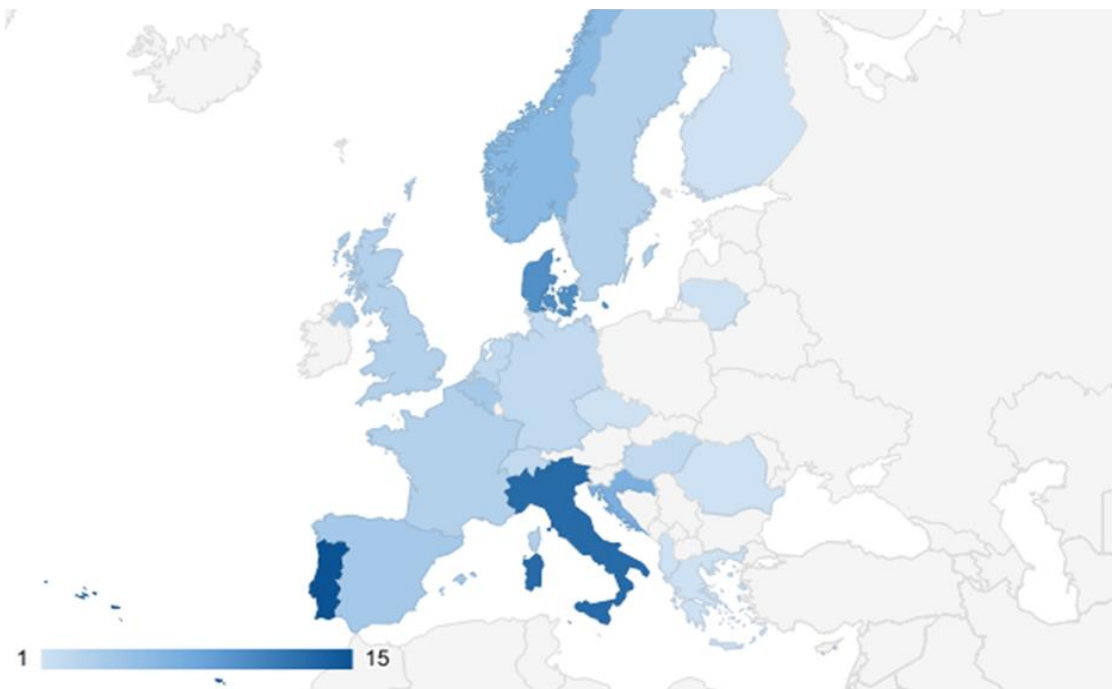
Calculated with the **Environmental Footprint (EF)** method (EC, 2013)





# **ASSESSMENT OF THE SUBMITTED PREVENTION ACTIONS**

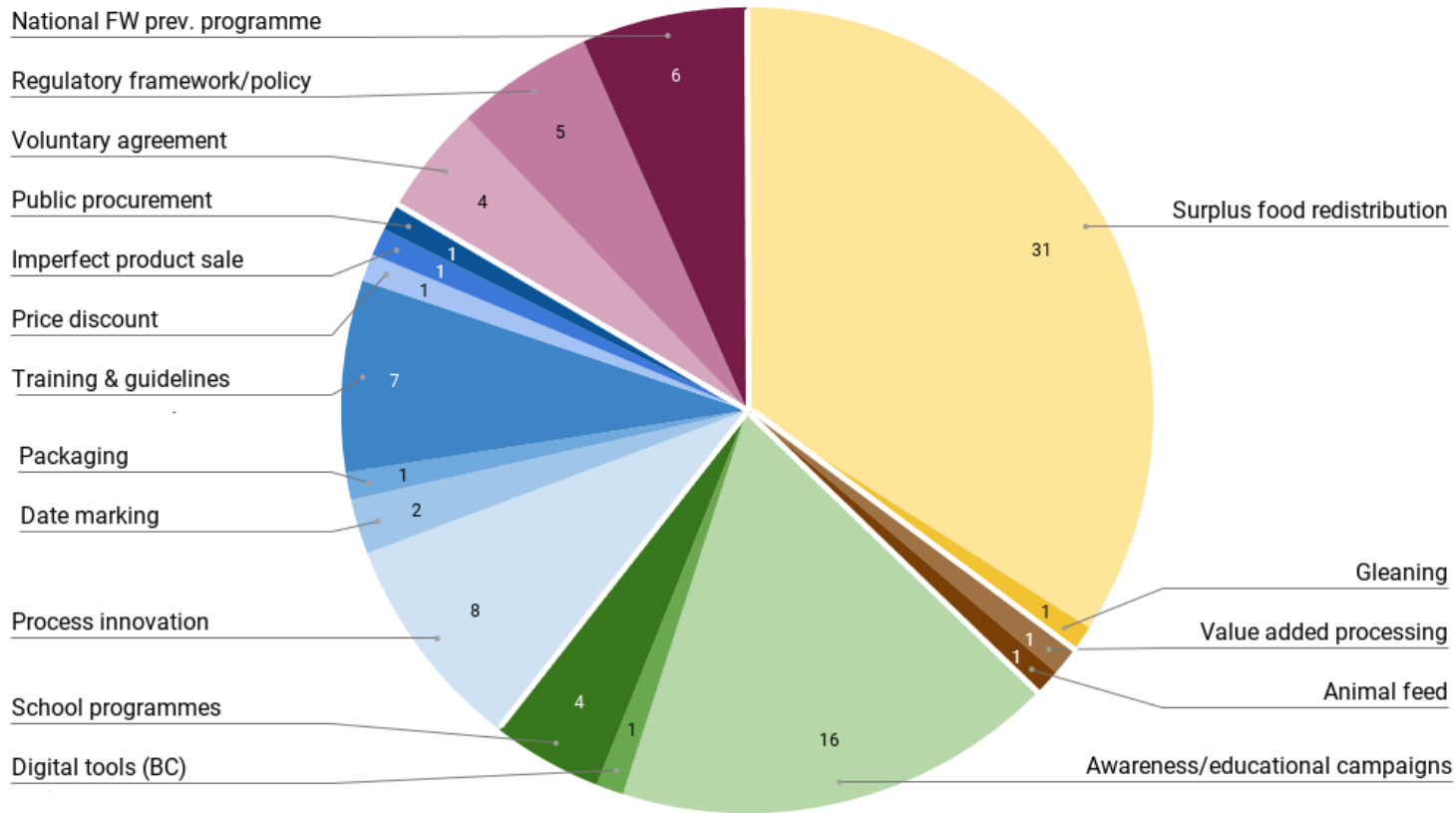
# Overview of the actions collected



<i>Country</i>	<i>Reported actions</i>
Albania	1
Belgium	4
Croatia	7
Czech Republic	1
Denmark	10
Finland	1
France	3
Germany	2
Greece	1
Hungary	2
Italy	13
Lithuania	1
Netherlands	2
Norway	7
Portugal	15
Romania	1
Spain	4
Sweden	3
Switzerland	2
United Kingdom	3
International	7
<b>Total</b>	<b>91</b>

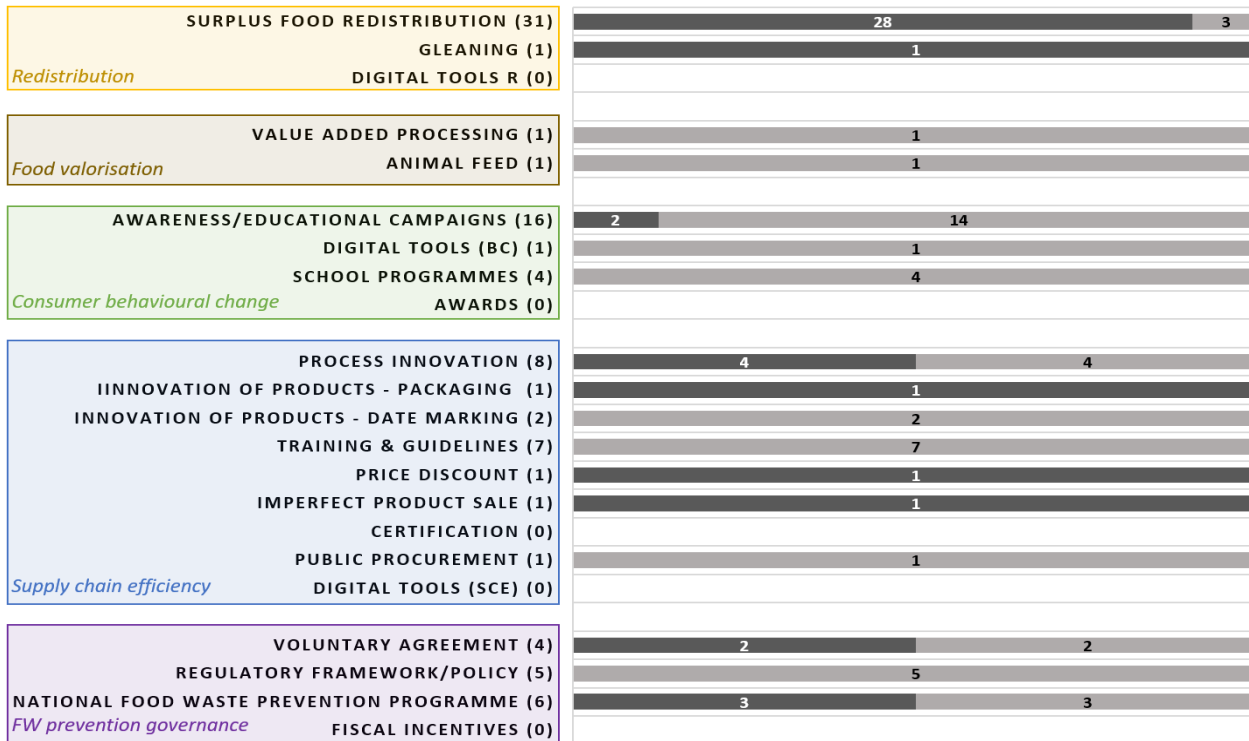
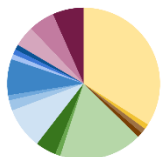
# Type of prevention actions and Overview of the actions collected

Type
Redistribution
Food valorization
Consumers behavior change
Supply chain efficiency
Food waste prevention governance





# Provision of the amount of food waste prevented



■ Quantifying amount prevented    ■ Not quantifying amount prevented

# Evaluation process

1. Screening of the reported actions for each type
2. A general evaluation of the actions reported for each criterion, including an assessment of the **quality of the data provided**.

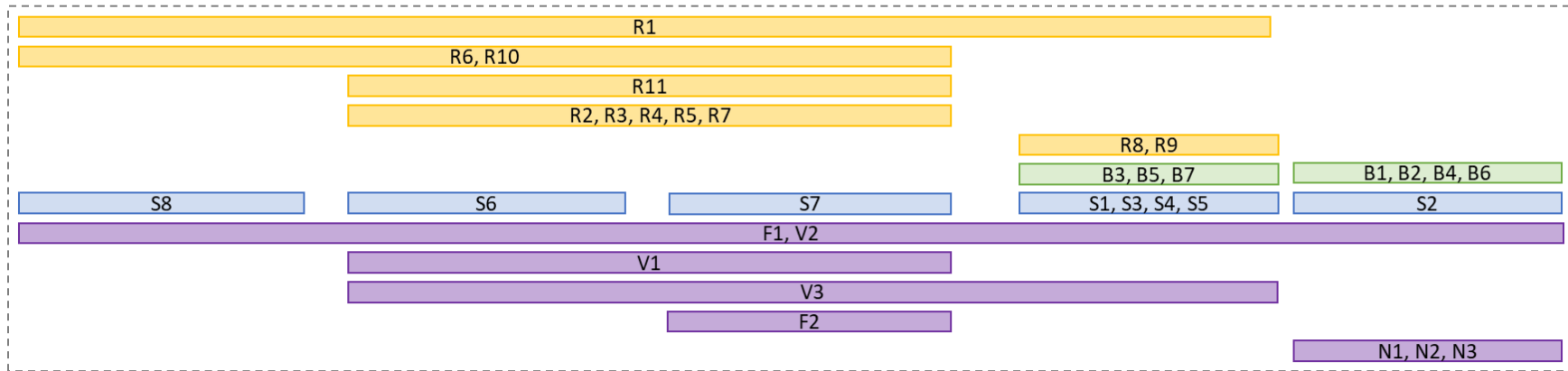
This was done by assigning to each action a score for each of the six criteria ( $i_{1-6}$ ) according to the following classification:

- the data provided were enough to assess the action according to criterion  $i$
- the data provided were enough but partially unclear, and it was not possible to obtain a clarification
- the data required to assess criterion  $i$  were incomplete
- the data required to assess criterion  $i$  were not provided

3. Selected actions presented in factsheets
4. Suggestions for actions' implementation.

Identification of elements to be considered when implementing, monitoring and reporting a food waste prevention action, in order to enable its assessment according to the evaluation framework developed.







# Summary of actions presented in factsheets



■ Redistribution   
 ■ Consumer behaviour change   
 ■ Supply chain efficiency   
 ■ Food waste prevention governance

Action code	Action name	Sub-type	Quality of the action					
			design	Effectiveness	Efficiency	Sustainability over time	Transferability And scalability	Intersectoral cooperation
R1	Boroume	SF Redistribution	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear
R2	Christmas Surplus	SF Redistribution	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear
R3	Transformar.te	SF Redistribution	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear
R4	Fondation Partage (foodbank)	SF Redistribution	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear
R5	Buon Fine Coop 2017	SF Redistribution	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear
R6	Integrated approach to increasing redistribution in the UK	SF Redistribution	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear
R7	Food without Waste	SF Redistribution	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear
R8	Zero Desperdício (Zero Waste)	SF Redistribution	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear
R9	Project "Food Support Network"	SF Redistribution	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear
R10	Fight against foodwaste and precariousness	SF Redistribution	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear
R11	Stockholms Stadsmision/Matcentralen	SF Redistribution	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear
R12	FEBA - European Food Banks Federation	SF Redistribution	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear
R13	Direct food surplus redistribution	SF Redistribution	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear
R14	Rete Banco Alimentare Onlus	SF Redistribution	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear
R15	Maisto bankas	SF Redistribution	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear
R16	The fresh food program initiative	SF Redistribution	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear
R17	Solidarity bread	SF Redistribution	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear
R18	The bread of everyday, Brother Galdino, Emporiums	SF Redistribution	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear
R19	Cibus	SF Redistribution	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear
R20	Operazione Quattro Province	SF Redistribution	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear
R21	Una sola famiglia umana, cibo per tutti	SF Redistribution	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear
R22	Life food waste stand up	SF Redistribution	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear
R23	Emporio della Solidarietà	SF Redistribution	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear
R24	Restolho	Gleaning	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear
R25	Food Bank	SF Redistribution	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear
R26	Donation of food to different social organisations	SF Redistribution	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear
R27	Distribuição de refeições que sobram em refeitórios de uma escola e da CercisEspinho	SF Redistribution	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear
R28	Food Banks of the Netherlands, Voedselbanken Nederland	SF Redistribution	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear

### Legend

	enough & clear
	enough but not clear
	incomplete
	not provided
	action in factsheet
	action assessed but not in factsheet

**REDISTRIBUTION, Surplus food redistribution** R1

**TITLE:** BOROUME 2012 - ongoing

**SHORT DESCRIPTION**  
 Boroume is a Greek NGO that aims at bridging the gap between the large amounts of food wasted in Greece and the growing number of people facing food insecurity by connecting selected donors (farmers, supermarkets, food manufacturers, and caterers) with nearby recipient charities and municipal social services that help food insecure families. Its main activities include: coordinating on a daily basis charities that collect surplus food from a variety of donors and then redistribute it to people in need; maintaining and constantly enlarging a network of donors and recipient charities; training new volunteers to provide support to the program; organizing events to raise awareness on the issue of food waste amongst the public.

**Stage of the FSC**  
 Primary production, processing and manufacturing, distribution and retail, restaurants and food services sector

**Actors**  
 Donors (farmers, food manufacturers, retailers, catering companies) and charities (food banks, soup kitchens, municipal social services)

**1. QUALITY OF THE ACTION DESIGN**  
 Boroume's aim is to facilitate the redistribution of surplus food from different types of organizations to nearby welfare organizations and charities as well as municipal social services who help people with food insecurity. A monitoring plan is implemented to monitor the action impact, using a set of key performance indicators, including: a) the total number of portions of food redistributed, and b) the ratio between the amount of food redistributed and the total operational costs beard.

**2. EFFECTIVENESS**  
 The effectiveness of this action could not be determined as no baseline or targets were reported.

**3. EFFICIENCY**  
 (Referring to 6 years)

**RESOURCES**

**Cost of the action (C)**  
600 000 €

**Volunteer hours \***  
3500 volunteer hours

\*Only referring to the first 10 months of 2018

**RESULTS**

Food waste prevented 10 080 tonnes

	Economic benefits (€)	Environmental savings Climate Change (kg CO <sub>2</sub> eq)	Water Use (m <sup>3</sup> eq)
(A)	28 877 316	41 196 846	83 950 292
(B)	1 151 400	7 693 142	131 254

**Social** 24 million meals donated

**Outreach** Since its start, Boroume has held a number of 'Feeding the 5000' events, numerous local events, two food saving festivals together with the WWF, hundreds of presentations and through its website and social media has been the focal point of the food waste discourse in Greece. A part of the awareness raising campaign consisted of an educational programme that reached 14 000 pupils in three years.

**REDISTRIBUTION, Surplus food redistribution** R1

**TITLE:** BOROUME 2012 - ongoing

**4. SUSTAINABILITY OF THE ACTION OVER TIME**  
 To ensure the economic sustainability and due to the lack of funds, the initiative was designed to have low operational costs. Since Boroume depends heavily on donations that change from year to year, the organizers have ensured that the sources of the incoming donations would be very diverse, including foundations, EU programs, companies, individuals and, to a smaller extent, in-house fundraising. The only technology needed to carry out the action consists on a CRM (customer relationship management) software package, which was donated to Boroume. All the procedures performed by the organization are described in written processes and there is constant training of new volunteers in order to ensure the sustainability of the operation over time.

**5. TRANSFERABILITY AND SCALABILITY**  
 The action has been transferred to other regions and countries, thanks to the transparency and willingness of Boroume in transferring any know-how regarding the operational aspects.  
 Boroume has been growing constantly since its beginning in 2012 both in terms of: number of donors and sectors of the food supply chain involved and size and resources invested in the awareness raising campaigns.

**6. INTERSECTORAL COOPERATION**  
 Boroume is a virtual food bank, therefore it acts as a facilitator to ensure the smooth cooperation between two main types of actors: the donors (mostly private companies such as supermarkets, bakeries, food manufacturers, catering services providers etc.) and the recipients (soup kitchens run by religious organizations, municipal social services and charities in charge of redistributing food to the most socially vulnerable members of society).

**KEY SUCCESS FACTORS AND BARRIERS**  
 A key learning point of this activity was that it is crucial to make it as easy as possible firstly for the donor and secondly for the recipient charity to donate and receive food. In other words, by trying to accommodate any logistical arrangement required by the donor and always make sure the donations happen at a local level to ensure that it will be easy for the recipient charity to collect them.  
 Success factors: before the Boroume initiative, nobody was speaking about food waste in Greece and, with the exception of a food bank in Athens, no one was redistributing/donating surplus food. Although there is no research on behavioural change regarding food waste in Greece, and not even a comprehensive research on the levels of food waste generated, in the last few years a change in people's behaviour was noticed, for example it has become common practice for restaurants to give customers their leftovers. Furthermore, thousands of people follow Boroume on social media, and use this platform to donate their surplus food.

**ADDITIONAL COMMENTS**

- Most actions (29/32) monitored and reported the amount of surplus food redistributed
- Few actions enabled to account for all the resources invested (direct costs, volunteers, material donations)
- 4 actions set SMART objectives, KPIs and a baseline against which to measure progress – necessary to measure *effectiveness*

➤ Sustainability over time

- designed with low operational costs
- diverse sources of the incoming donations /steady provision of funds
- availability of volunteers
- self-sustaining or that are implemented by companies are more certain

➤ Transferability and scalability

- most of the actions started as a pilot project or were implemented locally
- after proving to be successful, they were up-scaled either by increasing their geographic coverage or by increasing the amounts of partner organisations

➤ Intersectorial cooperation

- is at the core of these actions as to redistribute surplus food different sectors/actors need to cooperate

## Suggestions to improve the evaluation

- Clear definition of the objectives and the related KPIs
- Complete accounting of resources and results e.g. number of hours of volunteers needed to perform the activity can be monetized considering the gross minimum hourly wage in the country

Examples of KPIs to measure effectiveness and efficiency:



Amount of food redistributed  
*kg and/or number of meals*



Amount of fresh  
fruit/meat/dairy  
redistributed



Number of food insecure  
people reached



European  
Commission



## Quality of provided data

Action code	Action name	Sub-type	Quality of provided data					
			Quality of the action design	Effectiveness	Efficiency	Sustainability	Transferability And scalability	Intersectorial cooperation
B1	Chef save the food	Awareness/educational campaign	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear	enough & clear
B2	Zu gut für die Tonne! "Too good for the bin!"	Awareness/educational campaign	enough & clear	enough but not clear	enough & clear	enough & clear	enough & clear	enough & clear
B3	"CutFoodWaste2020". Communication campaign towards guests	Awareness/educational campaign	enough & clear	enough but not clear	enough & clear	enough & clear	enough & clear	enough & clear
B4	"Brukopp-leksikon" - A guide for consumers on how to store and reuse food	Awareness/educational campaign	enough & clear	enough but not clear	enough & clear	enough & clear	enough & clear	enough & clear
B5	Do not waste it, take what is yours!	Awareness/educational campaign	enough & clear	enough but not clear	enough & clear	enough & clear	enough & clear	enough & clear
B6	Date marking campaign	Awareness/educational campaign	enough & clear	enough but not clear	enough & clear	enough & clear	enough & clear	enough & clear
B7	Menos Olhos que Barriga - "Less Eyes than Belly"	Awareness/educational campaign	enough & clear	enough but not clear	enough & clear	enough & clear	enough & clear	enough & clear
B8	EFFECT	Digital tools - BC	enough & clear	enough but not clear	enough & clear	enough & clear	enough & clear	enough & clear
B9	No tires la comida "Do not waste food"	Awareness/educational campaign	enough & clear	enough but not clear	enough & clear	enough & clear	enough & clear	enough & clear
B10	Doggy bag for restaurants	Awareness/educational campaign	enough & clear	enough but not clear	enough & clear	enough & clear	enough & clear	enough & clear
B11	Solidarity Tray	Awareness/educational campaign	enough & clear	enough but not clear	enough & clear	enough & clear	enough & clear	enough & clear
B12	Green chef - school contest	School programme	enough & clear	enough but not clear	enough & clear	enough & clear	enough & clear	enough & clear
B13	Coleção Zero Desperdício - "Zero Waste Collection"	School programme	enough & clear	enough but not clear	enough & clear	enough & clear	enough & clear	enough & clear

**Legend**

- enough & clear
- enough but not clear
- incomplete
- not provided
- action in factsheet
- action assessed but not in factsheet

# Consumers behaviour change

## Example of factsheets

### CONSUMER BEHAVIOUR CHANGE, Awareness/Educational campaign B7

**TITLE:** Movimento Menos Olhos que Barriga "Less Eyes than Belly" 2013 - ongoing

#### SHORT DESCRIPTION

This campaign, ongoing since in 2013, takes place in all the food outlets of the University of Minho (Portugal). It is run by the University Social Services (in charge of the catering services at the University) and involves student volunteers. The campaign is based on a series of specific actions with the main goal of raising awareness on the issue of food waste and reducing the food waste generated on the University premises.

#### Stage of the FSC

Restaurants and food services sector

#### Actors

Food service; Academia/research

#### 1. QUALITY OF THE ACTION DESIGN

The main goal of this campaign is to change the behaviour of the academic community to achieve a food waste reduction. Furthermore, it aims at shaping the mind-set of students so that, when they finish their studies, they can take these values to other institutions and expand these principles to other communities and organizations. To this end, the main objective is to develop a set of awareness raising activities that promote the reduction of food waste by encouraging the users of the food service outlets to take only the amount they intend to eat. The activities conducted include providing cutlery paper bags with messages on food waste, setting up a photo competition and creating a Facebook page to promote the campaign.

In order to measure the results of the initiative, the total amount of food waste generated by the University food outlets was recorded before the start of the campaign and during its development. This was done by weighing each day the organic waste collected from the University canteens and recording these quantities.

#### 2. EFFECTIVENESS

Before the start of the campaign, the University was generating 4 tonnes of food waste per year. After five years of implementing the campaign, this quantity was reduced to 2 tonnes per year. Although no initial target was set, the action can be considered effective in achieving a 50% reduction of food waste.

#### 3. EFFICIENCY

(Referring to the full action)

##### RESOURCES

**Cost of the action**  
500 €

**Working time invested**  
800 volunteer hours each semester



##### RESULTS

Food waste prevented 5 tonnes

	Economic benefits (€)	Environmental savings Climate Change (kg CO <sub>2</sub> eq)	Water Use (m <sup>3</sup> eq)
(A)	14 296	20 408	41 657
(B)	774	2821	92

**Outreach** This campaign has reached almost the entire academic community which is approximately 20000 people each year. Behavioural change was not assessed through surveys, but due to the reduction of food waste generated by the University canteens, it is possible to say that the academic community change its behaviour.

### CONSUMER BEHAVIOUR CHANGE, Awareness/Educational campaign B7

**TITLE:** Movimento Menos Olhos que Barriga "Less Eyes than Belly" 2013 - ongoing

#### 4. SUSTAINABILITY OF THE ACTION OVER TIME

The sustainability over time of this action is ensured by the fact that it is part of a broader strategy to improve the sustainability of the University of Minho. A strategic sustainability plan was developed in 2018 consisting of 17 short, medium and long-term programs focused on the three sustainability pillars. A Sustainability Office was also established with a full-time person responsible for the operationalization of the whole program. Thus, this year, in addition to the improvement in the efficiency of the organic and inorganic waste produced, specific measures to reduce energy and water consumption were implemented. A process to eliminate all types of disposable plastic was initiated and awareness and social impact campaigns were implemented. Furthermore, a sustainability report will be published in 2019 in order to achieve the ISO 14001:2015 Environmental Management System certification - becoming the country's first social services to do this.

#### 5. TRANSFERABILITY AND SCALABILITY

The action has been conducted at local scale and has not been upscaled nor transferred to a different context, although it is considered potentially transferable.

#### 6. INTERSECTORIAL COOPERATION

The action is internal to the university, being the result of a partnership between the internal catering service provided of the University of Minho and the University of Minho's academic Social Science Institute.

#### KEY SUCCESS FACTORS AND BARRIERS

The main challenges encountered were the following:

- Operationalization of the whole process: with three canteens and so many daily users, it was necessary to create many work teams and the overall coordination of the entire process was very challenging.
- Raising people's awareness to the food waste problem is not always easy, requiring a lot of effort and dedication.

#### ADDITIONAL COMMENTS

The total food waste avoided was calculated considering that the food waste generated was reduced gradually from 4 tonnes per year to 2 tonnes per year during the course of 5 years (between 2013 and 2018), leading to a total food waste reduction of 5 tonnes.

- 3 actions monitored the result, and 2 of them reported the amount of food waste avoided
- Few actions reported outcome objectives (% of people changing behaviour)
- 1 action set SMART objectives, KPIs and a baseline against which to measure progress – necessary to measure effectiveness

- Sustainability over time
  - conducting awareness campaigns on food waste should be part of a broader strategy, which can ensure the long term sustainability of these actions or at least until the strategy remains in place
- Transferability and scalability
  - 2 actions (B12, a school contest and B13, a set of books on the topic of food waste) reported that they had been upscaled
  - many of them were already conducted at national level, and are considered to be potentially transferable to other countries
- Intersectorial cooperation
  - Different dynamics underpin the actions e.g. Initiatives aiming at reducing household food waste were generally coordinated by public authorities, consumer associations, or private companies and often counted on the support of NGOs and other organisations

## Suggestions to improve the evaluation

- Clear definition of the objectives and the related KPIs

Actions measuring food  
waste reduction  
obtained

### **IMPACT OBJECTIVES**



food waste  
generated in  
one year  
*per capita/per  
household*



food waste  
generated per  
meal served

Actions measuring a reported increase  
in awareness/behavioural change  
(surveys, diaries, focus groups..)

### **OUTCOME OBJECTIVES**



share of people reporting  
a change in behaviour

Action code	Action name	Sub-type	Quality of provided data					
			Quality of the action design	Effectiveness	Efficiency	Sustainability over time	Transferability And scalability	Intersectoral cooperation
S1	Guidelines on FW reduction in hospitality	Training & guidelines	enough & clear	not provided	enough & clear	enough & clear	enough & clear	enough & clear
S2	Additional date labelling	Innovation of products - Date marking	enough & clear	enough but not clear	enough & clear	enough & clear	enough & clear	enough & clear
S3	CutFoodWaste2020 – employee training program	Process innovation	enough & clear	enough but not clear	enough & clear	enough & clear	enough & clear	enough & clear
S4	WasteWatch powered by LeanPath	Process innovation	enough & clear	enough but not clear	enough & clear	enough & clear	enough & clear	enough & clear
S5	The Gothenburg model for reduced food waste	Process innovation	enough & clear	enough but not clear	enough & clear	enough & clear	enough & clear	enough & clear
S6	Food Losses in the Flemish Food Industry	Training & guidelines	enough & clear	enough but not clear	enough & clear	enough & clear	enough & clear	enough & clear
S7	Improved shelf life	Innovation of products - Packaging	enough & clear	enough but not clear	enough & clear	enough & clear	enough & clear	enough & clear
S8	Fruta Feia	Imperfect product sale	enough & clear	enough but not clear	enough & clear	enough & clear	enough & clear	enough & clear
S9	Eating in Hesse	Process innovation	enough & clear	enough but not clear	enough & clear	enough & clear	enough & clear	enough & clear
S10	Reducing food waste in restaurants	Training & guidelines	enough & clear	enough but not clear	enough & clear	enough & clear	enough & clear	enough & clear
S11	Every Meal Matters	Training & guidelines	enough & clear	enough but not clear	enough & clear	enough & clear	enough & clear	enough & clear
S12	Less food waste in restaurants	Process innovation	enough & clear	enough but not clear	enough & clear	enough & clear	enough & clear	enough & clear
S13	The food waste hunters	Process innovation	enough & clear	enough but not clear	enough & clear	enough & clear	enough & clear	enough & clear
S14	No food waste campaign	Training & guidelines	enough & clear	enough but not clear	enough & clear	enough & clear	enough & clear	enough & clear
S15	From food waste to food resources	Training & guidelines	enough & clear	enough but not clear	enough & clear	enough & clear	enough & clear	enough & clear
S16	Systematic price discount for food close to the expiry date	Price discount	enough & clear	enough but not clear	enough & clear	enough & clear	enough & clear	enough & clear

**Legend**

- enough & clear
- enough but not clear
- incomplete
- not provided
- action in factsheet
- action assessed but not in factsheet

**SUPPLY CHAIN EFFICIENCY, Process innovation** SS

**TITLE:** The Gothenburg model for reduced Food Waste 2016 - ongoing

**SHORT DESCRIPTION**  
 The Gothenburg model is a procedure/tool developed by the City of Gothenburg (Sweden) in 2016, that provides tips and actions to reduce food waste in the public food sector (approximately 520 public kitchens). The City of Gothenburg trained 40 key employees in all city districts to coordinate the development of the program and approximately 1200 employees to implement the model as a daily routine. The aim of this initiative is to obtain a reduction of 50% of the food waste generated during procurement, storage, preparation, and serving of the meals (i.e. excluding plate waste), by December 2018 against a baseline of January 2017.

**Stage of the FSC**  
 Restaurants and food services sector

**Actors**  
 Local authorities, public food sector

**1. QUALITY OF THE ACTION DESIGN**  
 The overarching aim is to obtain a 50% reduction of food waste in public kitchens in the city of Gothenburg. To this end, a procedural tool "The Gothenburg Model for Reduced Food Waste" was created, that provides nine tips for food waste reduction, each underpinning a number of measures (for a total of 54 measures). A training program was implemented, to teach employees how to use the tool, and two surveys were conducted: the first during the training session, and the second a few months later, to establish the effectiveness of the training program (the surveys were mostly focused on which of the 54 measures suggested had been implemented). All public kitchens taking part are asked to measure daily the food waste generated, and register it in a meal planning software system. In this way, it is possible to track the progress towards the goal.

**2. EFFECTIVENESS**  
 At the beginning of 2017, on average the food waste generated by the public kitchens was of 30 grams per guest (excluding plate waste). The goal was to halve the food waste generated by December 2018. At the time of reporting (Dec 2018), this level had reached 15 grams per guest, 50% lower compared to the baseline, meeting the original target. Therefore, this action was effective in meeting its target. Additional measures of the effectiveness of this measure were provided: in May 2018 96% of the public kitchens in Gothenburg were measuring and registering their food waste in the system, and the surveys show an overall increase in the number of measures implemented in the months following the training program (the share of measures fully implemented increased from 42% to 56% in the months following the training program).

**3. EFFICIENCY**  
 (Referring to 24 months)

**RESOURCES**

Cost of the action  
540 000 €

➔

**RESULTS**

Food waste prevented \* 300 tonnes

	Economic benefits (€)	Environmental savings Climate Change (kg CO <sub>2</sub> eq)	Water Use (m <sup>3</sup> eq)
(A)	1 000 000	1 224 503	2 493 860
(B)	57 900	138 047	9 608

**Outreach**  
 This program increased the awareness of the leadership, sales teams, operational teams, the clients and consumers. It helped to realize how much food is wasted and how much waste can be avoided through simple targeted actions at site level.

**SUPPLY CHAIN EFFICIENCY, Process innovation** SS

**TITLE:** The Gothenburg model for reduced Food Waste 2016 - ongoing

**4. SUSTAINABILITY OF THE ACTION OVER TIME**  
 The economic sustainability of the action is based on the concept that its cost is balanced by the savings from the avoided food purchases (the savings from the reduced purchases since the start of the action - approx. 1 000 000 euros – are more than the cost of the action 540 000 euros).

**5. TRANSFERABILITY AND SCALABILITY**  
 This action has been partially transferred. Recently, the Swedish Food Agency has launched a model to reduce food waste which includes parts of the Gothenburg Model for Reduced Food Waste. Furthermore, a number of other municipalities have started implementing the model.

**6. INTERSECTORIAL COOPERATION**  
 This action is mainly conducted within the public food service of the city of Gothenburg. Nevertheless, since its start, the different city districts started cooperating towards the common goal of reducing food waste.

**KEY SUCCESS FACTORS AND BARRIERS**  
 The whole process has been received very positively. A learning point is that the program would have proceeded more smoothly if the operative managers had been included earlier in the process and the key coordinators had been trained before the remaining employees.

**ADDITIONAL COMMENTS**  
 (\*) The total food waste prevented was calculated considering that yearly food waste was reduced gradually from 600 tonnes per year to 300 tonnes per year over two years.

- 5 actions monitored and reported the amount of food waste avoided, but only 2 of these reported also the cost of the action
- 2 actions (S5 and S8) reported SMART objectives, KPIs and a baseline against which to measure progress – necessary to measure effectiveness
- 4 actions used KPIs to measure progress but did not set a target



- Sustainability over time relies on :
  - their ability to achieve food waste reductions, as this implies that less resources are spent on purchasing the food, balancing the costs of implementing the action (actions generally implemented within the private sector or in the public food service sector)
  - on the level of acceptability amongst management and staff
- Transferability and scalability
  - Some actions started as a pilot project and then were upscaled, others stated that they had been (at least partially), replicated in different contexts. Other actions started at regional level and after proving successful were upscaled at national level
- Intersectorial cooperation
  - Lower than the other groups of actions assessed. Most of the reported initiatives were conducted within an organization

- Clear definition of the objectives and the related KPIs

Actions based on the implementation of process/product innovations to reduce food waste

**IMPACT OBJECTIVES**

Actions that provide information, training or tools to implement or to track success of practical measures to reduce food waste

**OUTCOME OBJECTIVES**



food waste generated per kg sold



food waste generated per kg produced



food waste generated per meal served


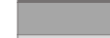
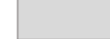



Number of businesses entering the program

Number of businesses tracking food waste



Action code	Action name	Sub-type	Quality of the provided data					
			Quality of the action design	Effectiveness	Efficiency	Sustainability over time	Transferability And scalability	Intersectorial cooperation
V1	Voluntary Food Waste Agreement	Voluntary agreement	enough & clear	enough but not clear	enough & clear	enough & clear	enough & clear	enough & clear
V2	Food Supply Chain Roadmap on Food Loss 2015-2020		enough & clear	enough but not clear	enough & clear	enough & clear	enough & clear	enough & clear
V3	Voluntary Agreements to reduce supply chain food waste		enough & clear	enough but not clear	enough & clear	enough & clear	enough & clear	enough & clear
V4	Partnership for Less Food Waste		enough & clear	enough but not clear	enough & clear	enough & clear	enough & clear	enough & clear
F1	Legislation regarding food donation system in Croatia and Ordinance on VAT	Regulatory framework	enough & clear	enough but not clear	enough & clear	enough & clear	enough & clear	enough & clear
F2	The amendment of the Czech Food Law (2018)		enough & clear	enough but not clear	enough & clear	enough & clear	enough & clear	enough & clear
F3	Legislative change regarding possibility of donating and consuming food after the expiration of "best before date"		enough & clear	enough but not clear	enough & clear	enough & clear	enough & clear	enough & clear
F4	The abolition of a national prohibition to sell best before products past their durability.		enough & clear	enough but not clear	enough & clear	enough & clear	enough & clear	enough & clear
N1	LIFE-FOODWASTEPREV / Wasteless	National food waste prevention programme	enough & clear	enough but not clear	enough & clear	enough & clear	enough & clear	enough & clear
N2	Estrategia Nacional "Más alimento, menos desperdicio"		enough & clear	enough but not clear	enough & clear	enough & clear	enough & clear	enough & clear
N3	Integrated action to reduce household food waste		enough & clear	enough but not clear	enough & clear	enough & clear	enough & clear	enough & clear
N4	Denmark without Waste II - A Waste prevention strategy		enough & clear	enough but not clear	enough & clear	enough & clear	enough & clear	enough & clear

### Legend

-  enough & clear
-  enough but not clear
-  incomplete
-  not provided
-  action in factsheet
-  action assessed but not in factsheet

### FOOD WASTE PREVENTION GOVERNANCE, National Food Waste Prevention Programme

N1

TITLE: Wasteless

2016 - ongoing

#### SHORT DESCRIPTION

Wasteless is a Hungarian programme against food waste in households, funded by the EU LIFE programme. It includes: (1) Identification and development of good practices for food waste prevention in the food chain. The Guide for good hygiene practice (GHP) for hospitality and catering based on the regulation (EC) No 852/2004 was published online; (2) Public awareness campaign and dissemination of results; (3) Development of education material delivering knowledge on FW prevention to primary schools. 280 000 copies of the Wasteless students' books (with an extra awareness-raising poster attached) were transported into all (2666) primary schools of Hungary. The Teachers' guide and the Workbook are also available online; (4) School Programme and Summer Camp. Within the framework of the Wasteless School Programme, the first online quiz competition of 4 rounds (based on the content of the students' book) has been undertaken. 44 primary schools, 1314 children of 61 classes participated in the quiz and 40 short food waste related videos arrived as the task of the fourth round of the competition. The award of two winner classes was a 7-day-long thematic Summer Camp; (5) Transfer of knowledge. The results of the baseline study were published in the British Food Journal, thus becoming the first study on actual food waste measurement in the region.

Stage of the FSC  
Households

Actors  
National and Regional government, NGOs, Trade associations, Professional organisations, manufacturers, Wholesalers, Retailers, Food service, Schools, Academia/research, Consumers, Opinion leaders

#### 1. QUALITY OF THE ACTION DESIGN

The main objectives of the project are: 1. Decrease the proportion of food waste among Hungarian families, through changing consumers' attitude and behavioural patterns. The target value is 8% reduction within 2016-2020; 2. Increase the food waste and food waste awareness and the level of knowledge of children attending primary school, by our students' book, demonstration tools, online quiz competition and thematic summer camp; 3. Collection of good practices which contribute to prevention of generating food waste, and based on that, elaborating a guide book for the concerned food chain participants, such as catering, retail, industry, primary production and community; 4. Collaboration and cooperation with other EU Member States, in order to contribute to the international implementation of the project's results. Indicators were set to be reached during the implementation period (table 1). Surveys were conducted to assess behavioural changes (table 1). The baseline indicators are monitored by surveys conducted annually.

#### 2. EFFECTIVENESS

The target for food waste reduction is 8% within 2016-2020. The baseline is the values of food waste for 2016 (68.04 kg/capita/year). The next measurement will be carried out in 2020 so far now the effectiveness in terms of food waste prevented cannot be assessed. Nevertheless for other indicators related to outreach to which were also established targets the action has shown to be effective (table 1). The effectiveness of the communication campaign elements (e.g. the number of presentations, TV/radio appearances, press releases, online articles, website visitors, reach on Facebook, the advertising equivalent of the collected media broadcasts) are monitored as part of the internal reporting system.

#### 3. EFFICIENCY



### FOOD WASTE PREVENTION GOVERNANCE, National Food Waste Prevention Programme

N1

TITLE: Wasteless

2016 - ongoing

#### 4. SUSTAINABILITY OF THE ACTION OVER TIME

After receiving the first project results, the Hungarian government issued a governmental decision determining consumer education as an important activity of the National Food Chain Safety Office (Nébih), which covers food waste prevention and food safety. This, and the strong commitment of Nébih's management ensure the long term sustainability of the programme. The costs are planned to be covered part from own budget and part aim for funding opportunities to enhance the intensity of the preventive activities. On-the-job training is provided to the new staff. As a LIFE project, Nébih had to develop an After-LIFE Plan for Wasteless for 5 years, to ensure the continuing of awareness-raising actions after the official end of the project implementation period. Organizing education programmes for households has become part of Nébih's strategy.

#### 5. TRANSFERABILITY AND SCALABILITY

Transferability was considered in its design and recommendations in this regard have been presented. However, the action has not been transferred yet and was not upscaled.

#### 6. INTERSECTORAL COOPERATION

The action is carried out in cooperation with several stakeholder groups. The educational materials have been revised by the National Chamber of Teachers. The Hungarian Food Bank Association is involved in every phase of the project, from the preparation of the Good practices guides to the organization of professional events and the participation in the Steering Board of the project. Representatives of the Hungarian Ministry of Agriculture, the National Food Chain Safety Office, NGOs, duty holders, cross-sectorial organisations, and large, small and medium-sized enterprises were involved in the preparation and completion of the 4 Good practices guides for every stakeholder groups of the food chain from farm to fork. They worked in sector-specific working groups to find solutions for the specific challenges of the catering, retail, food industry and NGO sectors. The event 'Round Table Discussion on Food Waste Prevention', held in 2018, was of great interest within every sector of the food chain: representatives of including but not limited to retailers, manufacturers, NGOs, public bodies, cross-sectorial organisations were present and tried to find solutions for the cross-sectoral challenges of the food waste issue. Furthermore, Wasteless organised the 2018 EU LIFE Platform Conference for Food Waste Prevention, with close to 120 participants from 14 European countries, coming from a variety of different organizations and enterprises. Every two years a competition is organized giving a special prize to companies that present the best practices for food waste prevention.

#### KEY SUCCESS FACTORS AND BARRIERS

**Positive aspects**  
Instead of the originally planned 3 040 copies, 280 000 copies of the Wasteless students' books (with an extra awareness-raising poster attached) were distributed to 2666 primary schools in Hungary. The Guide for good hygiene practice (GHP) for hospitality and catering based on the regulation (EC) No 852/2004 (into which the most essential elements of the Guide created by the Working Group of Catering has been transplanted) was published online.

**Difficulties:**  
As a commitment, awareness-raising videos were produced and shared, however no professional actor is employed at the National Food Chain Safety Office of Hungary. Therefore, official employees of the Office (who deal with for example risk assessment or administrative tasks within their daily work) were involved in the shooting of the short movies.  
An international LIFE Food Waste Platform Meeting (originally planned as the Mid-term Conference of the project) was held in 8-9 October 2018, Budapest. Remarkable projects of food waste prevention, mitigation and reduction will be presented at the conference, to provide concrete suggestions to tackle food waste generation in the different sectors, based on the shared experience of the representatives present.

#### ADDITIONAL COMMENTS

The measurement on food waste levels will be carried out in 2020. The Wasteless project aims to decrease the amount of food waste by 8% by 2020 compared to the initial value of 2016, saving approximately 26 000 000 kg of food from becoming food waste annually.

The results of the baseline study conducted in the project was published in a scientific journal, becoming the first study on actual food waste measurement in the region. It is available at: <http://www.emeraldinsight.com/doi/abs/10.1108/BFJ-04-2017-0255>.

### Voluntary Agreements

- Definition of specific objectives including targets on amounts of food waste to be reduced against a defined baseline
- Sustainability over time of these actions is defined by the duration defined in the voluntary agreements
- Experience and lessons learned were used to design new and up-scaled voluntary agreements (V3 used for the new voluntary agreement C2025, UK). Some actions were transferred to other countries
- Voluntary agreements involve the collaboration of different entities such as government, business, and NGOs.

### National Food Prevention Programme

- Focus on reducing food waste generated by households
- 'amount of food waste prevented' was reported by the participants (N1, N2, and N3), but only action N1 had defined a food waste reduction target
- Action N1 was designed considering several KPIs that will allow assessing the effectiveness and efficiency of the action in different dimensions, including behavioural change
- The actions reported are either ongoing or expected to be continued in a second phase
- 1 action (N3) has been transferred and implemented in several countries.
- Cooperation of different stakeholders, including the entity responsible for developing and coordinating the plan, and food services and other businesses, consumer and community groups, food regulators, local and national governments.

### Regulatory framework

- No specific objective (i.e. no target is defined)
- 2 actions reported KPIs: 'amount of surplus food redistributed' / 'financial value of surplus food redistributed'
- All reported zero cost for the action implementation
- Sustainability over time is guaranteed unless changes in the regulation are made
- None of the actions reported was transferred or up-scaled.
- Intersectorial collaboration between the government that defines the law/regulation and the different entities involved in a food redistribution scheme (private companies, charities, NGOs).

## Suggestions to improve the evaluation

- Voluntary Agreements and National Food Waste Prevention Programmes are a combination of actions that are within the previous types presented
  - Ideally a KPI would be used to measure the overall impact of the action: amount of food waste prevented
  - Each action that constitutes the programme/agreement can be evaluated using the adequate KPI
- For regulatory frameworks, there is the need to account the resources used for the action design and implementation because zero cost is unrealistic



# Conclusions

- Assessing **effectiveness** was limited by data availability. The **main gap** was the **definition of SMART objectives, related KPIs**, and a **monitoring system** to track their progress towards achieving their goal(s).
- **KPIs should be defined according to the type of actions.** The distinction between actions in which is feasible to account for food waste prevented vs those where this is not possible was taken into account when suggesting KPIs.
- To **evaluate the efficiency** of a food waste prevention action it is **crucial to fully capture the total cost and benefits of the action implementation**, which should reflect all the resources used to implement the action and the multiple possible benefits.

# Conclusions

- **Measurements** of the food waste amounts to establish **baselines and monitoring the action** should be done following a **defined methodology** clearly stating what is the **definition of food waste used in the accounting exercise**.
- High **variability of the data related to the different reported actions**
- Is important to be aware of **socio-demographic** and other **context-related factors** that may **influence the results of the action**.

# Challenges

- *Maximising FW reduction per resource input*
  - *Multiple societal benefits*
  - *Sustainability over time*
  - *Systemic changes*
- 
- **Indicators and data may differ** from one typology of action to another
  - Very difficult to make any **comparison between the actions**
  - Accounting for **voluntary** work
  - Difficult to account comprehensively for burdens and benefits when **many different actors** are involved
  - Assessing effective reduction of waste when **a change in behaviour is stated**
  - Defining **business models** that may overcome (at least partially) the heavy reliance of these activities on private and public funds
  - How to ensure **transfer of good practices**, including interaction between those providing similar actions but reporting very different outcomes.

## .... and possible paradoxes

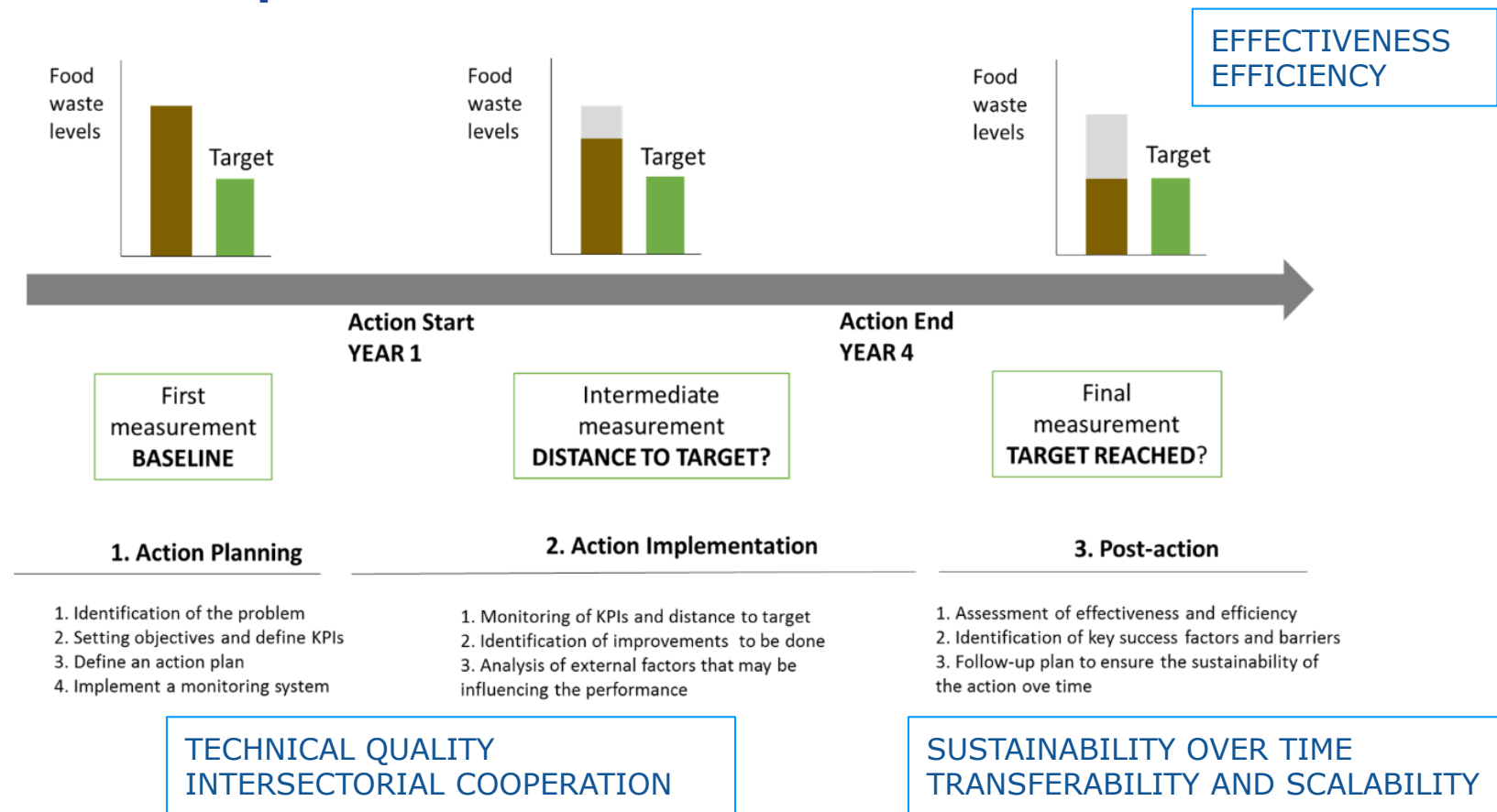
### **Decrease food waste less redistribution?**

If food waste campaigns are successful in e.g. retail and food services, there is the risk that the amount of food donated is significantly reduced. Based on the added value generated by some of the actions (e.g. 100 € of benefit every € spent in the action) this could be an issue.

### **Decrease food waste, increase of impacts due to changes in the expenditures?**

**Rebound effect** i.e. the **avoidance of food waste** in households, causes **an increase in the disposable income** that could be potentially be spent on other products or services. This **additional expenditure** can **reduce significantly** or even **offset** the **environmental benefits of food waste prevention actions**.

# Food waste prevention actions evaluation



# Template for comments

H10					
	A	B	C	D	
2	<b>ORGANISATION PROVIDING THE COMMENTS</b>		<b>Name of the organisation and contacts</b>		
3	<i>GENERAL COMMENTS</i>		<i>Please highlight major issues for attention or potential new information that could be considered for inclusion in the final version of the report. If the information has a specific reference, please provide full references</i>		
4	<b>SPECIFIC COMMENTS PER CHAPTER</b>		<b>Page(s)</b>	<b>Comments</b>	<b>References</b>
5	<b>1 - Introduction</b>				
6	<b>2 - Framework for the evaluation</b>				
7	<b>3- Development of the calculator</b>				
8	<b>4- Food waste prevention actions evaluations</b>				
9	<b>5- Discussion and conclusions</b>				
10	<b>References</b>				
11	<b>Annexes</b>				
12					
13					
14	<b>COMMENTS on FACTSHEETS</b>		<b>Factsheet code</b>	<b>Comments</b>	
15					
16					

# Calculation of effectiveness and efficiency of a food waste prevention action: a practical example

A restaurant starts providing more flexible portions to reduce plate waste

Objective: to cut the food waste per meal by 20% compared to current values

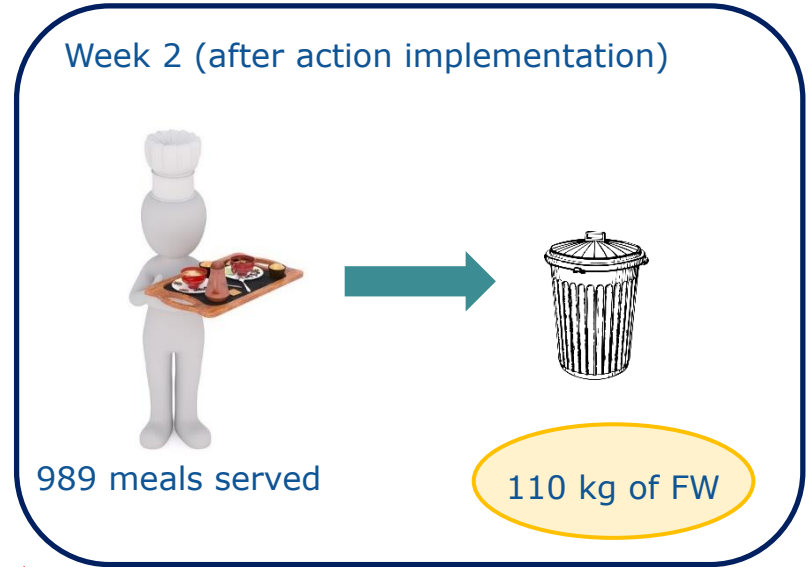
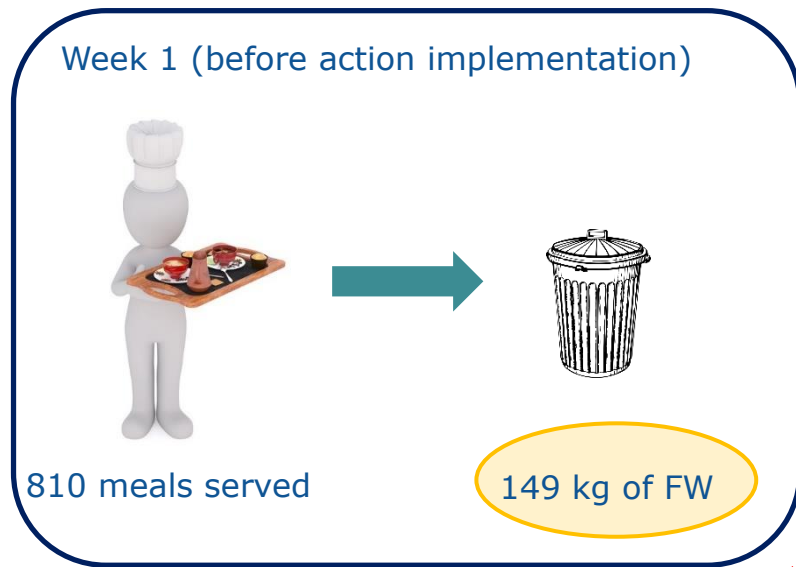
Cost of the action: 100 € (leaflets to inform customers)

## Monitoring:

The total food waste generated and the number of meals served in one week are measured:

- Before the implementation of the action (week 1)
- After the implementation of the action (week 2)

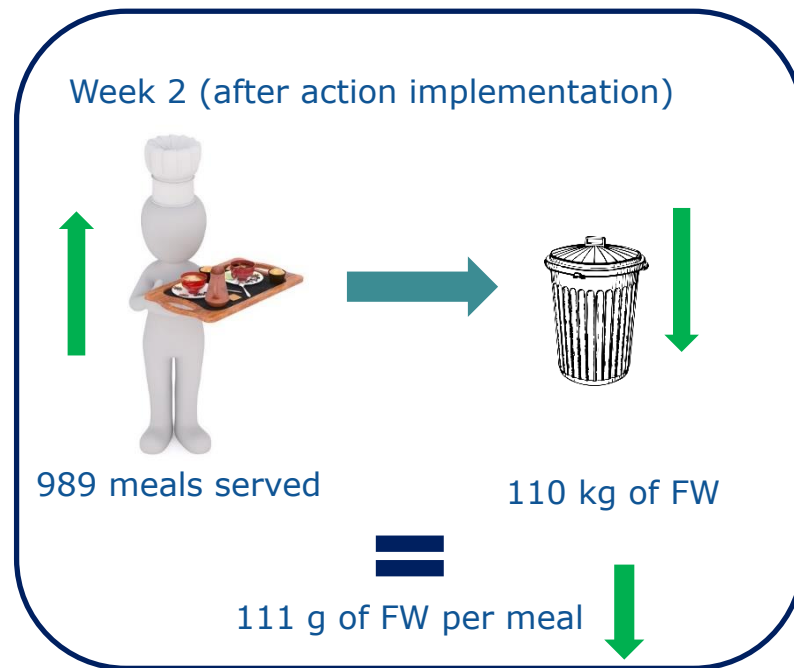
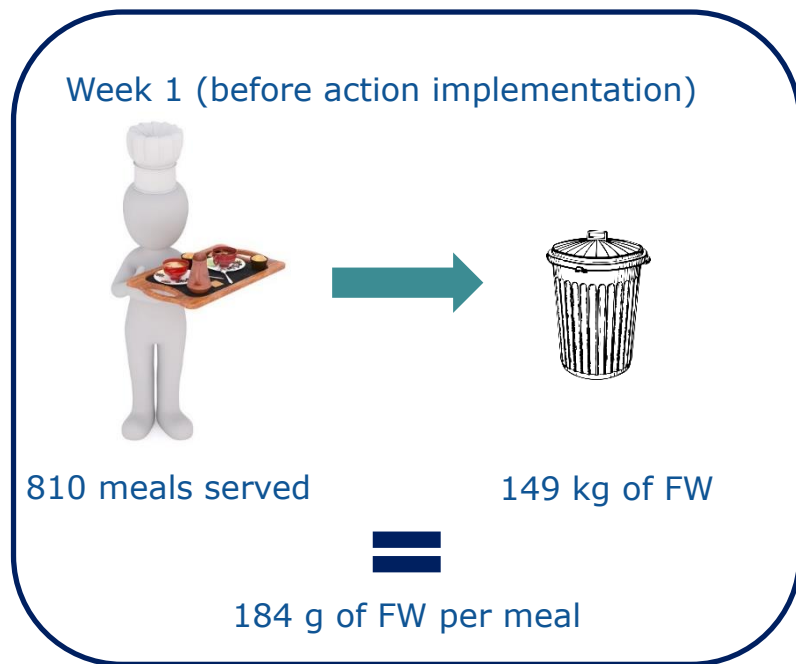
# Calculation of effectiveness and efficiency of a food waste prevention action: a practical example



$149 - 110 =$  ~~39~~ kg of FW avoided



# Calculation of effectiveness and efficiency of a food waste prevention action: a practical example



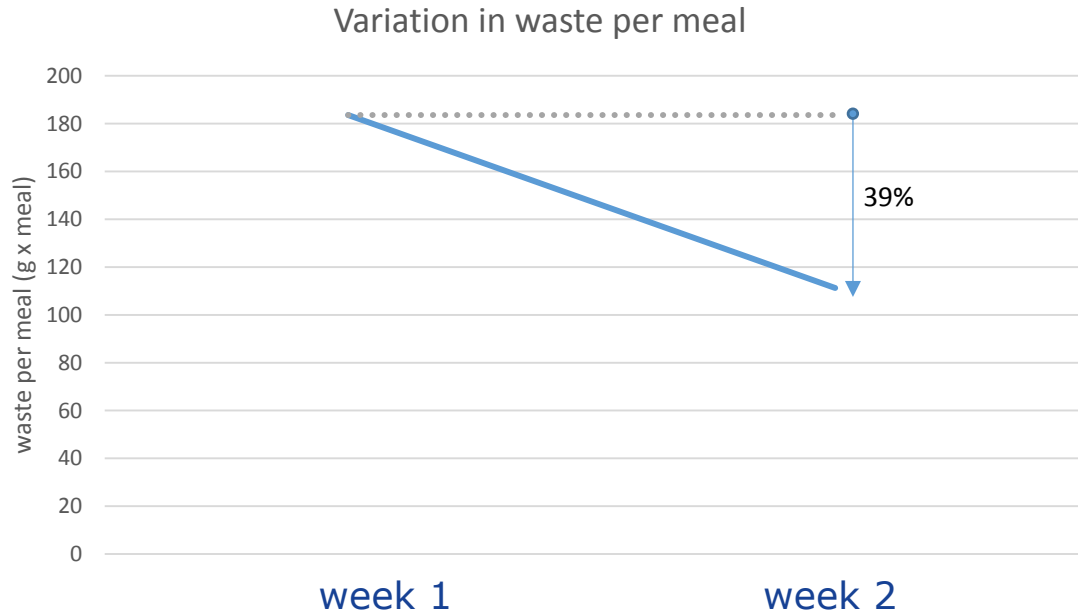
# Calculation of effectiveness and efficiency of a food waste prevention action: a practical example

Waste per meal reduction:

$$(184 - 111) / 184 * 100 = 39 \%$$

*Objective: to cut by 20% the FW per meal generated against current values*

Action effective



# Calculation of effectiveness and efficiency of a food waste prevention action: a practical example

Food waste prevented:

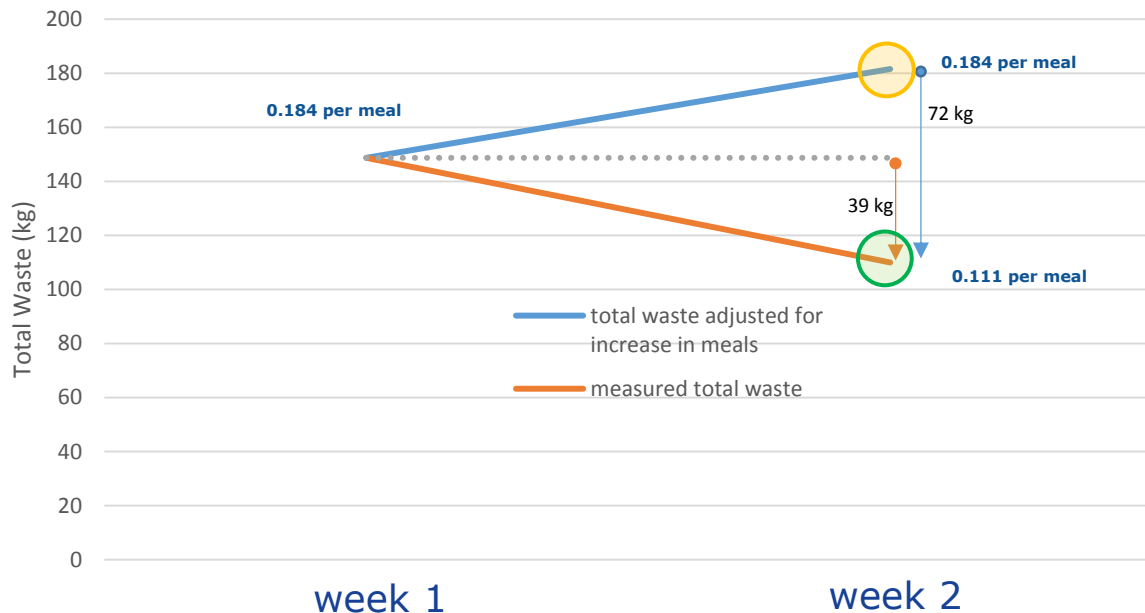
$$(0.184 - 0.111) \times 989 =$$

$$= 182 \text{ kg} - 110 \text{ kg} = 72 \text{ kg}$$

Food waste measured in week 2

Total food waste of week 2 if the waste per meal had not changed

Variation in total waste



# Calculation of effectiveness and efficiency of a food waste prevention action: a practical example

Food waste prevented:

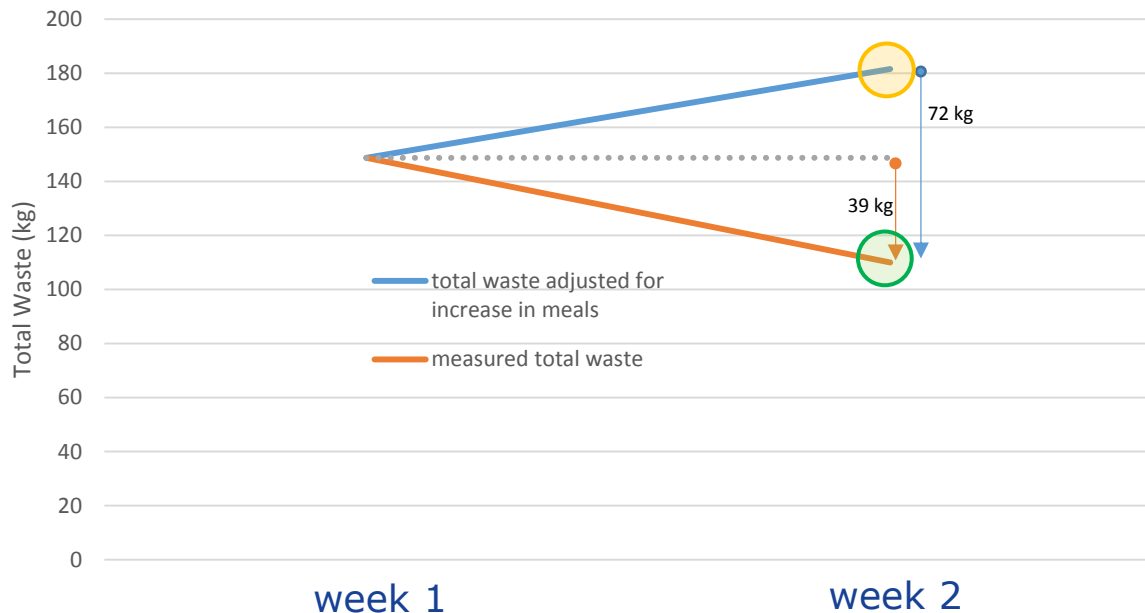
$$(0.184 - 0.111) \times 989 =$$
$$= 182 \text{ kg} - 110 \text{ kg} = 72 \text{ kg}$$

Cost of the action 100 €

Efficiency → 72 kg/100 € =

0.72 kg per euro

Variation in total waste



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YouTube: [EU Science Hub](https://www.youtube.com/EU_Science_Hub)

# References

WRAP (2018) Food and Drink material hierarchy. Available at:  
<http://www.wrap.org.uk/content/why-take-action-legalpolicy-case>

WRAP (2010) Improving the Performance of Waste Diversion Schemes: A Good Practice Guide to Monitoring and Evaluation

Manfredi & Cristobal (2016) Towards more sustainable management of European food waste: Methodological approach and numerical application. *Waste Management & Research*, 34(9), pp.957-968.

Notarnicola, B., Tassielli, G., Renzulli, P. A., Castellani, V., & Sala, S. (2017). Environmental impacts of food consumption in Europe. *Journal of Cleaner Production*, 140, 753–765.

Sinkko, T., Caldeira, C., Corrado, S., & Sala, S. (2019). Food consumption and wasted food. In Charis Galanakis (Ed.), *Saving food: Production, Supply Chain, Food Waste and Food Consumption* (in Press).

EC (2013a). Communication from the Commission to the European Parliament and the Council - Building the Single Market for Green Products - Facilitating better information on the environmental performance of products and organisations. COM(2013)196

EC (2013b). Recommendation 2013/179/EU on the use of common methods to measure and communicate the life cycle environmental performance of products and organisations, Annex III, OJ L 124, 4.5.2013, p. 1–210. Available at:<https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32013H0179>