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**IMPACT ASSESSMENT ON MEASURES ADDRESSING FOOD WASTE TO
COMPLETE SWD (2014) 207 REGARDING THE REVIEW OF EU WASTE
MANAGEMENT TARGETS**

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Introduction

The food sector in the EU has a significant economic value, comprising around 17 million holdings and enterprises (of which 82% are agricultural holdings), providing jobs to over 48 million Europeans (Eurostat, 2011). Together, all of the holdings/enterprises within the EU-27's food chain generated EUR 751 billion of added value - almost 6% of the EU Gross Domestic Product (Eurostat, 2011)¹.

While the production and consumption of food is essential to life, and plays a pivotal role in the economy, it (inherently) also has a major impact on the environment through its resource use and emissions. In their assessment of the environmental impacts of current methods of production and consumption the UNEP International Resource Panel concludes that agriculture and food consumption are the most important drivers of environmental pressure². The sector, as currently organised, is the leading cause of land-use change, habitat loss and subsequent biodiversity loss, and, when indirect impacts are accounted for, one of the main drivers of climate change, water pollution and soil degradation. Since food production relies heavily on natural resources and ecosystem services, there is a high risk that the lack of environmental sustainability within the food system will impact on the functioning of the system itself - such that the supply of healthy, affordable food will be affected, as will the ability of the food sector to provide secure jobs and to remain a competitive industry. And yet major potential resource efficiency gains can be seen within the food system - with large discrepancies seen between the efficiency of production of different agricultural systems³, and with a significant proportion of food produced for human consumption is wasted.

The aim of this initiative on 'sustainable food' will be to address part of this resource inefficiency by offering an action plan for tackling food waste, identified by the 2011 Roadmap to a Resource Efficient Europe as one of the areas of greatest potential for policy intervention in the short-term. This impact assessment will highlight the issue of food waste within the bigger picture of the sustainability of the food system as a whole, and assess what actions the Commission should take to tackle food waste specifically.

Box 1: What do we mean by a 'sustainable' food system?

There are many different views as to what constitutes a 'sustainable' food system, and what falls within the scope of the term 'sustainability'. The United Nations define 'sustainable development' as development that meets the needs of the present without compromising the ability of future generations to meet their own need, and consider that sustainable development is based on three components: economic development, social development and environmental protection.

Strictly speaking sustainability implies the use of resources at rates that do not exceed the capacity of the Earth to replace them. For food, a sustainable system might be seen as encompassing a range of issues such as security of the supply of food, health, safety, affordability, quality, a strong food industry in terms of jobs and growth and, at the same

¹ The European food and drink industry has a turn-over of about € 1 trillion and provides employment to 4.4 million people, predominantly in SMEs (FoodandDrinkEurope, 2011).

² http://www.unep.org/resourcepanel/Portals/24102/PDFs/PriorityProductsAndMaterials_Flyer_English.pdf

³ For example, the yields in west Europe for wheat are up to 9 tonnes per hectare, whereas in east Europe they are around 2-4 tonnes. (<http://www.economist.com/node/18200618>)

time, environmental sustainability, in terms of issues such as climate change, biodiversity, water and soil quality.

1. PROCEDURAL ISSUES AND CONSULTATION OF INTERESTED PARTIES

1.1. Procedural issues

An Impact Assessment Steering Group was established in May 2012 and has met more than ten times since then. The group includes AGRI, SANCO, CLIMA, MARE, CNECT, COMP, DEVCO, EAC, ECHO, ENER, EMPL, ENTR, JRC, JUST, MARKT, REGIO, RTD, SG, TRADE. (The timetable of actions for the development of this impact assessment is included in Annex 1 to this document.)

1.2. External expertise and consultation of interested parties

In its first phase of work, the Impact Assessment Steering Group has been evaluating the available evidence base of research on the sustainability of the food chain, and meeting with the authors of this research. (A list of relevant experts and background reports that have so far provided input into the IA process is included at the end of Annex 3 to this document.)

In addition to discussion with these technical experts, other key stakeholder groups have been approached including: The European Food SCP Roundtable (DG ENV); the High Level Forum of a Better Functioning Food Supply Chain (DG ENTR); The Working Group on Food Losses & Food Waste under the Advisory Group on the Food Chain (DG SANCO); and various advisory groups managed by DG AGRI.

A public consultation was launched in July 2013 via the EUROPA website in order to gather comments and suggestions from stakeholders. Over 630 responses were received, including more than 80 business associations, such as retailer, manufacturers and producers, more than 60 NGOs and more than 350 citizens. Response spanned all EU Member States as well as many other countries and globally representative associations. A summary of the responses to the public consultation is included in Annex 2 to this document.

Three analyses of particular relevance have been made by the Commission:

- DG ENV has completed a comprehensive background study entitled "The Sustainability of the Food Chain - an appraisal of the European food cycle with respect to resource use and emissions to the environment". The analysis of the existing EU policy framework analysed a number of areas where additional policy responses might be needed as well as considering the need for a 'systemic' approach to resource efficiency in the food cycle. The study concludes that *"When considering improvement potentials, system-level innovation could provide the greatest benefits, such as shifts in dietary patterns, avoiding waste, and closing of resource cycles"*⁴.
- The 'EU Standing Committee on Agricultural Research' has published its foresight report *'Sustainable food consumption and production in a resource constrained world'*⁵, that highlights the need for a coordinated approach on food and states among the top priorities "the urgent need to take planetary boundaries seriously", "to address both food consumption and production" and "to explore new ways of policy

⁴ http://ec.europa.eu/environment/eussd/pdf/foodcycle_Final%20report_Dec%202012.pdf

⁵ http://ec.europa.eu/research/agriculture/scar/pdf/scar_feg3_final_report_01_02_2011.pdf

coordination." Coherence between food, energy, environmental and health policies and across all levels of governance are prerequisites for a timely transition to a sustainable and equitable food systems. A new reality of governance is needed at local, national and global level (SCAR, 2011).

- A study on the key causes of food waste in all sectors across the EU and established a baseline of food waste data in 2013, in the *Preparatory Study on Food Waste across EU* 27.⁶

The FUSIONS project (Food Use for Social Innovation by Optimising Waste Prevention Strategies) has also provided useful input on food waste. It is a project about working towards a "more resource efficient Europe by significantly reducing food waste." It will run for 4 years, from 2012 to 2016 and is funded by the European Commission Framework Programme No.7. Key experts from this project have been consulted in a dedicated workshop, specifically on food waste aspects for this impact assessment.

2. POLICY CONTEXT, PROBLEM DEFINITION AND SUBSIDIARITY

2.1. Policy context and mandate

Mandate

The overarching mandate for this work is the **Europe 2020 Strategy** - A resource-efficient Europe⁷ - that calls for an increase in resource efficiency, to "...find new ways to reduce inputs, minimise waste, improve management of resource stocks, change consumption patterns, optimise production processes, management and business methods, and improve logistics."

The **Roadmap to a Resource Efficient Europe**⁸ follows up on this, and stresses that our natural resource base is being eroded by growing global demand, **highlighting the food sector** as priority area for taking action - calling for "...incentives for healthier and more sustainable production and consumption of food and to halve the disposal of edible food losses in the EU by 2020." The Roadmap states that the Commission will assess how best to limit waste throughout the food supply chain, and consider ways to lower the environmental impact of food production and consumption patterns. The 2011 **European Parliament Resolution** "on how to avoid food wastage: strategies for a more efficient food chain in the EU" also strongly supports action in this area.⁹

The **7th Environmental Action Programme**¹⁰ states that the Commission will: "...set a framework for action to improve resource efficiency aspects beyond GHG emissions and energy, targets for reducing the overall lifecycle environmental impact of consumption will be set, in particular in the food, housing and mobility sectors" and that "The Commission should present a comprehensive strategy to combat unnecessary food waste and work with Member States in the

⁶ http://ec.europa.eu/environment/eussd/pdf/bio_foodwaste_report.pdf

⁷ http://ec.europa.eu/resource-efficient-europe/pdf/resource_efficient_europe_en.pdf

⁸ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:DKEY=615217:EN:NOT>

⁹ <http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+REPORT+A7-2011-0430+0+DOC+XML+V0//EN>

¹⁰ http://www.cc.cec/dgintranet/env/newsfeeds/2013-10-31_7EAP.pdf

fight against excessive food waste generation. Measures to increase composting and anaerobic digestion of discarded food, as appropriate, would be helpful in this regard. "

Context

There are many EU policies that relate directly or indirectly to the food system, but few to food waste prevention.¹¹ In relation to the food system in general, two key policies currently in place are the Common Agricultural and Fisheries Policies, which deal with environmental issues and have recently been reformed. Other important policies that regulate environmental aspects of food production are the Water and Nitrates Directives.¹² Proposals are about to be adopted for seeds, plant and animal health. For pesticides and biocides new regulations have recently been installed. Examples of policies that are indirectly related are those on biodiversity, climate change, bio-energy (because of direct and indirect land use change), transport and trade. On the demand side, the General Food Law¹³ and food safety policies, EU legislation on food labelling¹⁴ and Food-based Dietary Guidelines (FBDG)¹⁵ are also relevant.

Related to food waste, the Waste Framework Directive calls for Member States to implement and monitor waste prevention programmes, however no specific actions on food are foreseen.

2.2. Main problem

The production and consumption of food is essential to life and plays a pivotal role in society and the global economy. Food production depends on natural resources (e.g. water, land, nutrients) and ecosystem services (e.g. biodiversity, climate). However, almost all recent meta-analyses lead to the conclusion that the resource management in the food system is currently unsustainable, depleting the natural resources and undermining the ecosystem services on which it depends.¹⁶

In their assessment of the environmental impacts of production and consumption the UNEP International Resource Panel concludes that agriculture and food consumption are among the most important drivers of environmental pressure¹⁷. The sector is one of the leading causes of land-use change (and subsequent biodiversity loss), climate change, water scarcity/pollution and soil degradation, particularly when indirect impacts are accounted for as well.

Global demand for food is predicted to increase, but at the same time globally hundreds of millions of people worldwide are going hungry.¹⁸

¹¹ See Annex 3, part C.

¹² <http://ec.europa.eu/environment/water/water-framework/>;
<http://ec.europa.eu/environment/water/water-nitrates/>

¹³ The food law aims at ensuring a high level of protection of human life and health, taking into account the protection of animal health and welfare, plant health and the environment. This integrated "farm to fork" approach is now considered a general principle for EU food safety policy.

¹⁴ Directive 2000/13/EC on labelling, presentation and advertising of foods. In general nutrition labelling is governed by Council Directive 90/496/EEC, as amended by Commission Directives 2003/120/EC and 2008/100/EC.

¹⁵ Food-based dietary guidelines (FBDG) are simple messages on healthy eating, aimed at the general public. They give an indication of what a person should be eating in terms of foods rather than nutrients, and provide a basic framework to use when planning meals or daily menus (Eufic, 2012). The majority of European countries have some form of FBDG.

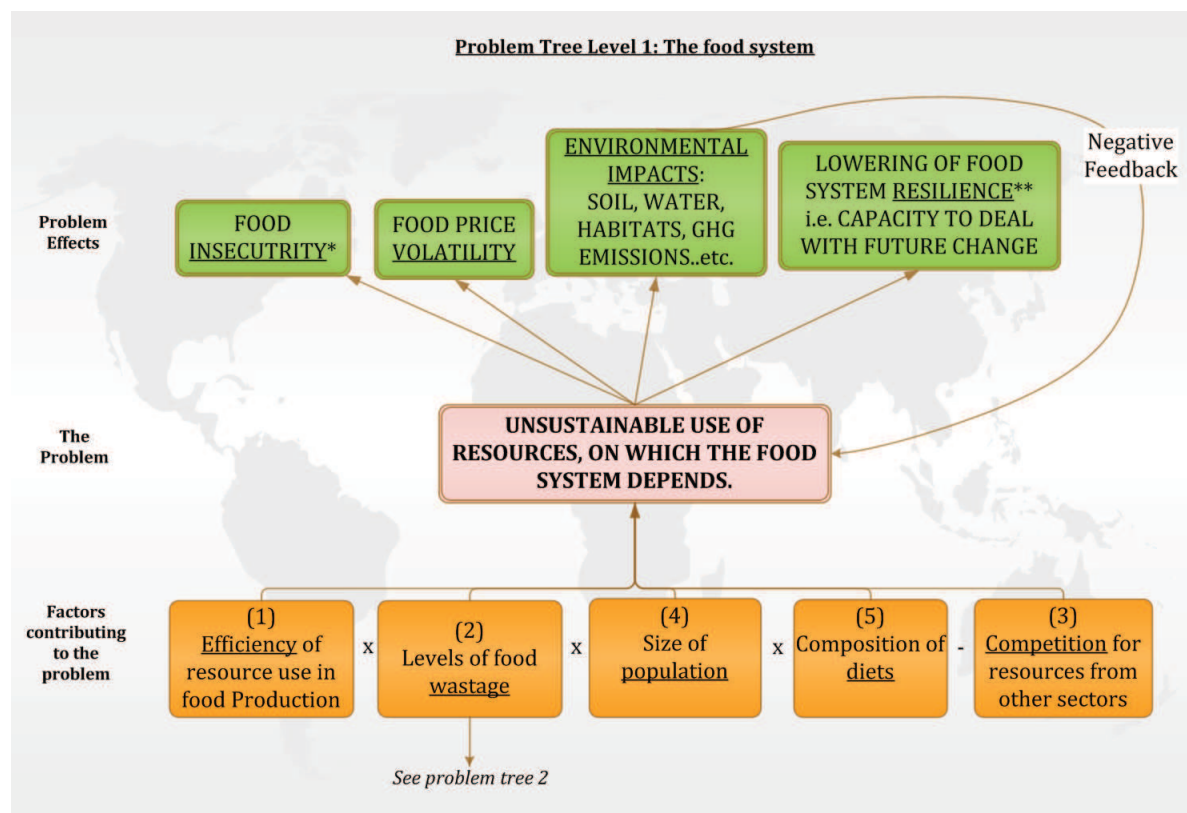
¹⁶ The leading advisory committee on the future of agriculture, made up of experts from EU Member States, (The EU Standing Committee on Agriculture Research (SCAR)) concluded in their latest report that: "*Many of today's food production systems compromise the capacity of Earth to produce food in the future.*"

¹⁷ http://www.rona.unep.org/documents/partnerships/SCP/Assessment_of_Env._Impact_of_SCP_on_Priority_Products.pdf

¹⁸ <http://www.fao.org/publications/sofi/en/>

The diagram below provides a summary problem tree for the wider food system:

Diagram 1: Problem tree for the whole food system



* Food security «when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life » (FAO)

**Resilience: the capacity of a system to absorb disturbance and reorganize while undergoing change, so as to still retain essentially the same function, structure, identity and feedbacks

Based on an assessment of this problem presented in the Roadmap to a Resource Efficient Europe, food waste has been identified as one of the greatest sources of inefficiency in the food system - a type of inefficiency representing up to 30% of all food produced¹⁹ (although this is not known with any certainty and could be as high as 50%.²⁰).

Given the scale of the total impacts of food production and consumption, food waste can be seen to be a major factor in terms of global resource use and global environmental concerns. For example, based on the 30% estimate, globally it may represent around 3-5% of total global warming impacts alone, more than 20% biodiversity pressure and close to 30% of all of the world's agricultural land.

It is also relatively easy to measure and, for the 'quick wins', relatively cheap and easy to tackle. (It is often cheaper to prevent food waste than to manage the waste that it produced. See later in this assessment for details.)

In general a reduction of food waste will lead to a reduction in demand, because less food will be needed to achieve the same objective (i.e. supplying food) than before. This means that

¹⁹ <http://www.fao.org/docrep/018/i3347e/i3347e.pdf>

²⁰ <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2935112/>

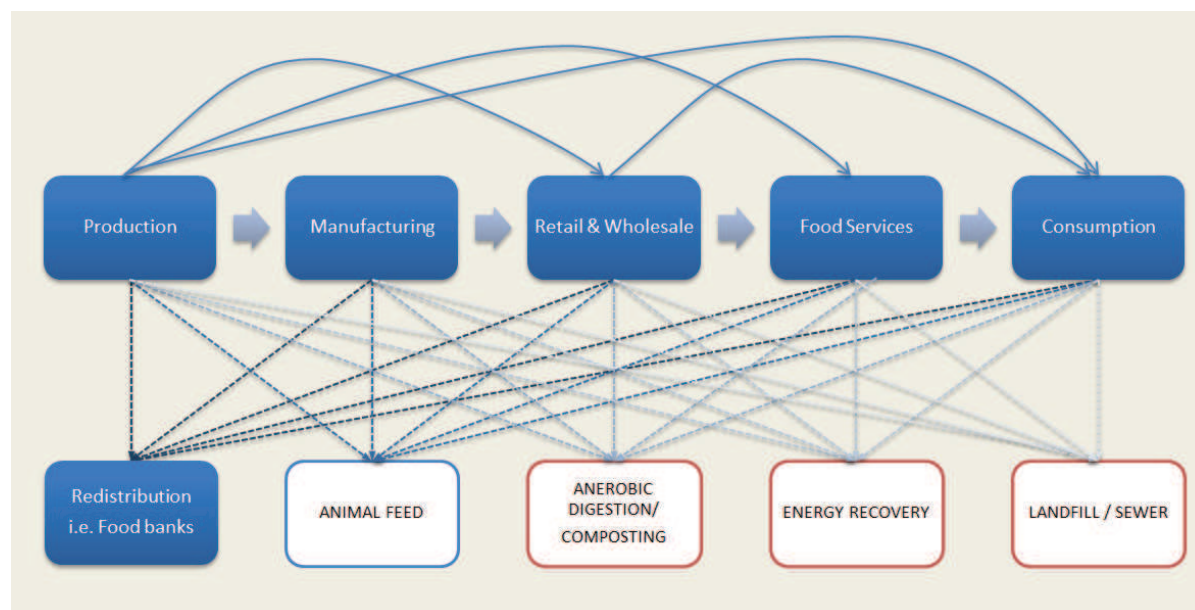
when food is wasted there is effectively over production taking place, without meeting the objectives of providing affordable, quality food for people. (A strong parallel can be drawn with to energy inefficiency, which is why energy efficiency measures, such as insulating homes, is a policy goal.)

There are currently very few policies looking at food waste prevention, and very little nationally driven activity in Member States. This is an agreed area for the Commission to look into, as set out in the Roadmap, 7th EAP and the European Parliament resolution.

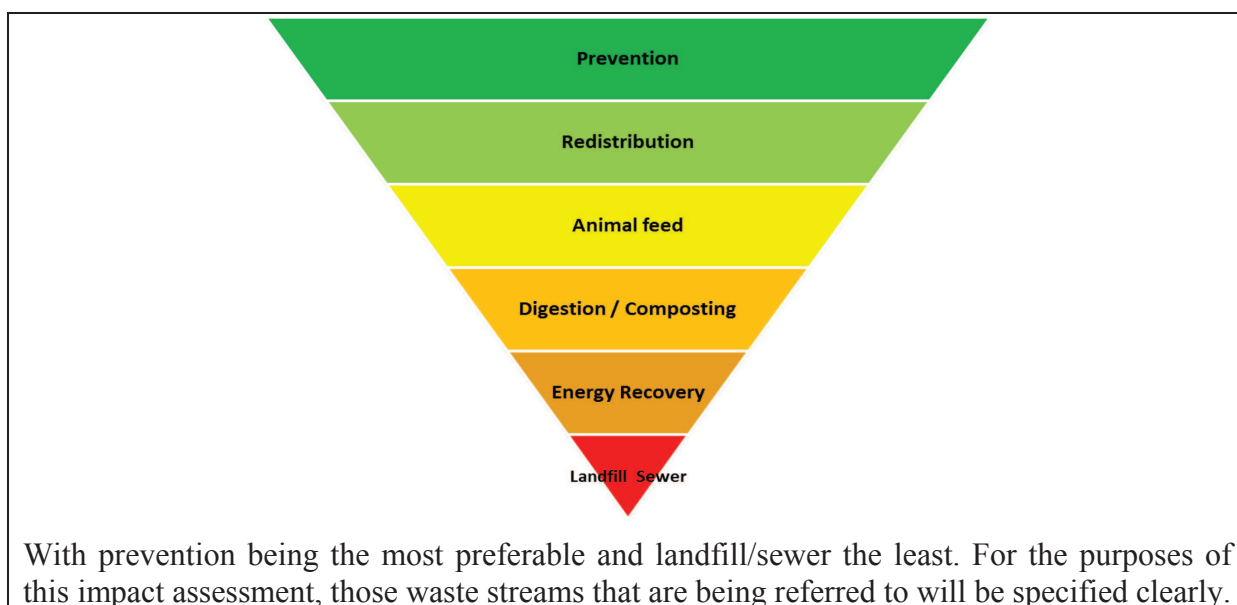
A more detailed analysis of the problem of food system sustainability is included in **Annex 3** to this document.

Box 2: Note on food waste definitions

There are many different definitions of food waste that can lead to confusion. In some cases reference is made to 'edible' and/or 'non-edible' food, in others, 'avoidable' and/or 'unavoidable'. Sometimes reference is made only to household, consumer waste, in others food service, processing, manufacturing and the production stage are included. Definitions also vary in relation to where food ends up: with food going to food banks or animal feed, sometimes classified as waste, sometimes not. It is also very specific to the characteristics of particular food product types. Rather than thinking of a very specific and fixed 'top down' definition of food waste, it is more realistic and productive to consider resource flows along the food chain - and the points at which food can be lost or wasted - and put this into an order of preference or a 'food waste hierarchy'. Below is a diagram showing the food chain and highlighting that at each stage food can be lost or wasted.



The food waste hierarchy looks like this:



The main problem to be addressed by this impact assessment is that there is excessive food waste²¹ generated throughout the EU food chain. (i.e. all along the food chain, from production to consumption.)

Based on data from Eurostat and national data, it is estimated that around 89 million tonnes or 179 kg per person of food waste was generated in the EU-27 in 2006, of which 42% was from households, 39% from manufacturing and the rest from other sources including retailers, wholesale and the food service sector. This calculation, however, excludes agricultural food waste, which may amount to a similar volume to that of households but cannot be readily defined.²²

According to UK estimates, over a quarter of avoidable food waste at the consumer stage is thrown away still in its original packaging²³ and the total annual financial loss per household is approximately €560.²⁴ In 2013, food waste across EU-27 was estimated from 2006 data to have increased to around 100 million tonnes (although no primary data for 2013 are yet available).

The chart below shows the percentage breakdown of EU27 food waste by Manufacturing, Households, Wholesale/Retail, and Food Service/Catering sectors.

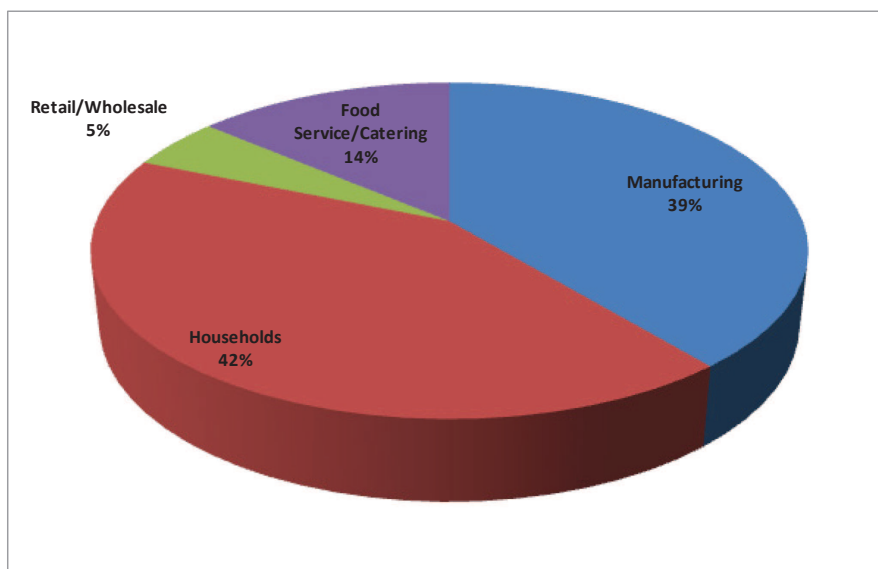
²¹ Food waste is composed of raw or cooked food materials and includes food loss before, during or after meal preparation in the household, as well as food discarded in the process of manufacturing, distribution, retail and food service activities. It comprises materials such as vegetable peelings, meat trimmings, and spoiled or excess ingredients or prepared food as well as bones, carcasses and organs (BIO Intelligence, 2010).

²² <http://ec.europa.eu/environment/eussd/reports.htm>

²³ WRAP (2008) The Food We Waste

²⁴ WRAP (2009) Household Food and Drink Waste in the UK. Report prepared by WRAP.

Chart 1: Breakdown of food waste in the EU (2006)



Source: 2006 EUROSTAT data + national data

Not accounting for agricultural losses, (for which no detailed data is yet available in the EU, only generic data) households produce the largest fraction of EU food waste among the four sectors considered, at about 42% of the total or about 38Mt, an average of about 76kg per capita.²⁵ Manufacturing food waste was estimated at almost 35 Mt per year in the EU27 (70kg per capita). Food which ends up as being discarded by households represents 25% of food purchased by householders (by weight), according to studies completed by WRAP.

The table below shows the total levels of food waste by Member State and by sector, estimated in 2006, in kg. (Other sectors represents food service and retail together.)

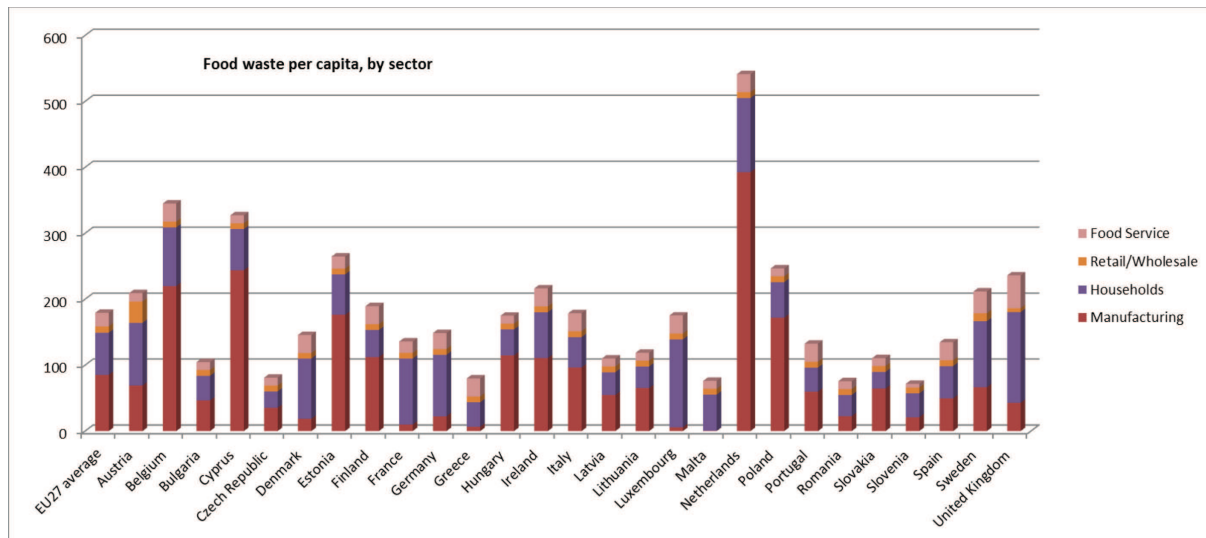
²⁵ This is probably an over-estimate as it may include by-products. The graph shows some unexpected variation for this sector across EU27

Table 1: Total food waste by Member State and by sector

	Manufacturing	Households	Other sectors	Total
EU27	34 755 711	37 701 761	16 820 000	89 277 472
Austria	570 544	784 570	502 000	1 858 000
Belgium	2 311 847	934 760	945 000	4 192 000
Bulgaria	358 687	288 315	27 000	674 000
Cyprus	186 917	47 819	21 000	256 000
Czech Republic	361 813	254 124	113 000	729 000
Denmark	101 646	494 914	45 000	642 000
Estonia	237 257	82 236	36 000	355 000
Finland	590 442	214 796	208 000	1 013 000
France	626 000	6 322 944	2 129 000	9 078 000
Germany	1 848 881	7 676 471	862 000	10 387 000
Greece	73 081	412 758	2 000	488 000
Hungary	1 157 419	394 952	306 000	1 858 000
Ireland	465 945	292 326	293 000	1 051 000
Italy	5 662 838	2 706 793	408 000	8 778 000
Latvia	125 635	78 983	11 000	216 000
Lithuania	222 205	111 160	248 000	581 000
Luxembourg	2 665	62 538	31 000	97 000
Malta	271	22 115	3 000	25 000
Netherlands	6 412 330	1 837 599	1 206 000	9 456 000
Poland	6 566 060	2 049 844	356 000	8 972 000
Portugal	632 395	385 063	374 000	1 391 000
Romania	487 751	696 794	1 089 000	2 274 000
Slovakia	347 773	135 854	105 000	589 000
Slovenia	42 072	72 481	65 000	179 000
Spain	2 170 910	2 136 551	3 388 000	7 696 000
Sweden	601 327	905 000	547 000	2 053 000
United Kingdom	2 591 000	8 300 000	3 500 000	14 391 000

If this data is looked at per capita, it can be seen that the levels of food waste vary significantly across Member States. Below is the per capita data broken down by sector:

Graph 1: Food waste in the EU per capita (2006 data)



What are the main reasons explaining the wide divergence of per capita food waste across Member States?

There are a number of factors contributing to the broad differences that can be seen in the per capita food waste figures:

- Household waste is linked to affluence. In general, higher levels of food waste are seen at the consumer level, when food spending forms a lower proportion of disposable income.
- Cultural differences may also play a part. (for example factors such as the extent to which populations dine out or eat at home)
- In relation to manufacturing waste levels per capita, obviously the size of manufacturing base of each country in relation to the population affects this number.

Other inconsistencies relate to how and when food waste has been measured:

- Different definitions i.e. sectors/disposal routes covered – for example: sewage waste is sometime covered in figures, and is sometimes not; by-products within manufacturing are sometimes considered as ‘food waste’, and sometimes not;

***Note:** The very high levels of manufacturing waste seen for the Netherlands coming from this 2006 research have very recently been corrected and are significantly lower than shown in the diagram (by a factor of 3.5 to 6)²⁶*

- Different measurement methods in different Member States;
- Differing dates of research underpinning the data;

²⁶ NL Food Waste Monitor - Mid-term report p.6 <https://www.wageningenur.nl/en/Dossiers/file/Dossier-Food-waste.htm>

It should be noted, that in general those Member States for which more detailed data on food waste has been collected, tend to show higher levels, and where more basic estimates have been made, lower figures have resulted, so when a unified data set is collected, the variations may be smaller than shown above.²⁷

Impacts of food waste

Food products have embedded environmental impacts because of the energy, natural resources used and associated emissions generated throughout their life cycle.^{28,29} When food is discarded, all of the embodied energy and resources, as well as related environmental impacts such as GHG emissions, are effectively wasted. When food wastage occurs at a given phase of the food supply chain, three types of impacts must be considered:

- Impacts associated with the end-of-life of the waste;
- Impacts of the food in the phase of the food chain at which the waste occurred;
- Impacts of the previous phases.

So each phase of the life cycle adds its own environmental impacts. Therefore, **the impact of food waste accumulates along the food chain, as does the added value and the economic losses that accrue**. In other words, the later a food product is lost along the chain, the higher is the ‘environmental cost’: food processed, transported and cooked that is then wasted at home has a higher impact per kg than unprocessed food products lost at the farm.

At European level, the overall CO₂ equivalents attributable to food waste is at least 170 Mt. emitted per year (close to the total greenhouse gas emissions of Romania or of the Netherlands in 2008, and approximately 3% of total EU27 emissions in 2008³⁰). (This figure includes all steps of the life cycle of food waste, namely agricultural steps, food processing, transportation, storage, consumption steps and end-of-life impacts.)

²⁷ All the details of how these estimates were made can be found here: http://ec.europa.eu/environment/eussd/pdf/bio_foodwaste_report.pdf

²⁸ European Commission (2006) Environmental Impact of Products (EIPRO): Analysis of the life cycle environmental impacts related to the final consumption of the EU-25.

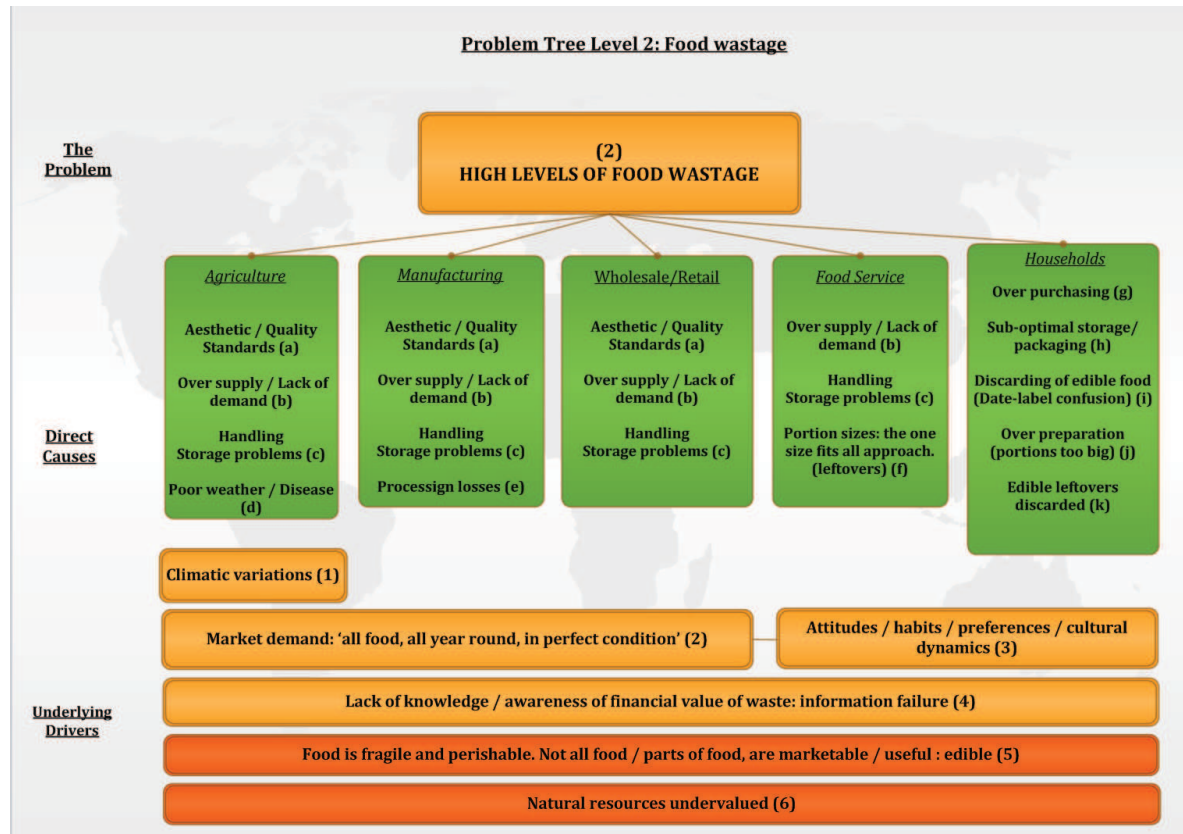
²⁹ UNEP (2010) Assessing the environmental impacts of consumption and production: priority products and materials. A Report of the Working Group on the Environmental Impacts of Products and Materials to the International Panel for Sustainable Resource Management.

³⁰ EUROSTAT data

Drivers of food waste in the EU

The diagram below illustrates the most important direct, and underlying, causes of food waste in the EU.

Diagram 2: Problem tree for EU food waste



As can be seen, there are a wide diversity of potential causes of food wastage:

- In the **agriculture (production) sector**, natural, unpredictable climatic variations may lead to food wastage, when crops are spoiled. Overproduction may also lead to waste on farm if there is a lack of demand for produce. Waste is also generated as a result of strict quality/size standards imposed by the market. Handling and storage damage and losses are also important at this stage.
- The **manufacturing (processing) sector**, shares some similar food wastage causes to the production side, where lack of market demand or poor demand forecasting can lead to overproduction, and where, in relation to fruit and vegetables in particular, there may be no market for misshapen or 'wrongly' sized products. Damage caused by poor product handling and technical malfunctions during manufacturing processes are also causes of food waste. Some food by-products from manufacturing (processing losses) may also end up as food waste if they are sent to landfill, energy recovery or digestion, although they can also be processed into animal feed or used for industrial processes.
- In the **wholesale/retail sector** stock management related issues are the key cause of food waste, particularly in relation to shorter shelf-life products, with

difficulties anticipating demand resulting in overstocking. This is linked to storage issues, with meat and dairy products particularly vulnerable to temperature changes during transportation and storage, risking premature spoilage and impacting food safety.

- In the **food service sector** similar logistical issues can cause food waste, with difficulty anticipating number of clients leads to overstocking or cooking of surplus food. In addition portion sizes and the 'one size fits all' approach have been identified as a significant cause of food waste within this sector. In relation to left-overs, the practice of taking leftovers home from restaurants is not widely accepted across Europe.
- In the **Household sector** the causes of food waste can be seen to fall into all the phases of food management, from planning and buying, to storage, preparation and use. Buy unwanted food, too much food, which is then incorrectly stored or cannot keep long enough even when correctly stored. These whole food items are then discarded. In addition, significant numbers of whole food items are discarded even though they are still edible, due to misunderstanding of date labelling. At the preparation stage, too much food is a common cause of food waste, as this food is often discarded, rather than being stored and consumed later.

Underlying these causes are a number of common drivers:

- A lack of detailed data and a subsequent lack of knowledge and awareness on levels and impacts of food waste.

*This is predominantly a driver of food waste in the **food service** and **household** sectors – although it may occur anywhere along the food supply chain. (in production, manufacturing and retail, food waste accounting tends to more advanced.)*

In the household sector the lack of awareness of the quantity of food waste generated individually seems to be a significant driver, along with the financial benefits of using purchased food more efficiently, and to a lesser extent, the environmental problem that food waste presents. There is also lack of knowledge on how to use food efficiently, e.g. making the most of leftovers, cooking with available ingredients. Preferences also play a role, with many (often nutritious) parts of food being discarded due to personal taste: apple skins, potato skins, bread crusts for example, and issues such as 'making too much food' hence leading to uneaten leftovers, as well as knowledge of how large portions of food need to be. The extent to which this driver is apparent in different Member States varies, (and is linked to the point below on the cultural aspects of food waste) with those Member States with lower GDP in general wasting significantly less food per capita. (See graph 1 in section 2.2 and Annex 10 section 2 on the relationship between food waste and disposable income for more details)

- A food market dedicated to providing a wide range of high quality food all year round.

This driver is a leading cause of food waste in production and manufacture, and retail. In the former two sectors the requirement for 'perfect' food means significant volumes of misshapen, under- or over-sized, or miss coloured food never reach the shelves. In retail, a full range of food is often expected to be on

display at all times of day, and all year – even if it is highly likely that the food will perish before it is sold. (e.g. bakery products, fresh meat and fish counters fully stocked-up even just before closing time. Much of this food cannot maintain its quality overnight, and is subsequently discarded.) While food waste levels per capita in manufacturing vary significantly across Member States (due to the wide variations in size and type of food manufacturing that take place), levels of food waste estimated in retail are more consistent across Member States.³¹

- A culture in which food is relatively inexpensive, and is given a low value.

The low cost of food relative to other goods, and relative to disposable income (averaging less than 10% in Europe now compared to more than 30% in the middle of last century) is a driver of food waste, particularly in the food service and household sectors, as there are lower financial incentives not to waste food. (Buying more 'just in case' for convenience is an option when food is relatively cheap, and when food is generally seen as abundant and always available). At the same time the lower cost of food production, that stems from historical advances in agricultural techniques and technology, is an underlying driver linked to all others. e.g. enabling misshapen, leftover food to be thrown away without significant financial loss.

- Underpinning all these drivers, *operating in all sectors in all Member States*, is the fact that food is by its nature perishable and fragile, and that the natural resources supporting the food system are not valued in accordance with their limitations.³²

A more detailed outline of the causes and drivers of food waste is included in **Annex 4** to this document.

While this impact assessment is focusing on options for reducing food waste in the EU, many of the environmental, economic and social impacts of food waste have a global perspective. (For example in relation to issues such as food price volatility, critical raw materials or climate change). The actions taken at EU level and how they relate to, or influence, those taken in other parts of the world also need to be considered. Lessons can also be learned from the global waste picture that could help with assessing the EU situation.

A global perspective on the problem and causes of food waste is presented in **Annex 5** to this document.

2.3. How will the problem develop?

The Commission's 2010 food waste study estimated that without additional prevention policies food waste could be expected to rise in Europe as high as 126 million tonnes by 2020, representing an additional 40% on top of the baseline 2006 figures. (Full details of how this calculation was derived are presented in Annex 10.) This calculation was based on anticipated EU population growth and increasing affluence, using EUROSTAT statistical trends. It has been observed that when the proportion of disposable income spent on food decreases, food

³¹ See [Evolution of \(Bio-\) Waste Generation/Prevention and \(Bio-\) Waste Prevention Indicators Report 2011](#), Annex 1 page 304

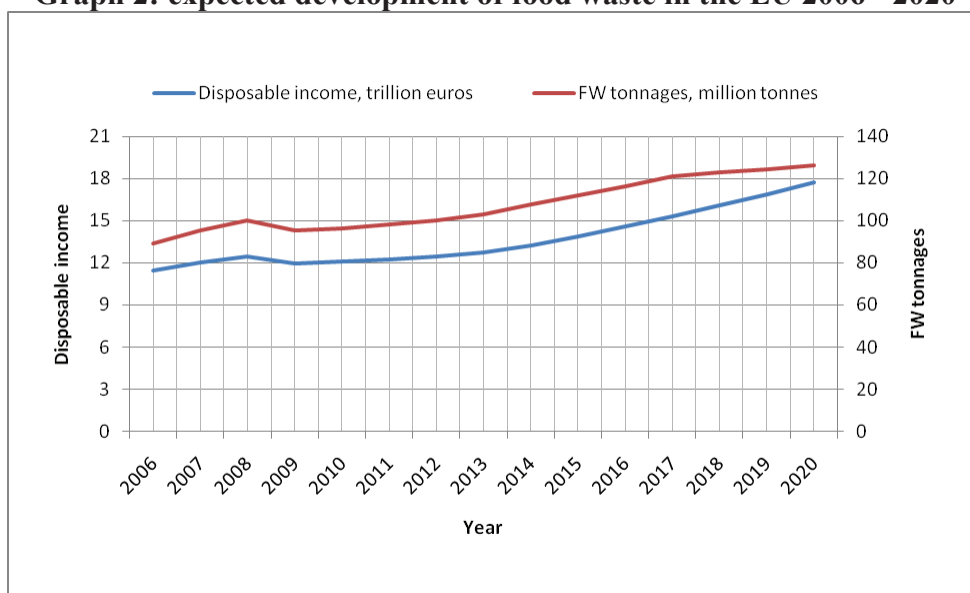
³² See the Roadmap to a Resource Efficient Europe for more details on the pricing of natural capital

waste increases, up to a certain point. The methodology incorporates differential growth in food waste for EU12 and EU15. The figure below shows the expected development of food waste in the EU up to 2020, along with the raw data (that may be useful for understanding some of the figures later in the impact assessment).

Table 2: Expected development of food waste in EU

Year	Tonnage
2006	89
2007	96.5
2008	100
2009	95.2
2010	96.1
2011	98.1
2012	99.95
2013	103
2014	107.5
2015	111.9
2016	116.4
2017	121.1
2018	122.8
2019	124.4
2020	126.2

Graph 2: expected development of food waste in the EU 2006 - 2020



This development in food waste takes into account the continued implementation of current EU waste policy. Those waste policies that relate to food waste are summarised in the box below.

Box 3: Waste policies relating to food waste

- **Waste Framework Directive 2008/98/EC:** Continuation of the principles and policies outlined in the Waste Framework Directive, the new recycling targets set for 2020, the strengthened provisions on waste prevention through an obligation for MS to develop national waste prevention programmes and a commitment from the EC to report on prevention and set waste

prevention objectives, the establishment of a five-step hierarchy of waste management options and the clarification of definitions such as recycling, recovery and waste, as well as a delimitation between waste and by-products and end-of-life criteria. This also includes the application of Article 22 of the Directive which encourages the separate collection and treatment of bio-waste.

- **Landfill Directive 1999/31/EC:** Continued application of the Biodegradable waste diversion targets, which oblige MS to reduce the amount of biodegradable waste (BMW) in landfill by 65% by 2016 compared to 1995 levels. As of 2006, MS were restricted to landfilling a maximum of 75% of the total amount by weight of BMW produced in 1995, a target which increased to 50% in 2009 and will increase to 35% in 2016. However, the Landfill Directive does not submit countries to binding specifications on methods for disposing of BMW not sent to landfills, a situation which has led, and will most likely continue to lead most MS to opt for incineration.
- **Thematic Strategy on the Prevention and Recycling of Waste:** Continued reference to guidance document on reducing waste and its environmental impacts throughout the product lifecycle.
- **Green paper on bio-waste management in the EU:** Ongoing reference to this analysis report, published in December 2008, which examines the necessity of a stand-alone EU Bio-waste Directive.

EU waste policy does not tackle food waste generation

It is important to note that these policies primarily deal with food waste *treatment*, and while they aim to divert food waste from landfill, to other treatment streams, **they do not tackle the bigger issue of food waste generation**. There is though a recognition of and encouragement of waste prevention most notably in the Waste Framework Directive.

So while waste policy has a considerable impact on the treatment of food waste once it has been generated - forecasts suggest that by 2020 the amount of food waste sent to landfill will decrease from about 40.5 million tonnes to about 4.0 million tonnes in compliance with policy – it does little to tackle the fact that this leaves an estimated 122 million tonnes of food waste across the EU27 by 2020 still to manage via other residual treatment technologies.

Without successful long-term pan-EU waste prevention activities achieving notable behaviour change in the way people buy and use food, the treatment capacity required to handle food waste will need to increase by more than a factor of two. The challenge this poses for raising capital, securing permission to build and planning (or extending existing facilities) will be considerable.

How will Current waste prevention activities in the EU affect the evolution of the problem?

It is difficult to say precisely. In a small number of Member States wide-ranging food waste prevention campaigns are underway. In a handful of others there are a number of much smaller scale, diffuse and recently established food waste prevention activities taking place. In the majority however, no targeted food waste prevention activity is taking place.

Of those activities in place, they fall into the following categories:

- ➔ **awareness campaigns**
- ➔ **informational tools** (e.g. sector specific prevention guidelines and handbooks)
- ➔ **training programmes** (e.g. food service staff prevention skills, waste-free cooking workshops for consumers)
- ➔ **logistical improvements** (e.g. stock management improvements and more accurate demand forecasting for retailers, reservation requirements for cafeterias, ordering flexibility in hospitals)
- ➔ **waste measurement activity** (e.g. hands-on quantification and composition analysis of food waste by households, restaurants or schools)
- ➔ **research/development/innovation** (development of new sector/product specific prevention methodologies, such as Time Temperature Indicators)
- ➔ **regulatory measures** (such as separate collection of food waste requirements in Ireland and the Zero Waste Regulations in Scotland)
- ➔ **food redistribution programmes** (diverting otherwise discarded food to charitable groups)
- ➔ **development of industrial uses** - turning food waste into by-products for other purposes (such as the production of fish chips from manufacturing sector fish waste, or gelatin production from pork skins, bones etc.)

Very few of these initiatives have shown any quantifiable results yet, underlining the early stage of development of food waste prevention activity. In addition most are on such a small scale that they are clearly not going to have large-scale national results at the scale required to significantly reduce food waste at the EU level. Of those that have had measured results, however, significant food waste reduction potential has been seen, so and it might be plausible that the current activities, if they were to grow over time, will have some impact, even without any additional future intervention at EU level.

The UK stands out as the only Member State that has run a coordinated food waste prevention campaign covering a wide range of those action areas outlined above, and that have measured the results before and after these activities in a systematic and comparable way. They have estimated that their food waste activities have led to a reduction of food waste in households of 15% from 2007 to 2012. In manufacturing & retail they have seen a 7.4% reduction in food & packaging waste over 3 years from 2009 to 2012. The UK are, therefore, the most advanced in their food waste prevention work by some margin, and while a number of other Member States are beginning similar activities, none have been running long enough to provide quantified results yet. All are being undertaken with smaller budgets than that of the UK.

The Commission are also supporting Member States in their efforts to reduce food waste by:

- Continuing to provide platforms for the sharing of best practice, both web based and via Member State and stakeholder meetings.
- Through funding via FP7 of the FUSIONS project – establishing definitions, measurement methods, best practice and waste prevention proposals.

- Publishing guidance for Member States on how to prepare food waste prevention strategies. (which is currently being followed up by UNEP – that will soon launch an updated comprehensive tool-kit for preparing and delivering waste prevention initiatives.)
- By looking at clarification of 'date labelling' (including the possible reduction in the number of products requiring use by dates and the extension of date times.)
- Looking for clarification of VAT rules in relation to food redistribution.
- By making €9 million of Horizon 2020 money available for food waste research.

It should be stressed however, that these Commission actions, while important, are not going to have a significant impact on food waste levels on their own. They are support/enabling actions that go together with strategic approaches that will measure, target awareness, and support food waste prevention along the food supply chain. These strategies need to be developed, and implemented at Member State level. Such strategies are currently very much in the minority.

Annex 6 – provides details of the types of food waste measures that can be taken in different sectors and their indicative costs

Annex 7 provides more details on food waste prevention initiatives underway.

A summary table of the estimated levels and impacts of food waste is presented below. The value of this food waste rises from €180 billion in 2006 (89M tonnes) to more than €260 billion (126m tonnes) by 2020.

Box 3: Summary of food waste levels / impact**EU***

<u>2006</u>	<u>2013</u>	<u>2020</u>
89 Mt food waste	100 Mt food waste	126 Mt food waste
Value €180 billion	Value €200 billion	Value €260 billion
170 Mt CO ² equivalents**	190Mt CO ² equivalents	240 Mt CO ² equivalents

Global**2013**

1.3 Gt food waste
3.3 Gt CO² equivalents
250 km³ water footprint
Using 1.4 Billion hectares of land
= 30% of all world agricultural land.

*EU figures do not include agricultural losses.

**This level is equivalent to roughly the total emissions of greenhouse gases of Romania.

2.4. Who is affected and how?

This initiative could affect all actors in the food chain, from farmers/fishermen, through to retailers and consumers. It has the potential to lead to improvements in efficiency that in turn would lead to cost savings, more competitive production, export opportunities and reduced waste, leading to higher value coming from resource inputs. It may also have administrative implications for public administrations, in terms of measuring food waste better and implementing food waste reduction measures. If successful, reductions in food waste will lead to a reduction in demand for food and lower sales in the EU, this has negative implications for producers if they cannot compensate via diversifying to export markets. On the other hand, consumers, with higher disposable incomes, may compensate by purchasing food of better quality and so to some extent dampen any negative effects on food producers. It may also affect those working in the food waste treatment sector.

2.5. The EU's right to act and justification

The Waste Framework Directive already covers waste prevention, as Article 29 of the Waste Framework Directive by December 2013 at the latest the EU Member States are to establish waste prevention programmes. In the subsequent years these programmes are to be implemented and their effects to be monitored. Article 11.4 stipulates that by end 2014 at the latest, the Commission should examine the existing targets³³ 'with a view to, if necessary, reinforcing the targets and considering the setting of targets for other waste streams'. The current provisions on waste prevention refer to municipal waste in general and do not specifically mention food waste, in spite of the fact that it is one of the principle components of municipal waste.

Currently there is no food waste prevention strategy in place at EU level, although there are some relevant measures being undertaken. Many Member States are currently taking little or no action, and food waste levels are increasing. This is despite growing information becoming available on levels of food waste, and the potential benefits of action being highlighted for a number of years. At the same time:

- Food Waste is produced in all the Member States of the EU and has significant trans-boundary environmental and pollution effects including the production of significant GHGs within the EU.
- The EU imports more than €60 billion of food, as raw materials for processing as well as for direct consumption. This food has a significant global environmental impact, both in terms of impact on land/biodiversity and in terms of GHG emissions.
- Coordinated action to reinforce national food waste prevention policies can significantly increase the environmental and economic efficiency of these policies through spreading good practices and synergies from similar approaches being developed in different Member States;
- A better understanding of the environmental impact of food waste generation and management in the EU can only be achieved by improving and developing the knowledge base available at EU level.

The 7th Environmental Action Programme states that the Commission will *"set a framework for action to improve resource efficiency aspects beyond GHG emissions and energy, targets for reducing the overall environmental impact of consumption will be set, in particular in the food, housing and mobility sectors"*

3. OBJECTIVES

3.1. General objectives

- To contribute, through action on food waste, to a food system that is more resource efficient, therefore contributing to a more competitive, low-carbon economy where

³³ Article 11.2 of the Waste Framework Directive includes a legally binding target to be achieved by 2020: a 50% 'preparation for reuse and recycling' target for municipal waste.

impacts on the environment are minimised and a system that is more resilient and able to withstand challenges in times of increasing resource scarcity and economic instability.

3.2. Specific objectives

- To reduce food waste at all stages of the food chain in the EU.

3.3. Operational objective

To halt the rise in the generation of food waste in the EU and to reduce the levels generated, by means of the following:

- a) To improve knowledge and awareness on levels and impacts of food waste.
- b) To influence attitudes that lead to food waste, to encourage food waste prevention measures.
- c) To encourage change in the food market toward less wasteful practices.

4. POLICY OPTIONS

4.1. Identifying options

A number of possible European Commission actions were identified in the preparation of this impact assessment, (by the inter-service group, stakeholders and through research) that could contribute to a reduction in food wastage throughout the supply chain. These actions were presented in the public consultation as set out below. For each action, the relevant 'operational' objective has been highlighted.

Possible European Commission actions on preventing and reducing food losses & food waste

Consumer Education and information

- Develop/disseminate consumer information on avoiding over-purchasing. (a+b)
- Develop/disseminate consumer information on the meaning of food date labels. ('best-before', 'use-by', 'sell-by') (a+c)
- Develop/disseminate consumer information on better storage of food. (a)

- Develop/disseminate consumer information on more sustainable food preparation and use of leftovers. (b)
- Establish new education campaigns on food waste prevention aimed at children. (a+b)
- Establish new education campaigns on food waste prevention aimed at adults. (a+b)
- Facilitate the exchange of good practices on food waste prevention and reduction activities at all levels: producers, retailers as well as local, regional and national authorities. (a+b+c)

Facilitation / Clarification

- Clarify the EU VAT Directive for donation of surplus food to food banks for Member States and businesses. (c)
- Encourage best-practice in relation to food date labels by food business operators to minimise wastage. (c)
- Develop EU Food Donation Guidelines for food donors and food banks on how to comply with the EU Food Hygiene legislation (types of food suitable for donation, conditions for transport and traceability, legal liability, etc.) (c)
- Agree a common EU definition of food waste, classifying products as food, feed or waste etc. as appropriate. (a)
- Develop a standardised methodology for collecting and reporting data on food waste to ensure data comparability across Member States. (a)

Legislative options

- Introduce reporting requirements on food waste. (a)
- Set binding targets for food waste prevention. (a+b+c)
- Set aspirational targets for Member States to prevent food waste (a+b+c)

In terms of the underlying drivers of food waste, this EU initiative is aimed at addressing (2) *Market demand: 'all food all year round, in perfect condition'*, (3) *Attitudes/habits/preferences/ cultural dynamics*; (4) *Lack of knowledge / awareness of financial value of waste: Information failure* and (5) *Food is fragile and perishable – not all parts are marketable /useful / edible*. These drivers will be address either through direct Commission actions, or via the development of comprehensive food waste prevention programmes at Member State level. This initiative will not address directly the driver of (1) *climatic variations*, nor the fact that (6) *natural resources are undervalued*. (The challenge therefore being to somehow give a higher non-financial value to food through, for example, Communication activities, without actually increasing the price of food.)

4.2. Preliminary analysis of options

In relation to **consumer education and information** the Commission can help by providing data and information on food waste, and has already published information about best-practices, and on how to support consumers in reducing food waste, translated into all Community languages. However, while EU-wide information campaigns can help, they cannot easily take into account the complex culturally-specific causes of food waste in different Member States. Such campaigns need to be developed with local partners, such as local government, education institutions, retailers, NGOs and food producers. Member States themselves are best placed to take forward such targeted information campaigns tailored to their citizens.

In relation to **facilitation** and exchange of best practices, some work is already underway at EU level. The Commission has established a multi-stakeholder and Member States 'Working Group on Food Losses & Food Waste (established under the Advisory Group on the Food Chain of DG SANCO) and is funding the 4 year FP7 FUSIONS project – a major EU wide project looking at exchange of good practices on food waste reduction. The **clarification** of certain EU laws (relating to date labelling and VAT of food donations) have been highlighted by a number of stakeholders as a useful actions – these are being further investigated by the Commission with a view to dealing with any misunderstandings.

All these are considered ongoing, 'no-regret' actions by the Commission, on education, facilitation and clarification will therefore be considered as part of the baseline scenario, 'take no additional action'.

Summary

- There are only food waste prevention strategies in place in a handful of Member States (even though five have set targets, even these do not all have food waste prevention strategies.) Other than this, actions are small scale and localised. In total they cover only a small fraction of the EU.
- This is a priority waste stream for waste prevention actions and should therefore be given extra emphasis within waste prevention strategies, the added value is in terms of cost savings to businesses and households.
- This is in spite of the Commission clearly setting out the problem in its preparatory study on food waste in 2010, and the setting of an aspirational milestone in the Roadmap to a Resource Efficient Europe, and in spite of a European Parliamentary resolution on the subject. The Commission two years ago published a guidance document on how to develop a food waste prevention strategy. In spite of this, in the latest food waste prevention strategies sent in by Member States, less than a quarter have food waste prevention plans of any sort mentioned.
- EU added value could therefore come from focusing Member States on this issue, ensuring it is correctly monitored and encouraging adoption of best practices where they would help.

- Taking action at EU level will therefore allow the benefits of greater food production efficiency to be realised – helping to deliver cost-efficiently EU objectives related to GHG emissions, water and air pollution, and land pressure. Just in relation to GHG emissions, for example, a 15% reduction in food waste represents a GHG reduction of between 0.5% and 1%.

In short, EU policy is not yet stimulating food waste prevention in an active way, that can guarantee results within a fixed time frame in line with the milestones set by the Commission itself, and by the Parliament. While waste prevention and separate collection of food waste are promoted, and while National Waste Prevention Programmes are required, food waste is continuing to rise steadily.

While these actions may begin to curb food waste in localised pockets around the EU, there is no evidence of and concerted national response to this threat, and no guarantee that food waste will not continue to increase at the EU level.

For this reason a regulatory policy response, targeted at food waste prevention, should be considered. This impact assessment will therefore assess the impact of options for EU policy to take a more active/legislative role in tackling food waste, specifically through the compulsory introduction of food waste reporting requirements and/or setting targets for food waste prevention either as national objectives or binding targets. It will consider therefore the costs and benefits of compelling all Member States to systematically measure their food waste, and to establish national food waste prevention strategies.

4.3. Options to be assessed in more detail

The following options will therefore be considered in more detail:

Option 1- Take no additional action

This action assumes the base level of low cost, easy actions within Member States and by the Commission on food waste will continue, and that the Commission will continue to take a responsible, coordinating role to support these.

Option 2 – Establish a standardised methodology for food waste data collection and compulsory reporting by Member States

This is an EU wide action that the Commission could take, on its own, or in parallel with the setting of a specific target. It would address the need for better, more consistent methodologies by drawing together standard approaches relevant to the measurement of food waste at each successive stage of the food supply chain. This option would require the revision of EUROSTAT's reporting requirements. On its own it will only directly address the specific objective (a), to improve knowledge and awareness on levels and impacts of food waste, but indirectly, in time, this improved knowledge could lead to indirect benefits for the other objectives.

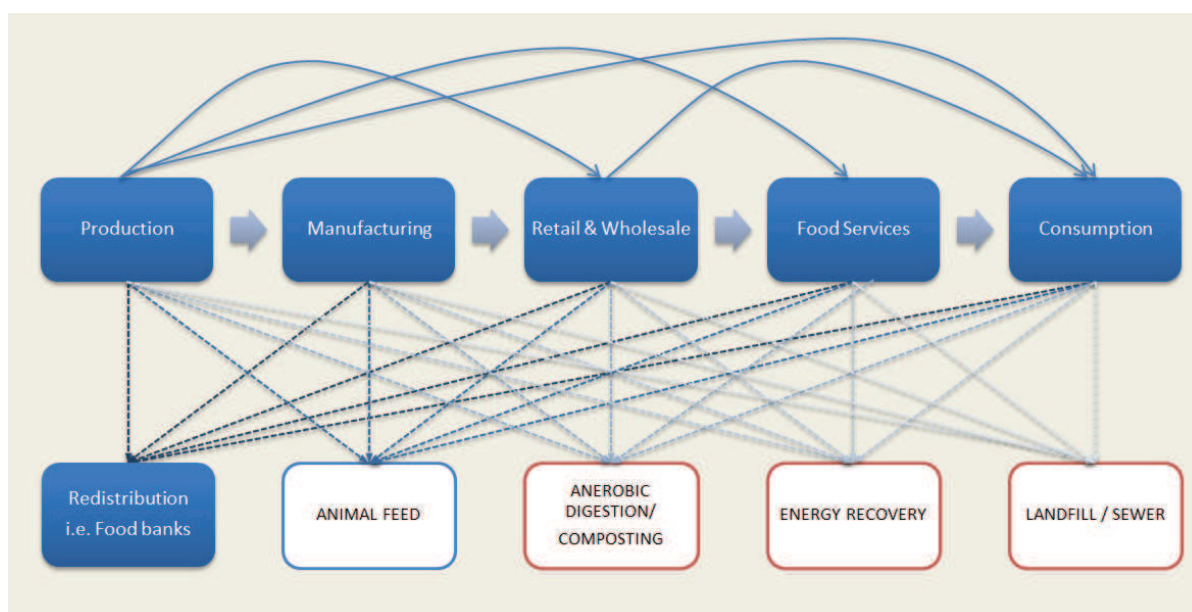
Option 3 – Setting of targets for food waste prevention

This option is about the creation of national food waste prevention targets for MS. These could be voluntary, or binding as part of the waste prevention targets that would be recommended in the revision of the Waste Framework Directive in 2014. Such targets would mean that the operational objective of reducing food waste would be addressed directly, with Member States implementing their own strategies to meet reduce food waste. The objectives and prevention programmes for each Member State might vary depending on their absolute level of food waste per capita, and in line with any waste reduction they have already undertaken. (See section (e) on threshold point below). This policy option depends on harmonising food waste data reporting (as proposed in policy option 2), such that any target needs to be monitored against a standardised methodology for data collection, and with regular reporting by Member States. The data currently available is, however, sufficient to establish what indicative level of target/objective for food waste prevention would be achievable at this point, such that the 'quick wins' can be achieved in the short-term. Future objectives could be set, based on more standardised data, at a later date.

Based on a two day workshop with experts from the FUSIONS project, a short list of potentially achievable targets was identified, for further assessment. The following observations were made in terms of the scope and level of a target proposal:

Choosing a Scope of food waste target

Below is a graphic showing the food chain, and the possible flows that food can take as it moves along it:



As can be seen, food intended for human consumption can be lost from the food supply chain at any point, from production to consumption, and end up in a range of destinations from landfill to anaerobic digestion, to animal feed or redistribution. If a target is set on food waste prevention, the scope of the target, (which effectively becomes the 'definition' of food waste for this target setting exercise) is crucial. If the scope is too narrow, firstly many food waste flows will not be addressed, and secondly, there is a risk of undesirable knock-on effects,

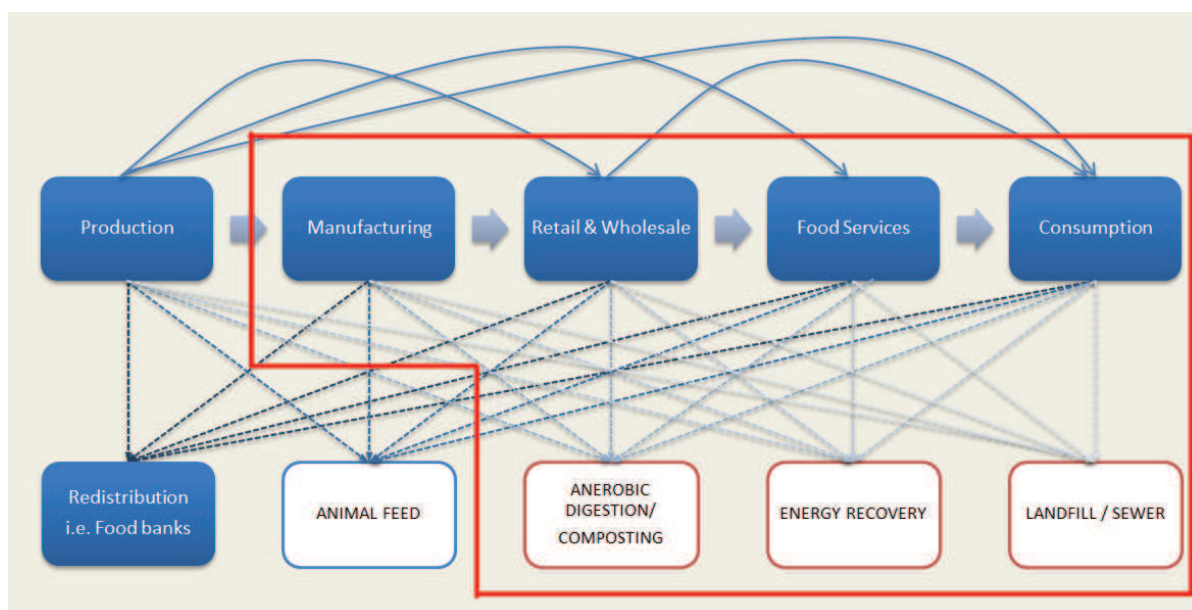
where waste is shifted into other parts of the chain. On the other hand, if too wide a target scope is defined, such as one that includes agricultural losses all the way through to consumption, then the target may be unmanageable and the measurement challenge too great.

Including the production stage in the target however is not practical at this time. Agricultural losses can be affected by weather patterns which are largely outside the control of policy makers, and data of food wastage in this phase is very poor compared to the rest of the food chain. (Some crops, for example, are left under-ground without ever even being harvested. Quantifying the levels of this loss is hard, as is setting reduction targets.) The fact that the total impacts of agricultural losses are lower per tonne of waste, as they occur before other resources have been used on the food along the food supply chain, also means that excluding this sector from a target is less relevant than it might first appear.³⁴

The rest of the food supply chain can, however, be included in a food waste prevention target, and it makes sense to do so. Manufacturing, retail, food service and consumption food wastage are monitorable and measurable, and there are many achievable opportunities for reducing them. Setting an overall target across these sectors will also allow Member States flexibility to reduce waste more in one sector than another, depending on their specific circumstances. There are also benefits from multi-stakeholder cross-sector food waste actions. (For example, targeting food waste prevention activity with food service providers and consumers together on portion sizes, or food storage advice.)

In terms of what constitutes food waste, it needs to be made clear that **food going to redistribution is not considered as food waste**. If this is not the case, there is a risk that a target could cause pressure to limit food to food banks. (it could be easier to reduce food going to food banks than to landfill. Avoiding this type of perverse side effect of policy is important.) Food banks should therefore be considered as part of the food chain. In relation to animal feed, the animals themselves are part of the food supply chain, so can food originally being produced for human consumption, diverted to animal feed, can also be excluded from this definition of food waste. The simple definition for food waste then is this: "Food intended for human consumption, lost from the food chain.". The scope of the food waste target selected for further assessment can be represented as shown in the diagram below:

³⁴ While food wastage at agricultural level is somewhat different in nature to those in the rest of the food chain, it can be affected by demand in the food chain. While a target might not be set for this part of the chain on food waste, it does need to be included in any overall food waste strategy, to avoid pressure coming downstream and increasing food losses on farm.



Choosing a level of food waste target

A number of sources were considered when selecting a level of food waste reduction target for further assessment:

a) Consideration of the Resource Efficiency Roadmap Milestone

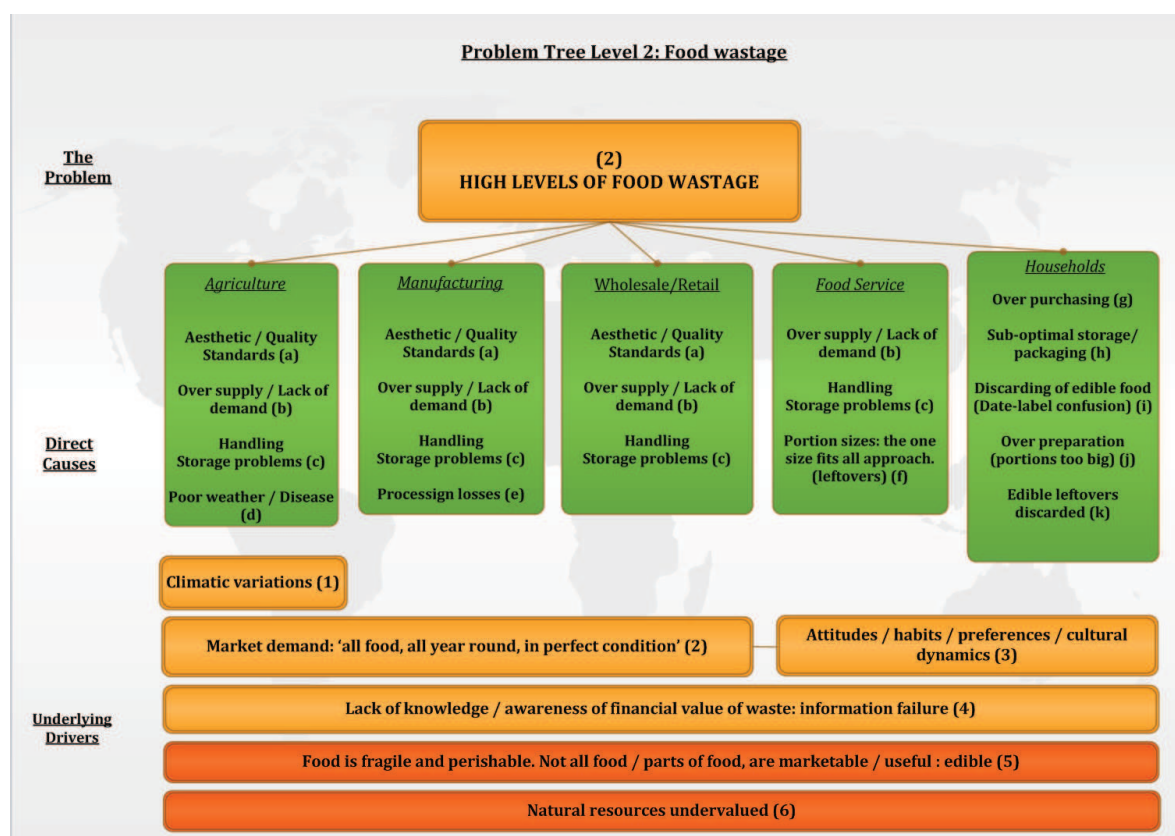
The Roadmap offered a milestone rather than a refined target, setting a high level of ambition: *"to halve edible food waste by 2020"*. This milestone referred to the retail, food service and consumption sectors and **represents around 32Mt of food waste reduction**.

Using the broader definition of food waste outlined above, including manufacturing and 'unavoidable' food waste,³⁵ this 32Mt reduction in food waste represents a 36% reduction from the 2006 baseline, or a lower percentage from a later baseline, assuming food waste has increased.

b) What sort of target might be achievable and how? What would establishing a national food waste prevention strategy mean for different Member States?

Looking at the problem tree below, direct causes and underlying drivers of food waste can be seen.

³⁵ In reality a large proportion of *inedible* food is also unnecessarily disposed of (i.e. A reduction in food waste leads to lower purchases and therefore lower unavoidable waste as well as avoidable or, for example, if a whole chicken is thrown out both the bones and meat are wasted.) so it is more practical and complete to set a food waste target on both edible and inedible food waste, as the two are closely linked.



How to best address these causes and driver, and how to prepare a national food waste prevention strategy, depends to a certain extent on the nature of the food waste profile of a given Member State. For those with very high consumer waste per capita, a focus on awareness raising campaigns / education / working with retailers on storage and purchasing behaviour would be most appropriate. For those with higher relative manufacturing/processing losses a higher focus on more technical options / packaging innovation, sharing of best practice, waste separation etc. would be more appropriate (so more can go to animal feed / industrial uses, for example).

So preparing a food waste prevention strategy will consist of selecting a package of actions form those available for implementation. Below the types of broad categories of action are summarised, along with which causes and drivers of food waste the relate best to:

➔ **awareness campaigns**

- **for consumers (f) → (k), (3), (4)**

- **for food services, manufacturing, retail** (consisting of explaining benefits, how to undertake better measurement, options for improvements / sharing of best practice, how to improve logistics. Also options on how to help consumer waste less.) **(a), (b), (c) + (4)** (+ those for consumers)

➔ **informational tools** (e.g. sector specific prevention guidelines and handbooks) **(4)**

➔ **training programmes** (e.g. food service staff prevention skills, waste-free cooking workshops for consumers) **(f) → (k)**

- **logistical improvements** (e.g. stock management improvements and more accurate demand forecasting for retailers, reservation requirements for cafeterias, ordering flexibility in hospitals) **(b), (c), (k) + (4)**
- **waste measurement activity** (e.g. hands-on quantification and composition analysis of food waste by households, restaurants or schools) **(4)** possibly leading to **(3)**
- **research/development/innovation** (development of new sector/product specific prevention methodologies, such as Time Temperature Indicators) **(c), (h) + possibly (5)**
- **regulatory measures** (such as separate collection of food waste requirements in Ireland and the Zero Waste Regulations in Scotland) **(4)**
- **food redistribution programmes** (diverting otherwise discarded food to charitable groups) **(b) + (4)**
- **development of industrial uses** - turning food waste into by-products for other purposes (such as the production of fish chips from manufacturing sector fish waste, or gelatine production from pork skins, bones etc.) **(e), (k)**

More details of what these measures might mean in practice is included in a table in **Annex 6**, which provides some indicative costs of different food waste prevention measures and the sectors they target.

The key message here is that there is no one simple solution to reducing food waste, but rather that national strategies are needed. The basic elements consist in the first instance of better measurement/awareness for consumers combined with communication and information tools with sharing of best practice along the supply chain on how others have reduced their food waste / helped other to do so. These have been seen deliver cost effective results at the local and national level, but have yet to be taken up widely. Other options can also be considered (although they may not be required for meeting a low target) consist of investing in new innovation and R&D, and looking at regulatory measures.

Looking at Targets set in Member States, so far five Member States have set targets for food waste, and one has a target soon to be agreed. None are currently binding. (Details of these targets, and activity taking place in all Member States related to overall waste prevention can be found in Annex 9.) The targets are as follows:

Austria	20% (2016) non-binding (households only)
France	50% (2025) non-binding
Germany	50% (2020) non-binding
Netherlands	20% by 2015 (non-binding) (households and 'agri-food chain')
Sweden	None, but in pipeline for 2014
United Kingdom	4% by 2012. In England only. Non-binding. (15-20% already achieved.)

It is not clear in all cases exactly what the scope of the targets is, nor from what baseline they are starting and what definition of food waste is being used. In the case of the targets set by France and Germany, they seem similar to the Commission and European Parliament's milestones. In any case, these aspirational targets give an idea of the level of ambition a minority of Member States have dedicated to this policy area.

The UK has already achieved significant reductions in the household and service sectors and has set short-term targets for households, retail and manufacturing and hospitality and food service sectors.

Household:

- 15% reduction achieved over 5 years from 2007 to 2012 (with two additional years for set-up), and another 5% targeted under latest commitments, from 2012 to 2015.
- WRAP has indicated that a 50% reduction in avoidable household food waste in the UK could be achieved by 2025, against a start date of 2007. This would be 50% over 18 years, or ca. 25% over 9 years.

Manufacturing & retail:

- 7.4% reduction in food & packaging waste over 3 years from 2009 to 2012, and a target of a further 3% from 2012 to 2015. (i.e. ~10% in six years)

Hospitality:

- No data on reductions yet, but a target of 5% has been set over 3 years (2012 to 2015).

A six-month campaign in West London, which resulted in significant changes in behaviour and reductions in food waste (ca 15% for total household food waste).

Brussels Environment has carried out pilot projects showing that it is possible to reduce consumer waste by almost 80% "simply by paying a little attention to habits in purchasing and preserving food."

EUREST Sweden: awareness campaign at 150 of their contracts => 23% reduction in food waste in half a year.

Ireland: 'Calling time on waste' campaign showed that one pub saved €4000 per year on waste charges by "re-tendering for waste collection and implementing a source segregation scheme.

The latest research from the Netherland concludes that in the household "20 percent reduction in food wastage easy to achieve"³⁶, and overall, "solutions for reducing food waste are within easy reach and reductions of between 40 and 50 percent are possible."³⁷

There are many lessons that can be learnt from those strategies that have been undertaken both at national and local level and by individual companies and actors in the food chain. One key lesson is that whenever concerted action is undertaken, the resulting food waste prevention is very high, at relatively low cost. The most effective strategies involve actions across the entire supply chain. Many other local examples exist like this, but the only nationwide campaign that has measured results is from the UK.

³⁶ <https://www.wageningenur.nl/en/Expertise-Services/Research-Institutes/food-biobased-research/show/Test-shows-20-percent-reduction-in-food-wastage-easy-to-achieve.htm>

³⁷ <https://www.wageningenur.nl/en/Dossiers/file/Dossier-Food-waste.htm>

What seems clear is that at least for the 'low hanging fruit', quick and significant reductions in food waste have been made relatively easily. (The cost effectiveness is analysed later in this document)

For further information on what level of target would be feasible, the European Commission funded a study by LEI Wageningen UR on "Reducing food waste by households and in retail in the EU; A prioritisation using economic, land use and food security impacts" in 2013. (see here <http://edepot.wur.nl/290135> for the full report). They considered evidence on the extent to which food losses and waste may be reduced, which is presented in Annex 7, and concluded as follows:

"...we propose to incorporate waste reduction percentages of 50%, 40% and 30% for both direct household demand and demand in retail; 50% reflecting the, perhaps ambitious, target aimed for by the EU member states, 40% representing, perhaps, a more realistic target and 30% reflecting, perhaps, a modest target. We assume that these food waste reductions will be realised over the period 2012-2020, the period of interest for the EU member states."

c) Setting a target date

The target date of 2025 was selected to give a more reasonable time for accurate setting of a baseline for those Member States lacking precise data, and then for setting up the required infrastructure / communication materials to set about reducing food waste. This target date, while not in line with the 2020 date proposed by the Roadmap to a Resource Efficient Europe, is in line with the date set by the European Parliament Resolution on food waste.³⁸ This would then mean the tracking of a waste prevention target from begin in 2016, and with the proposal being set out within the revised Waste Framework Directive in 2014.

A derogation from the start date could be envisaged for those Member States who already both measured their food waste accurately, and who have implemented food waste prevention programmes to tackle the problem – in such cases these Member States could request an alternative earlier baseline starting point, in order that their efforts already made could be recognised.

d) Setting a range of targets to assess

Based on the information above, three target options were selected for consideration:

Option 3 (a) Mandatory reporting (option 2) + A 15% reduction in food waste from 2016 – 2025, across the manufacturing, retail/distribution, food service/hospitality and household sectors, where food waste is defined as "Food intended for human consumption, lost from the food chain.", not including food diverted to animal feed, or sent for redistribution.

Option 3 (b) Mandatory reporting (option 2) + A 20% reduction in food waste from 2016 – 2025, across the manufacturing, retail/distribution, food service/hospitality and household

³⁸ <http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+TA+P7-TA-2012-0014+0+DOC+XML+V0//EN>

sectors, where food waste is defined as "Food intended for human consumption, lost from the food chain.", not including food diverted to animal feed, or sent for redistribution.

Option 3 (c) Mandatory reporting (option 2) + A 30% reduction in food waste from 2016 – 2025, across the manufacturing, retail/distribution, food service/hospitality and household sectors, where food waste is defined as "Food intended for human consumption, lost from the food chain.", not including food diverted to animal feed, or sent for redistribution.

All these targets are considered feasible within the 9 year time frame, falling within the scope of the levels set already by some Member States, and within the, per year, reductions already achieved in the UK. The 15% level is at the lower end of ambition, relatively easily achieved (catching the 'low hanging fruit') with awareness raising actions and sharing of best practice, with 20% likely to require a more concerted effort and a higher initial cost of prevention activity and 30% being at the upper end of the scale of ambition, but not impossible.

If the predictions for food waste increase are correct, then the lower targets are only going slightly beyond reversing the predicated trends currently taking place. (i.e. bringing food waste back to early-2000 levels) Any greater reductions in shorter time frames were, however, not considered realistic, given the time required to establish effective measurement and monitoring, and to build and implement a wide ranging food waste prevention campaign specific to the individual Member State.

If looking, however, at the food waste tonnages these targets of 15%, 20% and 30% represent, they compare favourably with the Roadmap to a Resource Efficient Europe milestone, at 17Mt, 23Mt and 35Mt of food waste compared to the 32Mt proposed in the Roadmap.

One voluntary national objective was also selected at the higher level of ambition:

Option 3 (d) An aspirational, non-binding national objective of a 30% reduction in food waste from 2016 – 2025, across the manufacturing, retail/distribution, food service/hospitality and household sectors, where food waste is defined as "Food intended for human consumption, lost from the food chain", not including food diverted to animal feed, or sent for redistribution.

This sub option, while being a softer, voluntary, measure than the others, would still form part of the revised Waste Framework Directive, in that Member States would be asked to provide a chapter in their existing waste prevention plans specifically on food waste. (Where they are currently only asked to prepare overall waste prevention plans, and often these do not contain specific measures/strategies targeting on food waste).

*e) **Different** targets/objectives for different Member States:*

In addition to the fact that any target or objective would be a % of total food waste (i.e. member States with a higher total food waste would be obliged to reduce their waste more in absolute terms than those with lower levels), a number of other factors should be taken into account when setting a level for food waste reduction.

- *Setting a **threshold point** below which Member States would not be obliged to achieve the target.*

Given the wide variation in levels of food waste observed in different Member States, it seems fair that below a certain absolute level of food waste generated per inhabitant, no further binding reduction would be required (because the 'quick-wins' available in some Member States, may not be available in others, rendering the targets difficult to achieve). For the purposes of this assessment, this threshold point has been set such that those Member States, whose level of food waste per inhabitant in 2016 is below the level of the **bottom quartile, looking across all EU Member States**, would be exempt from the food waste target or would be considered to have already met their food waste reduction target. This level is chosen as it will exclude all those Member States whose food waste per capita falls below the 'inter-quartile range', this being considered a robust measure of scale.³⁹ (In other words, those falling below this level can together be considered as showing significantly lower than average waste levels.) It would also mean, for those Member States nearer to this level than the target/objective set, that their expected reduction level could be lower than the specified %.

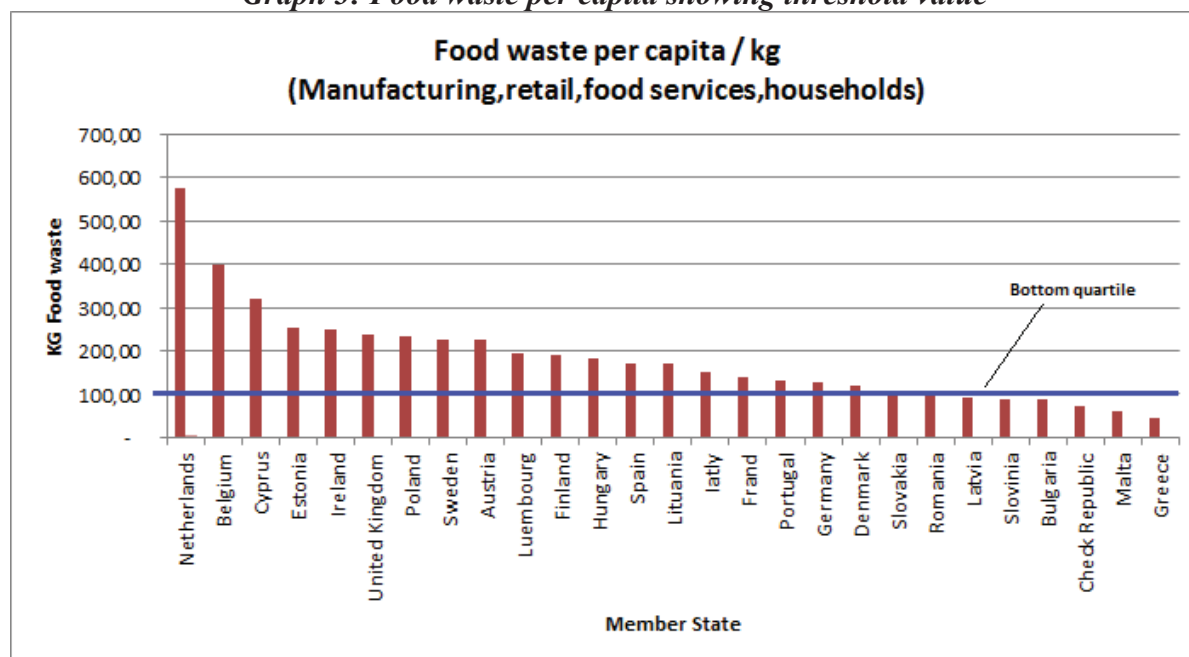
Based on current data this level is currently estimated to be ~100kg per inhabitant. (See diagram below.) These Member States would, however, be obliged to monitor and report their food waste every two years, and at least maintain their 2016 baseline level of food waste.

This threshold is based on fact there are big differences seen in food waste levels - where some Member States are consistently producing significantly more than the others. The threshold essentially means that those Member States with the lowest measured food waste per capita in 2016 would have to meet a target of 0%, so they would still have to report on their levels of food waste and demonstrate no increase above the baseline.

Because the levels of food waste observed in the MS wasting less is relatively low, so that the overall tonnages of food waste represented by the EU targets would only be marginally reduced (~5%) by introducing this cut-off point – see graph below. (This excludes 7 Member States based on current estimations: Romania, Latvia, Slovenia, Bulgaria, Check Republic, Malta and Greece. This may change once the data has been updated and refined for 2016.)

³⁹ http://en.wikipedia.org/wiki/Robust_measures_of_scale; http://en.wikipedia.org/wiki/Interquartile_range;

Graph 3: Food waste per capita showing threshold value



- *Setting a different baseline for those Member States who have already implemented national food waste prevention programmes.*

For those Member States who have made significant efforts to reduce food waste already, and who have properly measured their food waste data over time, a baseline before 2016 could be set, against which any reductions would then be measured. This would ensure that their efforts would be taken into account in any food waste measurement assessment.

In any case, for a non-binding objective the overall % reduction would be set to act as a guide against which progress could be measured and to allow Member States to set the level of ambition of their waste prevention programmes accordingly.

5. ANALYSIS OF IMPACTS

5.1. Option 1 – Take no additional action

Introduction

This option assumes the continuation of current EC legislation related to food waste, with no additions or changes to its application. This scenario would involve the continued unmodified application of the policies and principles in the Landfill Directive 1999/31/EC, the Waste Framework Directive 2008/98/EC, the Thematic Strategy on the Prevention and Recycling of Waste, the green paper on bio-waste management in the EU and the EC communication on future steps in bio-waste management in the European Union. (See section 2.3 for details.)

It also assumes a continuing, steadily increasing awareness and developing localised / private initiatives and national actions on food waste would continue to advance, and that the

Commission would continue to undertake communication and coordination activities to promote food waste prevention.

Impacts

Taking no additional action at the EU level will likely result, in spite of the actions being undertaken at present in the EU and by some Member States, in a continued increase in food waste, due to the rising and aging population and increasing prosperity.

Changing market conditions could feed back into the food supply chain and change these estimates of food waste, as the system is complex and levels of food waste are affected by numerous economic and environmental factors in the supply chain. For example, increasing prices of raw materials, oil, phosphate prices, changes in global demand, changes in feed prices, could all put up food prices. Higher prices will lead to lower food waste. (The opposite is also true.) This uncertainty cannot be seen as a reason to take no action of food waste, indeed the opposite is true. Reducing food waste will increase the resilience of the EU food system to future fluctuations in supply chain inputs.

More predictably, there is an increasing knowledge of the importance of tackling food waste, demonstrated by those targets already set by Member States. These aspirational targets set by Member State targets currently represent around 11Mt of food waste reduction. (Note: this figure cannot easily be compared with the 126Mt estimated for 2020, because the target dates set by MS vary widely.) Should these aspirations be met, this could lead to some food waste prevention, it is, however, highly unlikely to reach anything close to the milestones set by the Resource Efficiency Roadmap or by the European Parliament Resolution.

This option also risks sending the message to Member States, and to the sector at large, that the Commission is not committed to reaching its milestone of halving edible food waste by 2020. Rather, the continued focus of policy action would be on the other parts, lower down, in the food waste hierarchy – i.e. setting targets on what to do with waste once it is generated, rather than looking at the quantities generated themselves.

Option 1 – Summary

Pros

- No additional burdens from additional legislative requirements.

Cons

- Total food waste will continue to rise, to as high as 126 million tonnes per year, by 2020, with a total (lost) value of €260 billion.
- Annual food waste related emissions likely to climb to roughly 240Mt in 2020.
- Missed opportunity to use this waste stream as a resource, and to reduce environmental impacts. All the resources put into this food are wasted, including the land used produce it.

5.2. **Option 2 – Establish EU food waste data reporting requirements**

Introduction

This option entails bringing new reporting requirements for MS specifically on food waste, and putting in place a standardised methodology for calculating food waste quantities at Member State level to ensure comparability, in order to both aid EU policy making and stimulate action on food waste prevention.

The key element of this option is that the systematic collection of relevant, statistically sound food waste data over time, in all Member States would be guaranteed.

This could be set up through a new legal act, via the revision of the Waste Framework Directive for example, or through a reorganisation of the existing EUROSTAT reporting system, where waste data is already collected.

In the latter case it would be important to include the following elements:

- The addition of a sub-category to the EUROSTAT database under 09 ‘Animal and vegetal waste’ that is specifically entitled ‘Food waste’.
- The addition of sub-sectors for the ‘09 - Animal and vegetal waste’ category that are ‘Retail/Wholesale’ and ‘Food Service/Catering’, maintaining ‘Other Sectors’ for anything that cannot be included in the new sectors, or agricultural, manufacturing or household food waste.
- The clear, standardised definition of food waste for this purpose, (Food intended for human consumption, lost from the food chain, not including food diverted to animal feed, or sent for redistribution.) particularly as distinct from by-products, and the provision of a clear methodology for calculating food waste in each sector.

Estimated implementation costs

Regardless of how the reporting exercise were to be established, the obligation would come to Member States to collect specific data on food waste. Currently Member States collect data on organic waste, but it is not broken down into food vs. non-food waste, nor is it broken down sufficiently by sector (in that there is no sub-category for food services and catering or retail for example). To achieve a unified system, it would entail additional food waste sampling to be undertaken. The estimated costs of this additional sampling are shown in the table below.

Table 3: Estimated costs for one Member State

Implementation Cost (in Euros)	
EU Institutions	Negligible
Member States	Administrative costs for Ministries based on increased reporting: € 1 000 – € 3 000

	<p>Bin characterisation study per Member State:</p> <p><u>Households</u></p> <p>€30,000 (Synthesis of existing data)</p> <p>€120,000-€300,000 (Compositional analysis)</p> <p><u>Hospitality and catering</u></p> <p>€180,000 - €200,000 (Measurement of food waste quantities including 'down the drain' analysis)</p> <p><u>Manufacturing</u></p> <p>IPCC reporting already covers organic fraction for larger firms. A further €70,000 needed to bring data together and revise estimates (excluding by-products) + Bespoke estimates for SMEs.</p> <p>Total for a major national food waste study (maximum for a larger MS): € 400,000 – €600,000 every two years</p> <p><u>€200,000-€300,000 per year</u></p>
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Estimate based on information from the Commission's
'Preparatory study on food waste across EU 27' from 2010 (page 142) updated
following further interviews with the authors in 2014.

This cost would come down in subsequent years once a measurement system was established, and would not be an additional cost for those Member States who have already started measuring their food waste levels. (For the 18 MS have already signed up for the EUROSTAT voluntary food waste "plug-in" for 2014, this additional level of disaggregation should partly have already been achieved.)

Overall, implementation of such a policy option would involve limited costs for the EU, Member States and for industry. Potential implementation and ongoing administrative costs would primarily impact Member States. In the case of the industry, larger enterprises would be invited to join in the process of better measuring food waste, and to provide their existing data on waste generated. SMEs would not be under any requirements to provide data under this option.

Impacts

This option would provide a clearer picture of food waste quantities, sources and treatment, thereby raising awareness of food waste issues and allowing for targeted analysis to identify and address problem areas for food waste generation and treatment. It would also assist future monitoring and the setting of targets for food waste prevention, by providing more accurate sampled baseline data. The availability of more detailed and comparable food waste data would, in the long term, lead to more effective food waste prevention and treatment.

The act of measuring and reporting on food waste itself is likely to also have the effect of stimulating preventative action at Member State level. Seeing, and properly valorising the

food waste may catalyse action by those Member States as yet not active, however it is difficult to quantify to what extent this indirect effect would reduce food waste and over what timeframe.

It seems reasonable to assume that it would, in combination with the 'no-regret' options presented in option 1, lead to an additional reduction in food waste. However, it seems unlikely that this impact would be significant before 2020 or 2025, given that the first data would come in around 2016. It might be reasonable to expect that by 2025, the increase in food waste could have been halted, and reductions started.

Practicability and enforceability

The policy option is fairly straightforward to implement in theory as it could be done by adapting existing data reporting frameworks. Member States already collect general data on 'Animal and Vegetal waste', but there is no sub-group specifically entitled 'food waste' at this point. If this were specified, then the collection of this data would fall within the same monitoring programme as existing data, i.e. every two years to EUROSTAT. No new structures would be needed, only that the data would be disaggregated in a different way than it currently is. (i.e. the additional cost would relate to the sampling required to disaggregate data, but not for the reporting and monitoring of reporting which is already undertaken.)

To collect such data would provide an important source of baseline data to further the understanding of causes of food waste and to guide future EU efforts to reduce and prevent food waste. As the waste team at EUROSTAT has recently completed a two year process of revisions to their legal framework and data reporting requirements, additional changes related to food waste reporting would be administratively burdensome and could take time.

Synergies with and impacts on other options

This is a key building block for Policy Option 3 (EU targets for food waste prevention) as robust baseline data is important for monitoring and for setting a baseline for targets and track progress on food waste prevention.

Option 2 - Summary

Pros

- Important step for monitoring progress and for improving targets on food waste.
- Separate food waste reporting increases awareness of issue.
- Allows for clearer understanding of food waste-related issues (e.g. how much each sector is producing, possible causes, etc).
- Is likely to stimulate waste prevention activity indirectly.

Cons

- Administrative cost associated with sourcing and cataloguing new data.
- Implementation costs for some MS who do not yet collect detailed data.
- Possible measurement costs for industry, although almost all large businesses already collect data. (There would be no specific requirements on SMEs)
- Unlikely to reach food waste reduction objective in the short-term.

5.3. **Option 3 – Setting of (binding or non-binding) EU targets for food waste prevention**

Two sources of information have been used for the quantification of costs and impacts:

1. A **modelling exercise** undertaken as part of the revision of the Waste Framework Directive, in which the impacts of setting both the 15%, 20% and 30% targets were measured. (The box below gives more details about the model used, and additional detailed information is presented in **Annex 12** (in a separate document).)

Note: This model looks only at 'municipal' food waste, which does not represent all waste from manufacturing, retail and food services, some of which is classified as 'commercial'. The results from the modelling exercise are therefore considered as under-estimates in terms of the potential costs and benefits. The full costs of implementation have, however, been shown in the analysis of the options, not the costs coming from the modelling exercise. Thus only the benefits should be considered as conservative estimates.

2. Quantified **evidence coming from the UK** (by a significant margin the most advanced Member State in terms of food waste prevention activity) who have measured levels of food waste both before and after undertaking a concerted food waste reduction strategy. While it cannot be assumed that the results are valid for all EU Member States (where the cost of implementation of food waste prevention strategies, and the cost associated with dealing with food waste, may differ from those in the UK) it does provide a good basis for discussion, in particular given the compelling nature of the results. There is also no reason to believe that the results elsewhere would be very different. Where a range of costs for food waste prevention actions have been found, the highest figures have been used in this impact assessment.

Box 4: About the model used for this impact assessment

- The model was used to project how food waste would be managed in a 'full implementation' scenario, where all Directives in the various targets are met. In this scenario, the model apportions the food waste generated in each Member State and year to different treatments depending on whether the food is separately collected (composting and AD) or remains in residual waste (MBT, incineration and landfill).
- The model scenario (food waste prevention) was then run and compared to the full implementation scenario;

- Environmental benefits per tonne of food waste prevention (avoided treatment and the benefits from preventing one tonne of food waste itself) were calculated from the weighted average of the avoided environmental impacts of treatment and the avoidance of the GHGs associated with food production.
- Weighted per tonne avoided treatment costs were also calculated.
- The avoided tonnage of food waste in each year was calculated by calculating the total avoided in 2025 (the year of the target) and interpolating linearly back to 2016.
- The unit environmental and treatment costs were multiplied by the tonnage of food waste prevented to give total environmental impacts and total treatment costs.
- In terms of collection costs, it was assumed that there would be minimal cost reduction from kerbside food waste collection services as food waste services will still need to operate on the same frequency to collect the remaining food waste. The same assumption was made where food waste is currently collected through kerbside refuse collection services. However, for bring based refuse collection the frequency of collection may drop if the deposited volumes of material decrease. Therefore the only saving was assumed to be derived from bring based refuse collection services. The cost of this was determined for each Member State by calculating the total cost of bring based refuse collection in 2020 and dividing by the total tonnage of refuse collected. This per tonne cost was then multiplied by the avoided tonnage of food waste to calculate the financial saving.
- Finally the costs of preventing the food waste in the first instance were calculated by multiply the additional tonnage avoided in each year by €17 per tonne. This cost relates to food waste prevention campaigns and the like. In addition, for each tonne of food waste first prevented ongoing annual costs of 10% of the upfront cost (i.e. €1.7 per tonne) were included in the model. This represents the cost of ongoing campaigns needed to maintain the initial waste prevention effect.

The model, built as a spreadsheet tool in Microsoft Excel 2010, is populated with national waste management data for all Member States (including Croatia). At its core sits the mass flow modelling, where data on waste arisings, recycling, and residual waste treatment are recorded for each Member State. The model is able to make projections on waste generation and management in all MSs and at EU level –for the period 2010 to 2035.

The cost implementation use in the model, to cover the costs of implement waste prevention initiatives, was set at the highest estimate coming from waste prevention activities seen in the UK, at € 17 per tonne of food waste prevented. (The lower estimate being €6 per tonne.).

It has however also been assumed that in practice some ongoing communication cost is needed to stop people reverting back to old behaviours - this has been modelled as 10% of €17 per tonne in each year after the initial food waste was prevented. (Given the fact benefits are so large however, it has not proven to be particularly important overall, but is considered, principle, as better than assuming people maintain the prevention effect for ever.)

The model also accounts for environmental damage associated with emissions to air. The model defines the damage costs (in € per tonne) for GHGs and a number of common air pollutants and also identifies what emissions are likely from a comprehensive range of waste treatment and disposal technologies. In this way damage costs can be calculated depending on the quantity of waste being treated via each form of technology. Conversely, if waste is prevented relative to the full implementation scenario, then this reduction will result in environmental benefits associated with the amount of avoided. In essence, the environmental benefits of food waste prevention are made up of two parts:

- The avoided environmental impacts associated with producing, transporting and manufacturing the food that is wasted; and
- The avoided environmental damages that are prevented because the waste no longer requires collection or treatment.

5.3.1. Option 3 (a)

A 15% reduction in food waste from 2016 – 2025, across the manufacturing, retail/distribution, food service/hospitality and household sectors, where food waste is defined as "Food intended for human consumption, lost from the food chain.", not including food diverted to animal feed, or sent for redistribution.

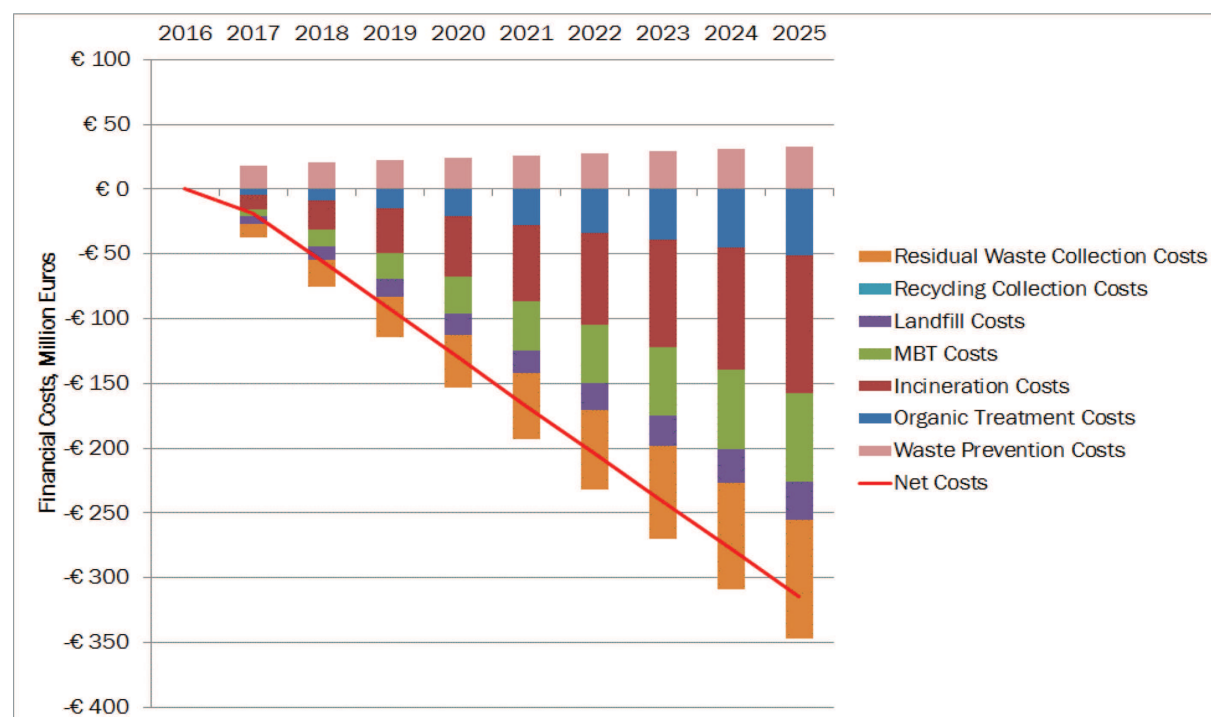
Costs of implementation

1. Evidence from the modelling exercise:

The figure below shows that there are net financial benefits associated with this option, if the cost of implementation is assumed to be at €17 per tonne of food waste prevented.

This is largely due to the fact that the implementation costs of preventing food waste are offset by the reduced costs for collecting and treating waste. (i.e. collecting, composting and landfilling food waste is much more expensive than €17 per tonne)

Graph 4: Net costs of implementation option 3(a) (at €17 per tonne prevented waste)



It can be seen that the costs of preventing food waste is outweighed by the relatively higher costs of managing waste, even when the highest cost estimate of implementing a food waste prevention program is used. This figures are per year, not cumulative, and demonstrate that by 2025 there would be **net implementation cost benefit of reaching the 15% target of up to €315 million per year.**⁴⁰ (Note: In most cases this benefit would continue even after 2025, even without additional implementation costs, in that once waste prevention measures have been put in place, they remain for the long term.)

To achieve the proposed 15% reduction, the **direct implementation cost would be around €33 million per year**, spread across all Member States.

The Commission has prepared "**Guidelines on the preparation of food waste prevention programmes**" aimed primarily at national policymakers developing National Waste Prevention Programmes, but that can also be used by waste management organisations, businesses, institutions, local authorities and environmental protection agencies.⁴¹

Box 5: Supporting Evidence from UK exercise

Between 2007 and 2012 WRAP estimated that the cost of the household food waste prevention programme was approximately €15.5 million (research, development of materials, delivery of the campaign, providing funding for local authority delivery of food waste reduction campaign locally). The value of the food prevented from becoming waste over the same period was €15.5 billion. **WRAP estimates that around half of the reduction was influenced by the campaign, with the remaining half being due to the recession and rapidly rising food prices between 2007 and 2010.**

The total tonnes of food waste prevented over the same period linked to this work was 5.2 million tonnes.

Therefore:

- €15.5 million public sector spend;
- 5.2 million tonnes less food waste, reduced to 2.6 million tonnes thought to be influenced by that spend

This gives an estimate of €6 per tonne of food waste prevented, for public sector spending. Because private sector spending on the campaign was estimated to match public sector spend, the total cost is **€12 a tonne**.

NOTE: this figure therefore takes into account the reduction in food waste attributed to the financial crisis (in other words, that part of the reduction was not assumed to be related to the money spent).

In addition WRAP estimates that the reductions in collected household food waste will have saved local authorities €100 million in saved disposal costs in 2012, and ca €350 million over the five years 2007 to 2012

⁴⁰ Taking into account the fact that this modelling exercise only looks at municipal food waste – if then factoring in all food waste from manufacturing to households (including industrial waste) this benefit would be as high as €500 million.

⁴¹ http://ec.europa.eu/environment/waste/prevention/pdf/prevention_guidelines.pdf

WRAP also recently evaluated the impact of a six-month campaign in West London, which resulted in significant changes in behaviour and reductions in food waste (ca 15% for total household food waste). The campaign cost ca €200,000, but the regions covered saved €1.6 million in avoided disposal costs (i.e. for every €1 invested up to €8 was saved). In addition residents will have saved around €17 million in avoiding food being thrown away. **Food waste was reduced by 12,350 tonnes, which would equate to ca €17 investment per tonne of food waste prevented.**⁴²

Based on these figures a rough range of cost per tonne of food waste reduction for food waste prevention activities can be taken as €12-€17.

This compares very favourably with the costs of food waste disposal in the UK per tonne:

Landfill:	€112
Composting:	€55
Anaerobic digestion:	€50

Effectively, the total costs of undertaking their food waste prevention measures was **cost negative**. It should be noted, however, that this trend was only seen for the first tranche of food waste reduction – future reductions, beyond the 'quick wins' are could require a greater effort.

Between 2007 and 2012 WRAP the cost of the household food waste prevention programme cost ca £13 million (research, development of materials, delivery of the campaign, providing funding for local authority delivery of LFHW locally). The value of the food prevented from becoming waste over the same period was £13 billion. WRAP estimates that around half of the reduction was influenced by WRAP and partner activity (the remaining half via deep recession and rapidly rising food prices between ca 2007 and 2010).

WRAP have stated publically that 'Every £ spent by WRAP on reducing household food waste has contributed towards preventing around £500 of food being wasted. Additional spending by LFHW partners has more than matched the WRAP spending'⁴³

By sector, the value of food wasted has been estimated at: Manufacturing - £950 a tonne; Retail - £1,200 a tonne; Hospitality and Food Service – an average of £2,775 a tonne (ranging from ca £1,660 to £4,000 a tonne for different sectors); Households - £2,960 a tonne.

For this impact assessment and average figure of just over €2000 per tonne has been used (coming from the 2010 EU preparatory study on food waste in the EU.)

For those Member States falling below the threshold point of food waste generated per inhabitant (and therefore exempt from meeting the target) there would be no costs or benefits associated with this option.

⁴² http://www.wrap.org.uk/sites/files/wrap/West%20London%20LFHW%20Impact%20case%20study_0.pdf

⁴³ http://www.wrap.org.uk/sites/files/wrap/Information%20sheet%20-%20reducing%20household%20food%20waste%20in%20the%20UK%202012_0.pdf

Details of what a food waste prevention campaign entails are included in Annex 11.

Impacts

Environmental: The environmental benefits of food this food waste reduction are very high, particularly when compared to the relatively low costs of implementation. Every 3% reduction in food waste can be seen to represent, very roughly, a 1% reduction in the total food demand (because 1/3rd of food is currently wasted) and in turn, a similar reduction in the total resource impact of the production and consumption of that food. A 15% reduction in food waste would therefore lead to the following savings, per year, over the business as usual scenario by 2025:

- 17 Mt of food waste
- 10,800km² of land need for the production of food to supply EU demand.
- 33 Mt CO² eq.

It is possible that part of these environmental benefits would not be directly realised in the EU, if the reduction in food demand in the EU was compensated by a growth in the global exports, but would rather be realised then in reduced production elsewhere. This would still be an overall benefit to climate change goals, and any land use pressure reduction would also offer, potentially higher, habitat and biodiversity benefits.

Economic: The overall economic impacts of this policy intervention, which essentially represent a efficiency saving, are very positive. In simple terms **17Mt of food waste has a monetary value of around €35 billion**. If not wasted, this food can either not be produced, and cost savings can be made with the resources or money used elsewhere, or the food can be produced and exported. In either case the objective of providing food to EU citizens is met and the EU economy is strengthened. The Communication from the Commission on *A resource-efficient Europe – Flagship initiative under the Europe 2020 Strategy* highlights this point, stating that resource efficiency "will bring major economic opportunities, improve productivity, drive down costs and boost competitiveness"

In relation to specific actors in the food chain:

- For consumers the 15% reduction represents a value of roughly €70 per capita, per year, in cost savings. These savings through reduced food wastage may trigger consumers to purchase higher quality (higher priced) food products, to save additional money, or to spend in other areas of the economy.
- For manufactures and food services, food waste prevention represents a cost saving, lowering inputs for the same output. The Commission's 2013 study entitled "The opportunities to business of improving resource efficiency"⁴⁴ identified considerable economic opportunities for businesses Food and Drink manufacturing and Hospitality and Food Services. One of the study's key observations was that "Minimising food waste provides the highest environmental impact savings potential in the Food and Drink manufacturing and Food Service sectors". The study suggested they could cut

⁴⁴ http://ec.europa.eu/environment/enveco/resource_efficiency/pdf/report_opportunities.pdf

their costs from improved resource efficiency with savings representing between 3% and 8% of annual turnover.

- For retailers and food producers a negative impact *could* be seen. Clearly any reduction in demand will lead to a potential reduction in income. In a worst case scenario, this could represent roughly 0.5% reduction in demand per year (due to this measure) for some producers, over the 9 years of implementation.

Specifically in relation to the food production sector, the impacts of this option relate to sales. Broadly speaking the fresh fruit and vegetable, and the cereals sectors are where the greatest food waste volumes and value are seen, followed by the fresh meat and dairy sectors. Processed foods are less likely to see reductions in demand, as food waste in these sectors is lower.

Two mitigating factors need to be considered however:

- a. The first is that there is a very strong, and growing, global demand for food. Any reduction in EU sales could be offset by further accessing this market. This would, in turn, make the EU food system more globally competitive. The latest available data coming from FoodDrink Europe in relation to EU imports and exports of food is shown below⁴⁵:



- b. The second is that consumers may 'trade-up' with their food waste reduction savings, which will bring benefits back into the retail sector.

Latest evidence from the UK (figures released in end January 2014)⁴⁶ show that half of household savings on food waste reductions between 2007 and 2011 have gone into 'trading up' to higher value foods. So consumers appear willing to pay more for what they see as higher quality food, if they waste less, which should

⁴⁵ <http://www.fooddrink europe.eu/publications/category/key-data/>

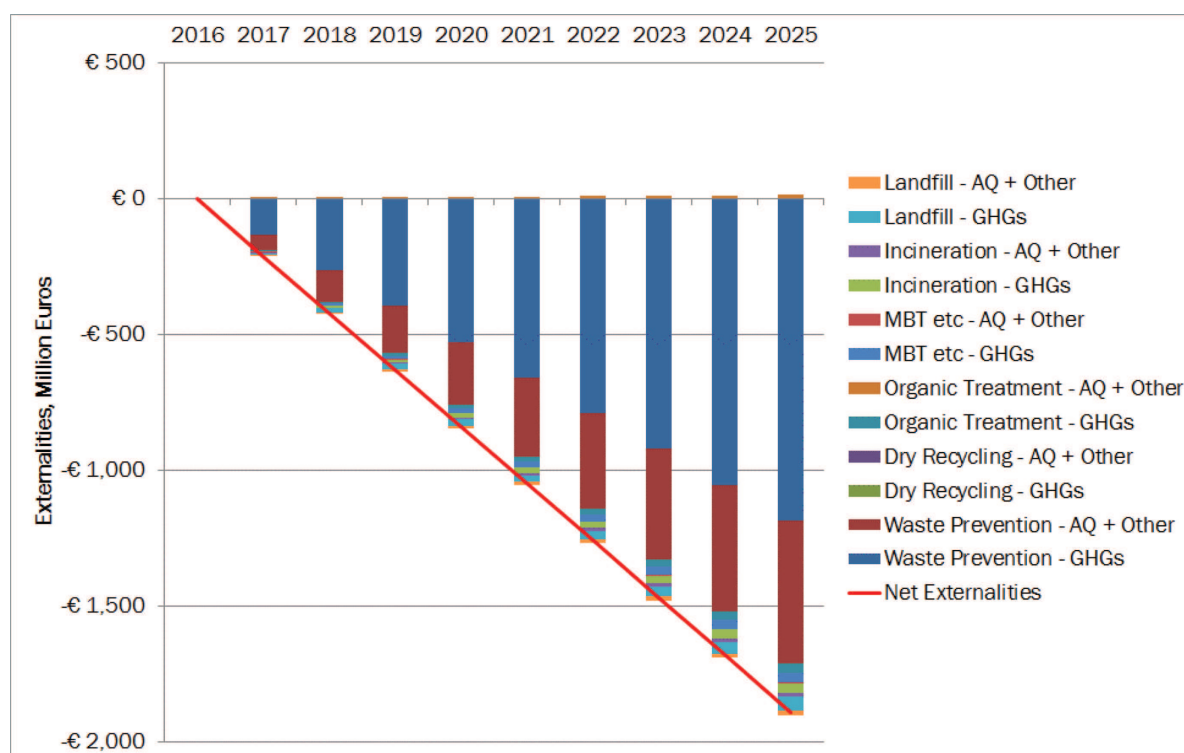
⁴⁶ <http://www.wrap.org.uk/sites/files/wrap/Econometrics%20Report.pdf> see executive summary

offer an opportunity for industry to add value to what they produce, potentially sell less volume nationally but at a higher price, and have ‘surplus volume’ for exports (or to replace imports).

- In other sectors of the economy, the increase in disposable income of consumers may clearly have positive effects as this additional money will be either spent or saved.

The modelling exercise also shows that there are major economic benefits are associated with the avoided GHG and other emissions related to bio-treatment (i.e. composting/anaerobic digestion). The avoided impacts associated with the fact that the food no longer has to be produced are shown in the Figure below, under the ‘Waste Prevention – Air Quality and Other’ category. These benefits are substantial which is not surprising given that 1 tonne of avoided food waste can save 3.8 tonnes of CO₂ eq. Other savings are derived from avoided collection and disposal/incineration costs.

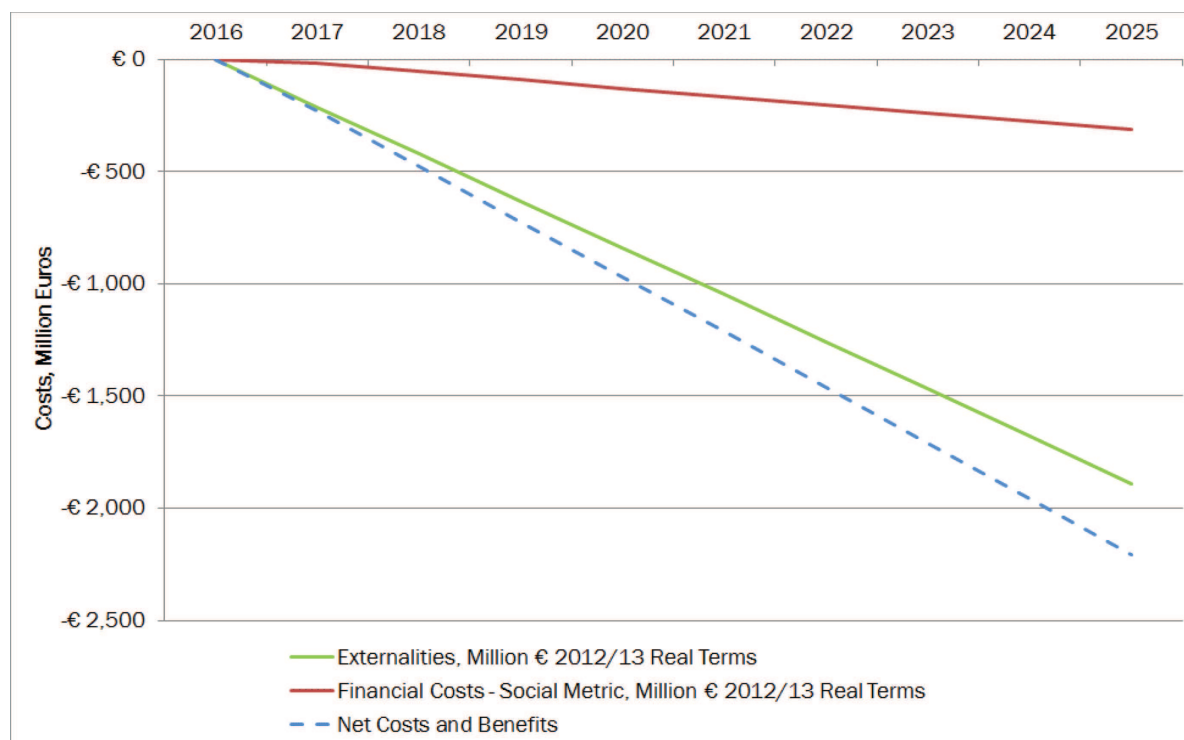
Graph 5: Scenario 1 - Environmental Externalities for the EU (million €)



The total savings in economic terms for EU for the 15% reduction linked to environmental costs associated with GHG emissions and air pollution are around **€1.8 billion per year by 2025**. Thus, the net position is very favourable as the benefits far exceed any costs in all years after implementation in 2016.

The figure below shows the results of both the cost savings and the environmental externalities together:

Graph 6: net cost benefits, option 3(a)



Evidence: Impact on the UK food industry

An analysis of the amounts of food and drink bought in the UK shows a significant reduction in sales – around 4% between 2006 and 2011 per household level, with a national total reduction of only 0.6% (i.e. increasing population off-sets most of the reduction). This reduction is consistent with consumers having to buy less (as they waste less), but many also have been influenced by things like healthy eating and alcohol awareness initiatives, and rising food prices \ difficult economic conditions. Econometric modelling in the UK has however suggested that as consumers find more ways to avoid waste, many change their purchasing behaviour and buy smaller quantities of more expensive food, which is a form of ‘trading up’. ⁴⁷

‘This research suggests an interesting aspect to consumers’ behaviour regarding food waste: they may find ways to waste less food without changing either their overall spending on food or the amount eaten, but the amount of food purchased is reduced because less food is wasted. In other words, consumers “trade up” towards higher price foods, but both purchase and waste less of those foods’

Social: This policy intervention would have a tendency to bring the price of food down, and would decrease food price volatility. This offers benefits to consumers going through harder financial times. In addition, this policy intervention has the potential to shift significant volumes of food away from waste streams and into food banks. (This being one way to reduce food waste.)

⁴⁷ <http://warrr.org/751/>

This policy intervention could reduce the number of jobs in the food production sector, as demand for food decreases, although this could be partly offset by those mitigating factors highlighted above.

Other impact observations from the UK experience: Wasting less food in the UK could offer opportunities to reduce imports of food, and contribute to greater exports. Latest statistics show that jobs in the UK food industry have remained stable at ca 3.7 million from 2008 to 2012.

5.3.2. Option 3 (b)

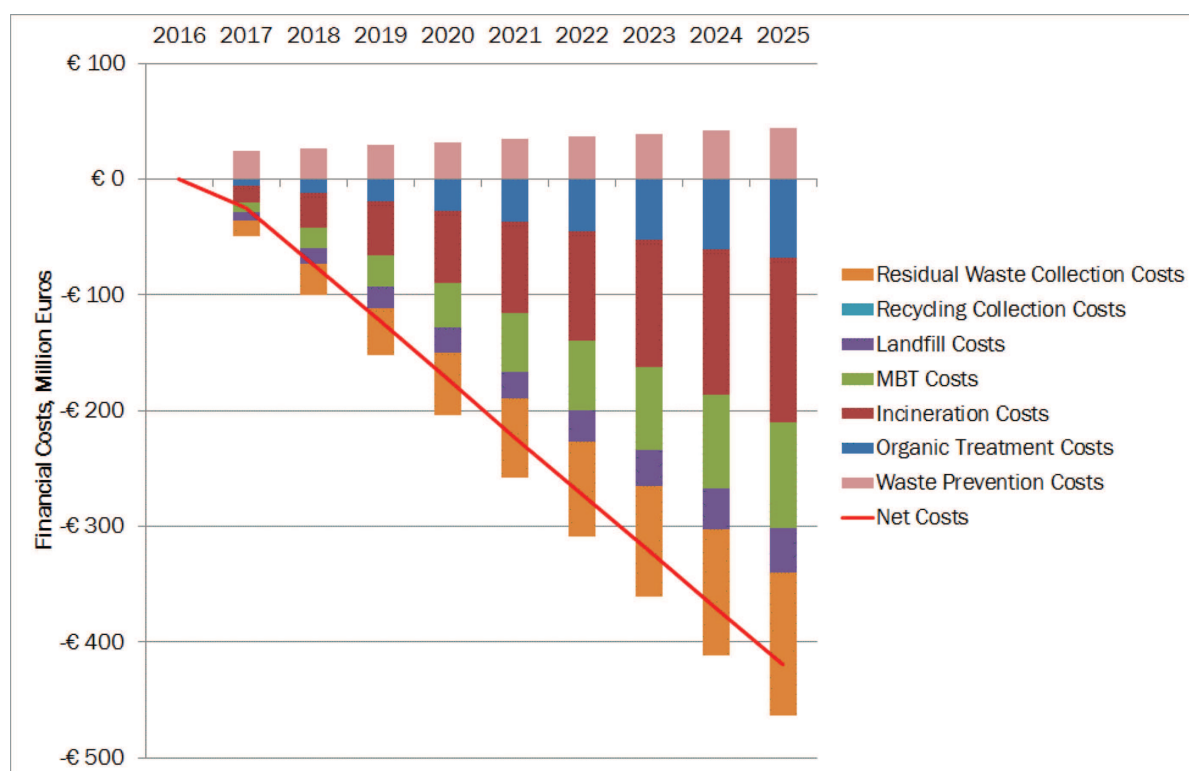
A 20% reduction in food waste from 2016 – 2025, across the manufacturing, retail/distribution, food service/hospitality and household sectors, where food waste is defined as "Food intended for human consumption, lost from the food chain.", not including food diverted to animal feed, or sent for redistribution.

The analysis of this option follows the same lines as that of the 15% reduction, but with the following variations:

The implementation costs are higher, and so are the associated net benefits (see figure below) (considering a higher number of tonne reductions)

Note: the implementation costs are potentially more than just what would be expected from a linear up-scaling of the cost estimated for a reaching a 15%. This is because a deeper reductions in food waste may be harder to achieve. In other words, once the 'quick wins' are achieved, future reductions in food waste may become more expensive per tonne. These additional costs may, however, be partly offset by the fact that the initial costs of setting up a waste prevention programme, setting up networks, information materials etc. have already been accounted for.

Graph 7: Net costs of implementation option 3(b) (at €17 per tonne prevented waste)



Again the costs of preventing food waste is outweighed by the relatively high costs of managing waste, even when the highest estimate of implementing a food waste prevention program is used. This figures are per year, not cumulative, and demonstrate that by 2025 there would be **net implementation benefit of reaching the 20% target of up to €420 million per year.**⁴⁸

To achieve the proposed 20% reduction, the **direct implementation cost would be around €44 million per year**, across all Member States.

Impacts

Environmental: Under option 3(b), the Environmental benefits are proportionately higher:

- 23 Mt of food waste reduced
- 14,400km² of land
- 44 Mt CO² eq.

Economic: A 23Mt reduction in food waste represents around €47 billion in value. For consumers the 20% reduction represents a value at the higher end of the scale of €95 per capita, per year, in cost savings.

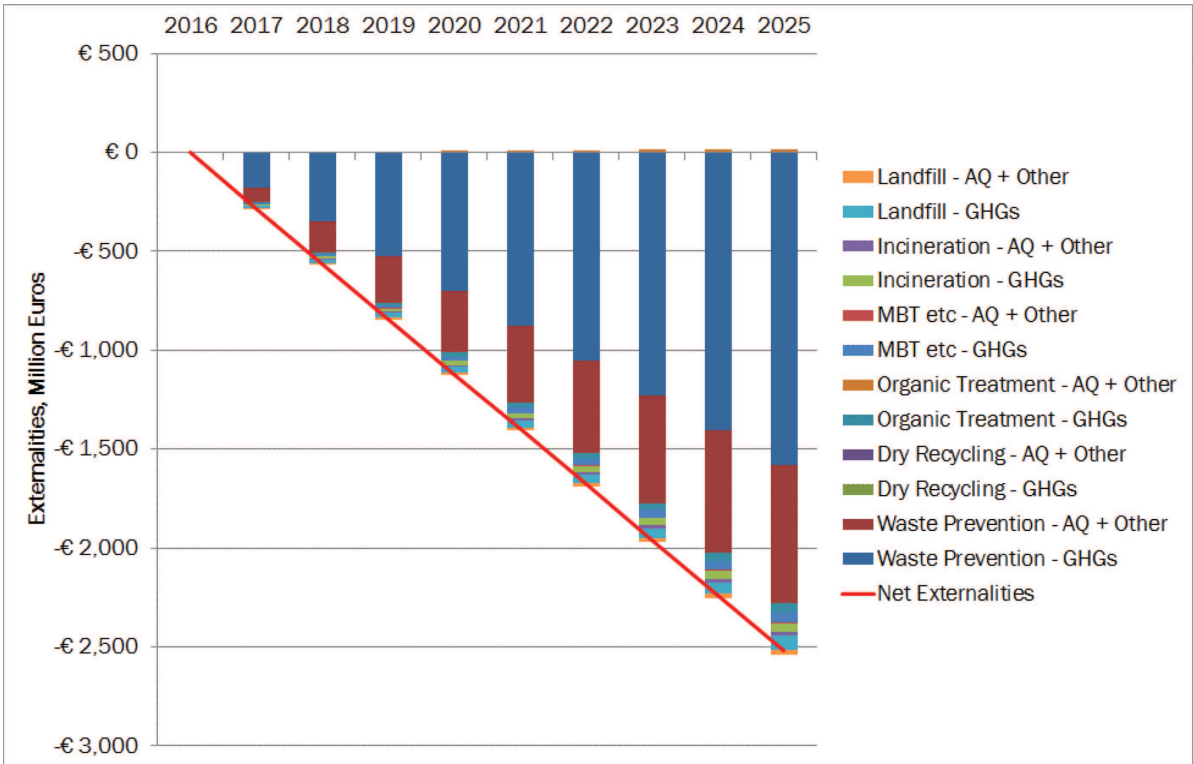
For manufactures and food services, food waste prevention represents a cost saving, lowering inputs for the same output, scaled up from option 3(a).

⁴⁸ Taking into account the fact that this modelling exercise only looks at municipal food waste – if then factoring in all food waste from manufacturing to households (including industrial waste) this benefit could be as high as €700 million.

For retailers and food producers a the reduction in demand could represent up to 0.7% per year (due to this measure) over the 9 years of implementation. Thus, while the economic impacts are proportionately higher if moving from 15% reduction to 20%, a more rapid reduction in food waste, and subsequent reduction in sale of certain food products would likely have a more dramatic negative impact on those producers affected, as they would have less time to make a transition to the new situation, i.e. finding other markets for their products, diversifying etc.

Using the model, this leads to proportionately higher net benefits, as shown in the figures below.

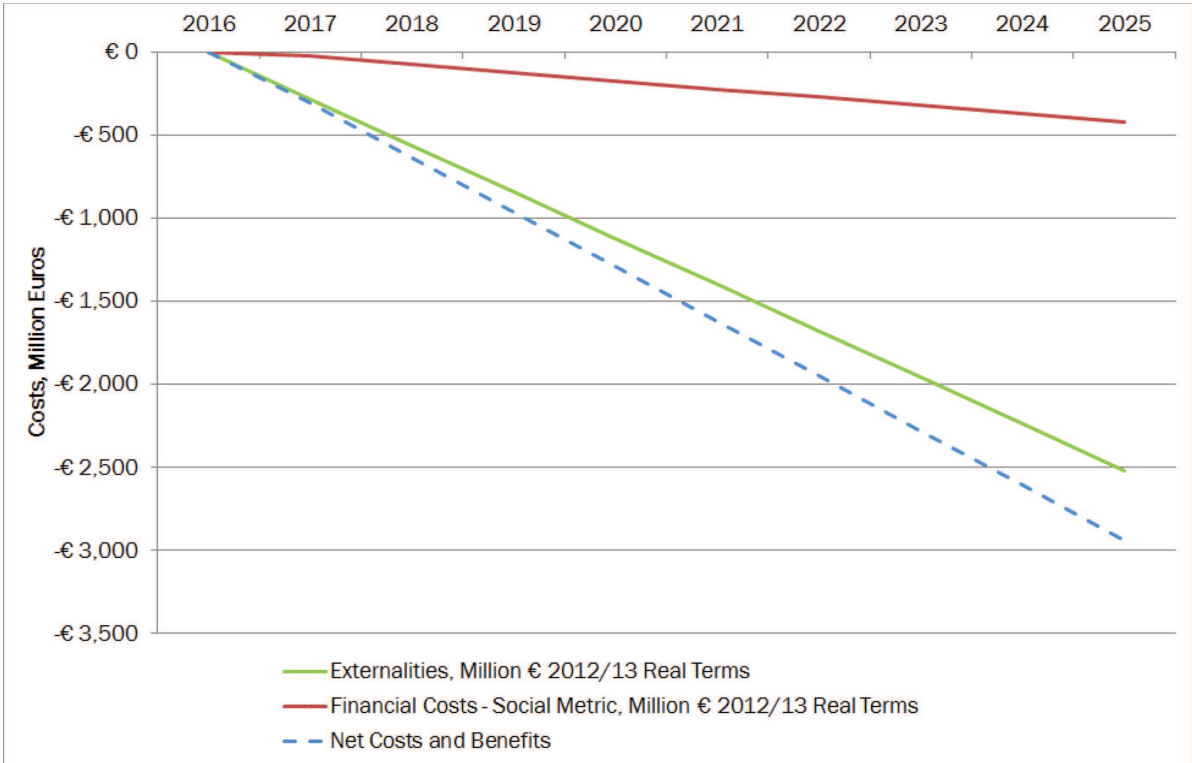
Graph 8: Scenario 1 - Environmental Externalities for the EU for option 3(b) (million €)



The total savings in economic terms for EU for the 20% reduction linked to environmental costs associated with GHG emissions and air pollution are around **€2.5 billion per year by 2025**. Thus, the net position is very favourable as the benefits far exceed any costs in all years after implementation in 2016.

The figure below shows the results of both the cost savings and the environmental externalities together:

Graph 9: net cost benefits, option 3(b) (million €)



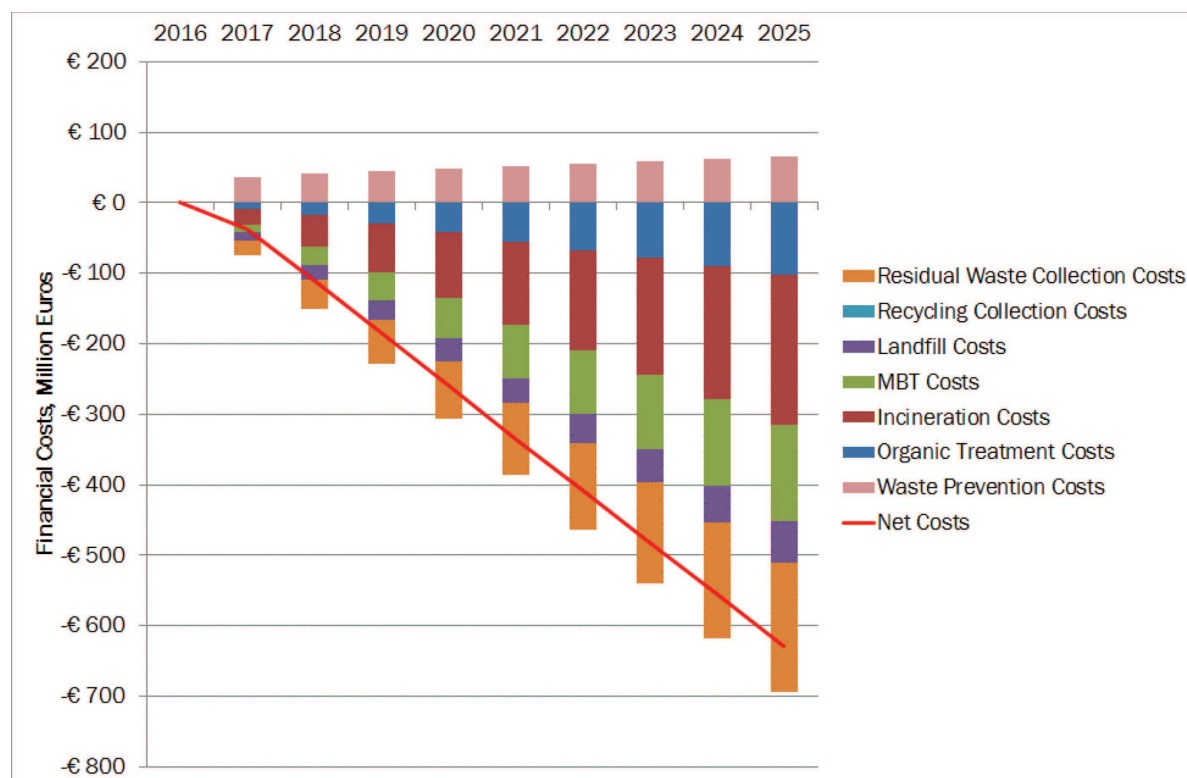
5.3.3. Option 3 (c)

A 30% reduction in food waste from 2016 – 2025, across the manufacturing, retail/distribution, food service/hospitality and household sectors, where food waste is defined as "Food intended for human consumption, lost from the food chain.", not including food diverted to animal feed, or sent for redistribution.

Note: While the analysis of this option follows the same lines as that of the 15% and 20% target options, it should be considered with more caution, as food waste reductions of this magnitude, within this time frame, are unprecedented. That does not mean that such reductions are not feasible, only that it cannot be assumed that the observed low costs and relative ease with which early reductions in food waste can be made, can continue beyond what has so far been seen (i.e. around the 20% level). In other words, the assumption of constant marginal costs for waste prevention, will at some point break down and marginal costs will increase but there is little clarity on where such thresholds may bite. That said, even if the costs do increase, it may still be seen as economically and environmentally desirable. Also, it is demonstrably not impossible to bring food waste down substantially, well beyond 30%, as the difference in observed food waste generation is much greater than this number.

In basic terms, for this measure, the implementation costs are higher, and so are the associated net benefits (see figure below) (considering a higher number of tonne reductions)

Graph 10: Net costs of implementation option 3(c) (at €17 per tonne prevented waste)



Again the costs of preventing food waste is outweighed by the relatively high costs of managing waste, even when the highest estimate of implementing a food waste prevention program is used. This figures are per year, not cumulative, and demonstrate that by 2025 there would be **net implementation benefit of reaching the 30% target of up to €630 million per year by 2025.**⁴⁹

To achieve the proposed 30% reduction, the **direct implementation cost would be around €66 million per year**, across all Member States.

Impacts

Environmental: Under option 3(c), the Environmental benefits are proportionately higher:

- 35 Mt of food waste reduced
- 21,500km² of land
- 66 Mt CO² eq.

Economic: A 35Mt reduction in food waste represents around €71 billion in value. For consumers the 20% reduction represents a value at the higher end of the scale of €140 per capita, per year, in cost savings.

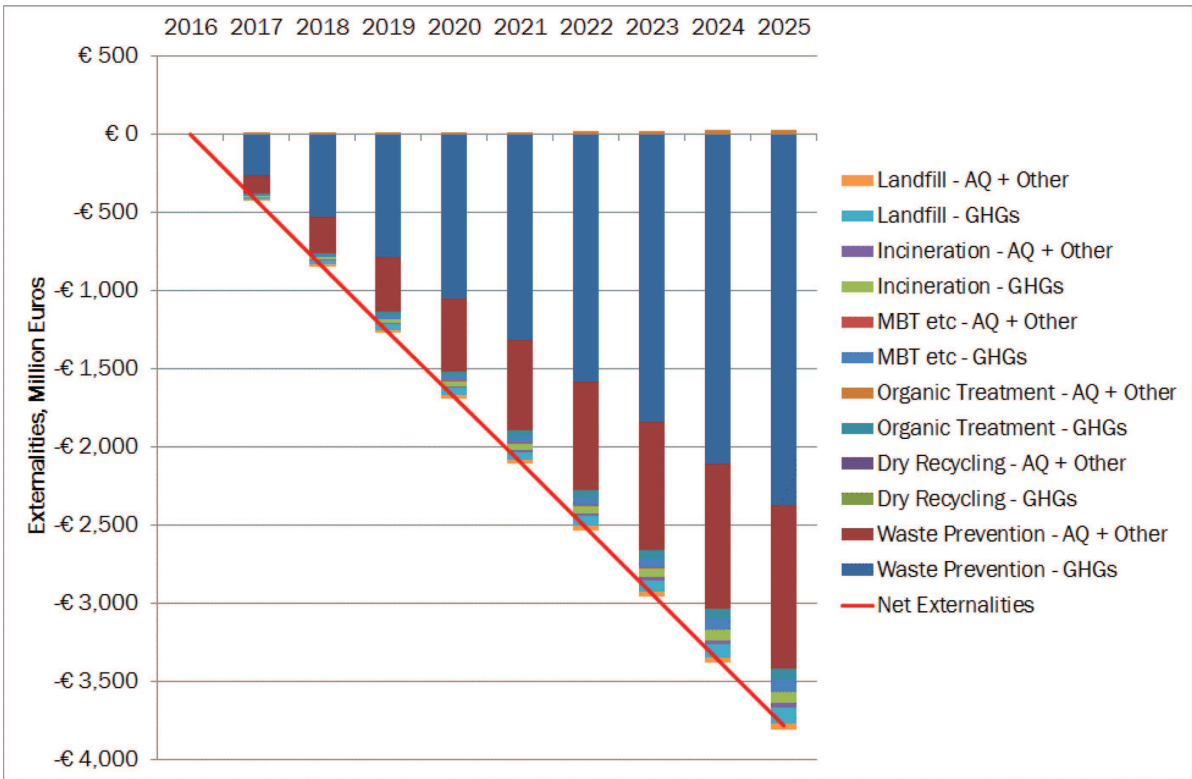
⁴⁹ Taking into account the fact that this modelling exercise only looks at municipal food waste – if then factoring in all food waste from manufacturing to households (including industrial waste) this benefit could be as high as €700 million.

For manufactures and food services, food waste prevention represents a cost saving, lowering inputs for the same output, scaled up from option 3(a).

For retailers and food producers a the reduction in demand could represent just above 1% per year (due to this measure) over the 9 years of implementation. Thus, while the economic impacts are proportionately higher if moving from 15% or 20% to 30%, a much more rapid reduction in food waste, and subsequent reduction in sales of certain food products would likely have a more dramatic negative impact on those producers affected, as they would have less time to make a transition to the new situation, i.e. finding other markets for their products, diversifying etc.

Using the model, this leads to proportionately higher net benefits than either other option, as shown in the figures below.

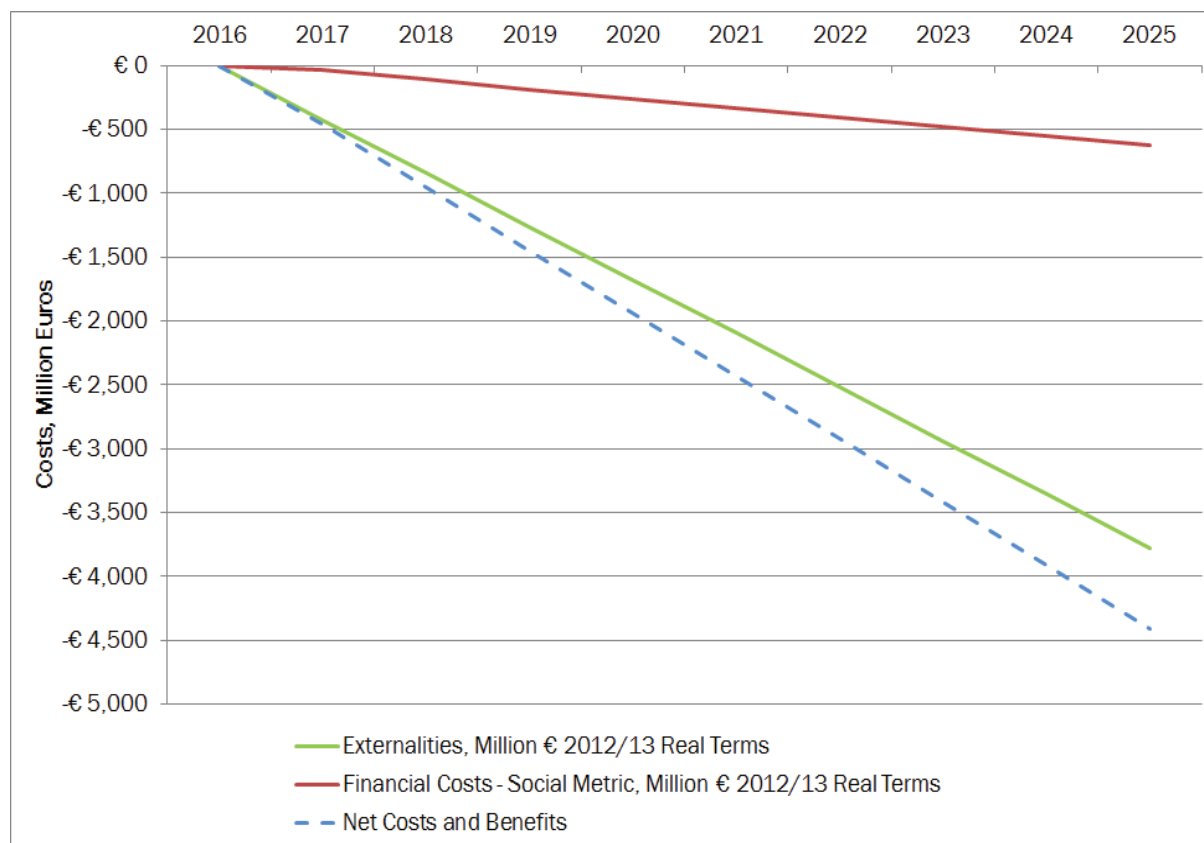
Graph 11: Scenario 1 - Environmental Externalities for the EU for option 3(c) (million €)



The total savings in economic terms for EU for the 30% reduction linked to environmental costs associated with GHG emissions and air pollution are around **€3.75 billion per year by 2025**. Thus, the net position is very favourable as the benefits far exceed any costs in all years after implementation in 2016.

The figure below shows the results of both the cost savings and the environmental externalities together:

Graph 12: net cost benefits, option 3(c) (million €)



Option 3(a)/3(b)/3(c) - Summary

Figures

- *Implementing a 15% target from 2016-2025 would result in:*
 - A direct implementation cost of **€33m per year**;
 - A net cost of implementation (taking account of savings in waste management and treatment) reaching **-€315m per year by 2025 (i.e. a net benefit)**;
 - A **total saving of 76.5Mt of food**, with the annual saving reaching **17 Mt per year in 2025** (with this saving continuing in future years at a reduced implementation cost⁵⁰);
 - A value of food waste saved of **€155 billion in total**, peaking at **€35 billion in 2025** (with this saving continuing at that level in future years at a negligible implementation cost);
 - **10,800km² of land** freed up for other uses;

⁵⁰ It is assumed that if a food waste reduction measure is successful, the beneficiary will not immediately revert to previous behaviour the following year. In some cases, such as technical innovation, logistical improvements, reduced fridge temperatures etc. savings could be permanent, in others, such as advice on use of left-overs, food purchase planning or other education campaigns, some continued activity might be need to remind/maintain benefits.

- A reduction of GHG emission reaching **33 Mt CO² eq. per year by 2025**;
- Economic savings linked to environmental costs associated with GHG emissions and air pollution reaching **€1.8 billion per year in 2025**. (with this saving continuing in future years at a negligible implementation cost)
- *Implementing a 20% target from 2016-2025 would result in:*
 - A direct implementation cost of **€44m per year**;
 - A net cost of implementation (taking account of savings in waste management and treatment) reaching **-€420m per year by 2025 (i.e. a net benefit)**;
 - A **total saving of 104Mt of food**, with the annual saving reaching **23 Mt per year in 2025** (with this saving continuing in future years at a reduced implementation cost);
 - A value of food waste saved of **€209 billion in total**, peaking at **€47 billion in 2025** (with this saving continuing at that level in future years at a negligible implementation cost);
 - **14,400km² of land** freed up for other uses;
 - A reduction of GHG emission reaching **44 Mt CO² eq. per year by 2025**;
 - Economic savings linked to environmental costs associated with GHG emissions and air pollution reaching **€2.5 billion per year in 2025**. (with this saving continuing in future years at a negligible implementation cost)
- *Implementing a 30% target from 2016-2025 would result in:*
 - A direct implementation cost of **€66m per year**;
 - A net cost of implementation (taking account of savings in waste management and treatment) reaching **-€630m per year by 2025 (i.e. a net benefit)**;
 - A **total saving of 157Mt of food**, with the annual saving reaching **35Mt per year in 2025** (with this saving continuing in future years at a reduced implementation cost);
 - A value of food waste saved of **€317 billion in total**, peaking at **€71 billion in 2025** (with this saving continuing in future years at a negligible implementation cost);
 - **21,500km² of land** freed up for other uses;
 - A reduction of GHG emission reaching **66Mt CO² eq. per year by 2025**;
 - Economic savings linked to environmental costs associated with GHG emissions and air pollution reaching **€3.75 billion per year in 2025**. (with this saving continuing in future years at a negligible implementation cost)

In total, from 2016-2025:

- *Every €1 spent on food waste reduction will have provided:*

- 265kg food waste prevented, with a value of €535⁵¹;
 - €9 of municipal waste costs are saved and;
 - €50 of economic savings linked to environmental costs associated with GHG emissions and air pollution.
- UK experience suggests for the nine year period 2016-2025, a 15% waste prevention target would be achievable. A 20% target would be more challenging, but feasible. It is unknown if 30% would be achievable, but it would be a very ambitious target.
 - In all cases a concerted policy effort would be needed, which would entail significant initial costs, and require public/private coordination. These costs, however, are outweighed by the savings to the public purse from reduced costs needed to handle food waste as prevention is actually the cheapest way of dealing with food waste available.
 - The net benefits to households, retailers, manufacturers and the food service sector are also very high.
 - Reduced food waste, will mean higher disposable income for EU consumers – money that can be spent in the food sector, or elsewhere in the economy. It will mean a more efficient and competitive food service and manufacturing sector.
 - At the same time a successful programme would mean lower sales, which could impact negatively on some parts of the food production sector. This could be compensated in some cases with a growing export market and a more competitive food sector, and evidence also suggests consumers who reduce food waste are 'trading up', i.e. purchasing higher value foods with some of their savings.
 - The environmental benefits from setting targets for food waste are also compelling, with very significant reductions in land pressure and GHG emissions likely.
 - In financial terms, the net savings associated with collecting and managing municipal waste and for environmental damage associated with emissions to air come out at around €2.2 billion per year by 2025 under option 3(a), €2.9 billion under option 3(b), and €3.75 billion under option 3(c), although there is decreasing certainty as to the reliability of these savings with the increasingly higher targets.

Pros

- Quantitatively addresses anticipated increase in food waste quantities
- Allows for country-specific and culture-specific adaptability; methods for achieving targets would be decided at the MS level
- A quantitative, time-bound target for reducing food waste would lead to action in all Member States within the time frame called for politically.
- Target will both raise awareness and mobilise resources for implementing reduction strategies.
- Will help with monitoring of progress of food waste prevention.
- Aligns with other legislation/targets. i.e. achievements in food waste prevention via concrete

⁵¹ Assumes progressive reduction in food waste from 2016-2025 from zero to the target level. This is then summed up and divided by the total cost of implementation. i.e. for 15%: 17Mtx4.5 divided by €32x9. Value of one tonne of food waste assumed to be €2022. (A conservative figure coming from the 2010 Commission preparatory study)

targets would contribute to the overall goals of the revised Waste Framework Directive and support the proper implementation of the waste hierarchy.

- Every € spent leads to considerably bigger savings for the EU economy.

Cons

- Direct initial costs for MS for carrying strategies for food waste prevention, through National Waste Prevention Programmes (although no additional cost for those who have already launched successful strategies).
- Implementation costs for industry, determined by the food waste prevention strategies utilised to meet targets.
- Potential loser for some producers if waste reduction leads to direct reduction in demand for food.

Note: For those Member States falling below the threshold point of food waste generated per inhabitant, (the bottom quartile) and therefore exempt from meeting the target, there would be no costs or benefits associated with this option. (See last part of section 4, 'Setting a threshold point')

5.3.4. Option 3 (d)

A national non-binding, aspirational objective of a 30% reduction in food waste from 2016 – 2025, across the manufacturing, retail/distribution, food service/hospitality and household sectors, where food waste is defined as "Food intended for human consumption, lost from the food chain.", not including food diverted to animal feed, or sent for redistribution.

Implementation costs

The implementation costs of this option depend on the extent to which Member States strive to achieve the objective. If an concerted effort is made to reach the target, then the cost would be the same as seen in option 3(c), (i.e. €66m per year Europe-wide) with a net cost ranging from cost neutral (if no action is taken) to a net benefit of up to €630m per year by 2025. In combination with option 2, and with those actions being undertaken already (as outlined in the baseline scenario) this option could offer a significant additional incentive to reduce food waste, particularly if the potential benefits of food waste prevention activities uncovered by this impact assessment, were effectively disseminated to Member States. i.e. evidence that shows that money spent on successful food waste prevention leads to net benefits, through savings from managing food waste that would have been produced.

Impacts

The environmental, economic and social benefits of this option depend on the extent to which the objective is achieved. If fully achieved, then the impacts would be identical to those outlined in option 3(c). The milestone to halve certain streams of food waste by 2020, set in 2010 in the Roadmap to a resource Efficient Europe, has contributed to encouraging the setting of food waste reduction targets in five Member States, so putting in place a more concrete objective, within the revised Waste Framework Directive, would be likely to stimulate the majority of Member States to take action. This option, while not binding, does have the advantage of setting out a time frame for action, which could influence national

policy making. Overall this policy option is considered to be a valuable addition when set against the baseline actions already foreseen, and in combination with option 2.

Summary – option 3(d)

In combination with the baseline actions being taken already, and with better national reporting on food waste, (option 2) and if established officially within the Waste Framework Directive, national food waste prevention objectives could give Member States the stimulus needed to take food waste prevention seriously, and to prepare strategic approaches to addressing it.

Pros

- Will establish an official and specific objective for Member States to aim for.
- Will raise awareness of food waste levels, and keep it highlighted as an important issue
- Can be used to call for Member State reporting on food waste prevention activities.
- Leaves Member States the flexibility and freedom to approach the target as they see fit.

Cons

- Less certain of achieving the impact assessment objectives than binding measures.
- Could therefore miss opportunity to use this waste stream as a resource, and to reduce environmental impacts.

Box 6: Stakeholder views – how they have been taken into account.

In general the views towards mandatory reporting were negative from the industry, with other stakeholders, including governmental organisations rather positive. The industry fear that they themselves would be forced to undertake full reporting of all food waste produced. In reality this is not what is being proposed by Option 2, but rather that Member States would be asked to undertake sampling of food waste at different levels, and that industry would be invited to help by providing their existing data.

In relation to binding targets, the response is similar, generally negative from the industry side, with strong support from NGOs, and from those governmental organisations that replied. (Note: only nine Member States replied specifically, of those one was openly against binding targets, and one openly in favour, with all others remaining non-committal.)

The key concerns raised in terms of targets were:

- There is insufficient data on which to monitor a target

This has led to the proposal that the start date for a food waste prevention target would be set after more harmonised data has been collected, in 2016.

- The target would not take into account efforts already made.

This has been accepted - those Member States that have already made efforts to reduce food waste could have these reductions recognised by setting an early baseline date.

- The target might not be achievable for those who have very low food waste already
A threshold level has been set below which not reduction would be needed.
- For retailers whose food waste is already very low, they fear being unable to meet any imposed target.

The proposed reduction is for a percentage of total food waste from manufacturing to consumption, not by sector – Member States, working with the food chain sectors, have the flexibility to implement their reduction plans as they see fit. Retailers, while not wasting a high proportion of food directly themselves, do nonetheless waste a significant quantity of high value edible whole food items, and are also very influential in some of the drivers and causes of food waste in other parts of the food chain.

In any case the option for a binding target has been rejected in favour of setting non-binding national objectives for food waste prevention.

6. COMPARING THE OPTIONS

Table 4: Comparison of impacts for policy options, by 2025.

	Option 2: Mandatory reporting	Option 3(a) Reporting+ Binding target: 15%	Option 3(b) Reporting+ Binding target: 20%	Option 3(c) Reporting+ Binding target: 30%	Option 3(d) Aspirational, non-binding national objective for food waste prevention: 30%
Implementation costs	around 5 million Euros per annum	around 33 million Euros per annum	around 44 million Euros per annum	around 66 million Euros per annum	Between 5 and 66 million Euros per annum depending on take-up
Financial savings from reduced waste management costs	+	around 350 million Euros per annum	around 460 million Euros per annum	around 630 million Euros per annum	up to 630 million Euros per annum
Climate and other environmental benefits	+	around 1.8 billion Euros per annum	around 2.5 billion Euros per annum	around 3.75 billion Euros per annum	up to 3.75 billion Euros per annum
Value of food waste saved	+	around 35 billion Euros per annum (broadly 70 Euros per person)	around 47 billion Euros per annum (broadly 95 Euros per person)	around 71 billion Euros per annum (broadly 140 Euros per person)	up to 71 billion Euros per annum (broadly 140 Euros per person)

Feasibility	++	++	+	≈	++
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Magnitude of impact as compared with the baseline scenario: ++ strongly positive; + positive; – – strongly negative; – negative; ≈ marginal/neutral; ? uncertain; n.a. not applicable. Figures are given for 2025, but ratios of benefits to costs are not sensitive to the time profile chosen.

In relation to the specific objective set for this exercise, "To reduce food waste at all stages of the food chain in the EU", the options can be ordered as follows, from the least likely to reach the objective, to the most likely:

- i. Option 1
- ii. Option 2
- iii. Option 2 + 3

Options 2+3(a), 2+3(b) and 2+3(c) and 2+3(d) offer very significant potential environmental benefits, and savings for the EU economy in terms of both not having to manage waste, and associated with considerable reduced environmental damage. These relatively rapid reductions in food waste, would, however, be initially expensive to set up, with coordinated waste prevention activities being required from Member States, and would lead to a reduction in demand for food at EU level. This reduction in demand is likely to be counterbalanced by the market, but there could still be negative impacts on the incomes of some producers. (alongside the benefits to the economy of efficiency savings and increase consumer disposable income). These options would be likely to significantly contribute to achieving the result of reducing food waste, but the binding nature of 2+3(a)-(c) could cause implementation issues. Food waste prevention is, by its nature, multifaceted, (in that there are a number of different drivers and causes) and it is therefore more complex than any other existing targets set on waste at national level. Even if a Member State acts in good faith to prepare and implement a food waste prevention strategy, it cannot be guaranteed that they will meet any specific target precisely (indeed, they could overshoot it).

Option 2 could stand alone, and given the significant potential environmental and economic benefits of food waste reduction, seems likely to yield results as the true value and levels of food waste are better defined. However, alone option 2 is unlikely to deliver in the time frame stipulated by the various political communications and resolutions mandating this work – i.e. seeking to get the rise in food waste under control by 2020-2025. Combined with option 3(d), (voluntary target) however, option 2 is significantly more likely to deliver results in time, as Member States will have a clear objective set within waste legislation. (albeit non-binding.)

Options 1 alone is likely to help with reducing food waste in time, but even more than with option 2 and 2+3(d), given current trends, it is highly unlikely to bring food waste down before 2025. Under these options the potential 'quick wins' in terms of environmental and economic benefits from taking action of food waste would not be realised until a later time.

7. PREFERRED OPTION

There is a very strong case for establishing an EU wide standardised methodology for food waste data collection and ensuring reporting by Member States in relation to this (option 2). Without such accurate measurement of food waste other actions cannot be considered, and in comparison to the scale of the problem and the potential environmental and economic

benefits, the cost of implementation are insignificant. **Option 2 is therefore considered essential.**

Any of options 3(a), 3(b) or 3(c) in combination with option 2, offer tremendous potential environmental and economic benefits. These options also make sense in terms of Article 11.4 of the Waste Framework Directive (that says the Commission should examine the existing targets⁵² ‘with a view to, if necessary, reinforcing the targets and considering the setting of targets for other waste streams’) given the that food waste is one of the principle components of municipal waste and that as present the waste framework directive is having little impact of total levels of food waste generation. However, the binding nature of these options, and the relative uncertainty in relation to meeting the targets within a fixed time-frame, means they should only be considered if all other avenues have been explored.

Option 3(d) however, is both in line with the level of political will and ambition shown by the Commission, Parliament and 7th EAP, and is in line with the proportionality principle. It sets a very clear objective for Member States, makes it clear that this is an important political issue, but is not overly heavy handed, giving flexibility to Member States to adapt their food waste prevention actions as needed. Given the balance of these factors **the preferred approach is for option 3(d) setting national food waste objectives, accompanied by option 2.**

8. MONITORING AND EVALUATION

- The progress indicators for food waste prevention will be the levels of food waste generated at each stage of the food chain, in all Member States. This data collection process would be established over the coming 2 years and could be implemented via national reporting to EUROSTAT (collected on a bi-annual basis through existing reporting structures.)
- In terms of the operation objective the analysis supports an operational objective to halt the rise in the generation of food waste in the EU and to reduce the levels generated by 30% by 2025.
- Monitoring: The data will be collected by Member States via a series of sampling actions as is currently the case with a number of other data streams, but will be collected specifically for food waste. This data will allow for comparative time series to be compiled on food waste levels at different stages of the food chain. The levels can be monitored easily and progress can be reported against population changes and changes in affluence for information.
- An ex-post evaluation of real effects of setting the objective could be carried out in for 2025. The scope of this evaluation would be to undertake a cost benefit analysis of waste prevention activities undertaken in different Member States, to verify if the costs of actions is outweighed by the savings in food waste value, the costs of dealing with food waste, the health of the food production sector and changing in patterns of consumer spending. This evaluation could help refine future food waste prevention targets, if they were considered useful.

⁵² Article 11.2 of the Waste Framework Directive includes a legally binding target to be achieved by 2020: a 50% ‘preparation for reuse and recycling’ target for municipal was.

- Member States would also be requested to provide a chapter in their waste prevention programmes, specifically on food waste.