



Policy recommendations to improve food waste prevention and valorisation in the EU

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List of abbreviations

- VA** Voluntary Agreement
- UTP** Unfair Trading Practices
- CB** Consumer Behaviour
- AF** Animal Feed
- AD** Anaerobic Digestion
- PWP** Piloting Working Platform
- LCA** Life Cycle Analysis
- LCC** Life Cycle Cost analysis
- SDG 12.3** Sustainable Development Goal 12.3
- FLW** Food loss and waste
- FW** Food waste
- CB** Consumer Behaviour
- HHFW** Household Food Waste

Executive summary

Currently, one third of annual global food production is wasted per year. This amounts to 1.3 billion tonnes of wasted food, representing the emission of 4.4 Gt CO₂ per year. If food waste was a country, it would be the third-largest CO₂ emitter in the world, after China and the United States (FAO, 2011). Globally, food waste represents an enormous loss of a valuable resource with unacceptably high economic, environmental and social impacts. Reducing food waste should therefore be an urgent policy priority.

This cross-sectoral problem is partly due to lock-ins in the food chain in relation to misfits between supply and demand and how these are managed between chain actors. The added value to supply chain actors of implementing food waste reduction measures is often not apparent to their own benefit, due to a lack of awareness or knowledge of the economic and environmental benefits seen from a full chain perspective. The cross-sectoral nature of food waste underscores the need to target all levels of the supply chain within an integrated approach when defining food waste reduction policies in order to ensure maximum impact and collaboration between actors.

This report presents a series of policy recommendations based on research conducted within REFRESH to reduce food waste along the whole supply chain, and improve the management of surplus food and food waste flows at the European level. The broader base for this summary of policy recommendations is published as REFRESH policy briefs and research reports in three areas:

- 1) Consumer behaviour**
- 2) Integrated supply chain policies (including Unfair Trading Practices and Voluntary Agreements)**
- 3) Valorisation**

Based on the REFRESH findings in the selected three key policy impact areas, the following main policy recommendations could be formulated.

On Consumer behaviour

Consumer behaviour is regarded as the resultant of motivation, ability and opportunity within the practice of household food management. REFRESH recommends the following when setting policy priorities:

- (Re)Set the social norm
- Use education to teach respect for food & cooking skills
- Encourage a mindset of flexibility in light of unforeseen events
- Take complexity and multiple-goals into account within communication / campaigning
- Consider interventions based on regulation, economic instruments and nudging approaches
- Use directive guidance in on-pack information to support consumer ability/skills development
- Utilize user-friendly IT tools, include incentives for using new technologies

- Take consumer acceptance into consideration, especially for novel solutions
- Monitor and evaluate interventions to gain insights about the effectiveness and allow for adjustments.

On Integrated supply chain policies (Voluntary Agreements & Unfair Trading Practices)

Voluntary Agreements (VAs) are self-determined commitments or pacts with qualitative and quantitative objectives, developed by private entities and/or other stakeholders in consultation with their signatories. They are used as alternative courses of action to traditional legislation and can be piloted by government officials, businesses or other actors. VAs can be used in addition to or independently from existing legislation. REFRESH recommends the following when setting policy priorities:

- Use voluntary and regulatory approaches to build flexible, transparent and collaborative supply chains that are better able to respond to the challenges of FW
- Understand the difference between countries' existing FW policies and the context they exist within
- Apply the Target-Measure-Act principle
- Ensure long-term financing and governance
- Establish an independent "third-party" to oversee the Voluntary Agreement
- Create an EU wide framework to support MSs establishing Voluntary Agreements

Unfair Trading Practices (UTPs) are broadly defined as practices that grossly deviate from good commercial conduct within trading relations between two parties, often as a result of an unequal balance of power in that relationship. Whereas VAs can be seen as a positive incentive towards supply chain collaboration, UTPs can be regarded as negative incentives.

REFRESH recommends the following when setting policy priorities:

- Develop a clear and easy to follow code of practice to govern trading behaviour in the food supply chain
- Provide sufficient resources to implement measures to investigate and prevent infringements
- Publish proven cases and fine in relation to turnover
- Provide financial support for the Adjudicator based on industry levy rather than fines
- Protect anonymity of case filing food business operators and accept civil society's evidence
- Include international and indirect suppliers in tackling UTPs, in- and outside EU MSs, and ensure that all covered by the code are aware of their rights

Valorisation

Valorisation focuses on the exploitation of (un)avoidable side-flows from the food supply chain that do not have a primary process function towards human consumption. This can be achieved via a feedback through animal production or ingredient processing or other highly valued applications. The valorisation approach follows the food-use hierarchy as adopted by REFRESH.

REFRESH recommends the following when setting policy priorities:

- Identify valorisation options using the REFRESH Top Waste streams and the FoodWasteExplorer tools
- Perform case-specific Life Cycle Analysis (LCA) assessments and Life Cycle Cost Analysis (LCC) based on the food use hierarchy for valorisation options, to compare environmental benefits and economic viability. The use of the FORKIFT tool developed within REFRESH can support stakeholders' decision making on investments and selection of measures.
- Ensure technical feasibility and (future) legislative compliance of new valorisation options
- Take into account that economically viable valorisation of side flows needs to consider available volume of side flows and logistics for collection and processing
- Raise awareness across the food supply chain including consumers on the environmental and economic impact of food waste, and the opportunities for reduction related to dietary changes (e.g. less meat and consumption of more seasonal produce)

Call for integrated policies for food waste and sustainable food systems in the circular economy

This report focuses on the three key policy areas (consumer behaviour, integrated supply chains, and food valorisation) to provide policy recommendations that are backed by project-based evidence. However, the food waste problem is a vast and complex issue that is transversely and (in)directly affected by numerous (other) policies areas. There is a need for more integrated policies for food waste and sustainable food systems in the circular economy. To achieve maximum impact on preventing and reducing global food waste, policy makers and other stakeholders will need to work on an integrated policy framework for sustainable food systems, that tackle food waste at its roots. Therefore, REFRESH calls for:

Based on the outcomes of the Project, REFRESH calls for integrative policy action on food waste, including:

- Development of integrated policies to prevent and reduce food waste and to promote sustainable food systems
- Development of integrated supply chains
- Stimulate sharing of data (data transparency) to improve supply chain collaboration, through baseline and impact measurements on business, sector and national level.
- Set priority action on the largest impact areas, by taking the food use hierarchy as leading principle, considering trade-offs and benefits of different

valorisation options from an integrated perspective, including environmental, economic and social aspects.

- Focus on:
 - Those food products that have the highest impact on food waste generation and reduction, such as bread and fresh fruit and vegetables (highest volumes) as well as animal-based products (highest environmental impact).
 - Capability to absorb 'gluts' in the food system, the desirability of year round availability of fresh produce, promotion of head-to-tail usage within animal production and consumption as well as investigating the impact of dietary changes on food waste prevention.

A number of issues were identified that comprise elements of a roadmap towards an integrated food waste policy for the EU. These issue areas indicated below, structured by the 'target – measure – act' principle:

TARGET:

- **Having stronger food waste reduction targets** would create a stronger incentive for Member States to reduce food waste
- **Voluntary Agreements** and setting binding targets for Member States holds strong potential for both food waste reduction and establishing sustainable food systems.
- Getting people to realise the **true price of food** is a key policy driver towards sustainable food systems → incentivising for food systems production, and penalizing for wasting or dumping (based on a polluter pays scheme). Such a scheme exists for plastics in the UK, it could be replicated for food waste.

MEASURE:

- **Measuring and monitoring food waste data has the potential to feed into projects that could drive food waste reduction.** Identify drivers of food waste reduction, and establish a baseline to monitor the progress achieved.
- **Make public reporting of food waste compulsory** for the public and private sector: "*When you report on waste, you act on it*".

ACT:

- **Design and use tools and technologies** (e.g. ICT based applications) that will create innovative solutions to monitor and forecast the food demand by working with the dynamic of the food supply chain, driven by private sector actors.
- **Target goal-oriented innovations**, related to: business models and business practices, technology, research, holistic approaches to UN SDGs, and social innovations. These innovations should be inclusive, and should have quantifiable and measurable effects.

- **Introduce public (green) procurement** with transparent criteria and/or requirements, such as what can be done in schools e.g. green requirements, limiting the size of portions, etc.
- **Enhance education and awareness at all levels**, including better communication (school programmes, social and traditional media) and engagement of stakeholders.
- **Connect the consumer with primary production.** The consumers' wants and needs must be adapted to the reality of primary production and vice versa. Food producers have a responsibility to educate the public/consumers about the reality of primary production.
- **Impact carbon emissions. Carbon taxes and a functioning carbon trading system** would have a strong impact as it would drive systemic change, notably by setting higher CO₂ reduction goals.

Furthering the roadmap for impact, the following recommendations were noted for the new Commission:

- Action on food waste should start right away. At first, **consolidation of data**, including data at the local level, is needed before implementing any actions. The actions which will be decided should be focused on **achieving the SDGs** (12.3 but not only), and the topic of food waste should remain high on the EU's agenda. Getting Member States to see **SDGs and other targets as hard commitments**. For instance, national level reporting would help Member States become more active in tackling SDG 12.3.
- At the short or medium term, establishing a **food waste action plan**, containing a clear set of actions, part of the circular economy action plan. This plan should be aligned to the key related topics (hygiene, safety, nutrition), involving cross-sectoral teams. New priorities should be set at the EC's DG levels at the long term, including a priority focus given to an **integrated food systems strategy**.
- Establish an **integrated food policy legislation**, in synergy with a vice-president who would act in favour of the food policy and which can promote and organise more **inter-commission work**: for instance, aligning agricultural policies with health outcomes (e.g. the production of healthy food).
- **Better alignment of food policies with other policies**, by working alongside other commissioners, and ensuring there is more communication amongst all, especially concerning the tools that are available to them.

A number of suggestions on a more detailed level include the following:

- **Campaigns at the EU level**: support from the Commission could prove useful to set up campaigns. Retailers have already been invested in communication campaigns activities, but the Commission could use its influence to support and disseminate food waste prevention campaigns.
- **Best practices** that Member States should implement concerning **taxes**, and **subsidies** in the event of **redistribution of surplus food**.

- Proper review of the **competitiveness of the grocery and retail market across Europe**: having the EC consider these topics could avoid market distortion. There is only a small number of large scale buyers across the EU: a review of the market competition could help identify **priority areas for action** (UTPs, added value at the primary production stage).
- Strengthen legislation to **improve farmers' incomes**, and work at the primary production level to avoid the occurrence of Unfair Trading Practices at the short term
- **Standardisation on date marking requirements.**
- Establish **mandatory public procurement** in line with a food waste reduction target defined at the EU level.

Introduction

Context and objectives

The EU project REFRESH (Resource Efficient dRink for the Entire Supply cHain, 2015-2019) is a EU Horizon 2020 funded project taking action towards food waste reduction. The project's goal is to support Sustainable Development Goal 12.3¹ of halving per capita food waste at the retail and consumer level, reducing food losses along production and supply chains, reducing waste management costs, and maximizing the value from unavoidable food waste.

Amounting to 1.3 billion tonnes or 4.4 Gt CO₂ per year, food waste is a global concern. Considering that this figure represents one third of annual global food production, there is great potential for improving supply chain dynamics starting from food production all the way to unavoidable waste management processes in order to reduce food waste (FAO, 2011). The interconnectedness of the food value chain makes it necessary to consider an integrated approach towards addressing food waste, because actions from one supply chain actor reverberate up and down the food value chain (Aramyan et al., 2017; Parfitt et al., 2010).

For example, although according to the available data, the highest percentage of EU food waste is generated at the consumer level, it is also necessary to include the retail sector, because of its strong influence on the food supply chain and consumers' behaviour (Aramyan & Kuiper, 2009; Piras et al., 2016). Furthermore, the retail sector plays a dominating role in supply-demand dynamics which directly affect suppliers and farmers, e.g. through cosmetic standards and trading practices (Parfitt et al., 2010).

In addition to the environmental benefits of optimised supply chain dynamics for the reduction of food waste, implementing these measures is justified by a strong business case. Research conducted in 17 countries proved that half of businesses engaging in food waste prevention activities achieved a return on investment of at least 14 to 1². As such, SDG 12.3 is not only achievable with the investment of supply chain actors, but can also have positive economic returns due to enhanced production processes (REFRESH, 2019)³.

¹ "Cutting in half per capita global food waste at the retail and consumer level, and reducing food losses along production and supply chains (including post-harvest losses) by 2030"
Source: <https://sustainabledevelopment.un.org/sdg12>

² See the publication "The business case for reducing food loss and waste" by the Champions 12.3, available via <https://champions123.org/the-business-case-for-reducing-food-loss-and-waste/>

³ REFRESH, WRAP Global (2019). *Building partnerships, driving change - A voluntary approach to cutting food waste.* <https://www.eu-refresh.org/VABlueprint>

Outline

In the following sections and chapters, a short overview of EU policies that are relevant for food waste prevention and reduction is given, followed by the scope and approach used to build the REFRESH policy recommendations. In each of the key policy areas (consumer behaviour, integrated supply chains and valorisation plus the REFRESH call for integrated policies), a short overview is given on the presentation of the current situation, the recommendations based on REFRESH evidence and outcomes, and a further specification of elements of the recommendations.

Background: overview of EU policies related to food waste

Food waste is a relatively new policy area, as the first steps to define and evaluate the extent of the issue in the EU and internationally were taken by 2010, by the publication of the "Preparatory study on food waste across EU27 (Monier et al., 2010). Albeit the quantification identified gaps in available data and lack of harmonised monitoring methodologies, the findings sparked numerous actions. It also was not a EU specific issue, as in 2011, the FAO reported that globally approximately one-third of all food produced gets lost or wasted and is not consumed by humans. Responding to these staggering amounts of food losses and food waste, the EU became committed to tackle the problem, through several policy actions, including the following:

- In 2011, food waste as an EU policy issue was first mentioned in the adoption of the Roadmap to a Resource Efficient Europe⁴. The Roadmap aimed to halve food waste in the EU by 2020.
- In 2012, the European Parliament adopted a resolution on how to avoid food waste, which recommended that the European Commission take practical measures towards halving food waste by 2025 and asked Member States to develop national food waste prevention programmes⁵.
- In 2012, the research project FUSIONS⁶ (2012-2016) was funded by the European Commission and aimed to establish a European Multi-Stakeholder Platform to generate a shared vision and strategy to prevent food loss and waste across the whole supply chain through social innovation, and to establish a harmonised monitoring framework to quantify food waste and its environmental impact across EU-28.

⁴ COM(2011) 571: *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Roadmap to a resource efficient Europe.* <https://www.eea.europa.eu/policy-documents/com-2011-571-roadmap-to>

⁵ 2011/2175(INI): *How to avoid food wastage : strategies for a more efficient food chain in the EU.* <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52012IP0014&from=EN>

⁶ <https://www.eu-fusions.org/>

- In 2014, the European Commission launched an initial circular economy package. In the final action plan entitled “Closing the loop” (European Commission 2015⁷), food waste is identified as a priority area with an EU commitment to food waste reduction.
- In 2016, the European Commission launched the “EU Platform on Food Losses and Food Waste⁸” gathering EU institutions, experts from the EU, and relevant stakeholders to support the definition of food waste, identify prevention measures, share best practices, and evaluate progress made over time.
- In 2017, the European Parliament adopted a second own-initiative Resolution “Resource efficiency: reducing food waste, improving food safety⁹” with a clear position: “including a clear definition of food waste, a common method for measuring it, a legally binding 50% reduction target by 2030 and an objective of at least a 30% reduction by 2025 for EU countries”.
- In 2018, the EC adopted the revised Waste Framework directive¹⁰ that calls on the EU countries to reduce food waste at each stage of the food supply chain, monitor food waste levels and report back regarding progress made.
- In 2019, the Commission Delegated Decision on the common methodology and minimum quality requirements for the uniform measurement of levels of food waste was adopted¹¹.

EU policies also benefit from international initiatives that aim to mobilize action against food waste. The SDG target 12.3 on food waste reduction is an important international reference and part of the United Nations General Assembly resolution “Transforming Our World: the 2030 Agenda for Sustainable Development¹²”, composed of 17 goals and 169 targets, also known as “Global Goals”. This target aims to “halve per capita food waste at the retail and consumer levels, and reduce food losses along production and supply chains by 2030”. SDG 12.3 also leaves room for a broader implementation of the food waste target. The EU is also committed to achieving this goal. Among the most important international initiatives on food waste, the Champions 12.3 initiative that was founded in January

⁷ COM (2015) 614 : Communication from the Commission to the European Parliament, the Council, The European Economic and Social Committee and the Committee of the Regions : Closing the loop – An EU action plan for the Circular Economy. https://eur-lex.europa.eu/resource.html?uri=cellar:8a8ef5e8-99a0-11e5-b3b7-01aa75ed71a1.0012.02/DOC_1&format=PDF

⁸ See : https://ec.europa.eu/food/safety/food_waste/eu_actions/eu-platform_en

⁹ http://www.europarl.europa.eu/doceo/document/A-8-2017-0175_EN.html

¹⁰ Directive (EU) 2018/851 of the European Parliament and of the Council amending Directive 2008/98/EC on waste. <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L0851&from=EN>

¹¹ Commission Delegated Decision (EU) 2019/1597 of 3 May 2019 supplementing Directive 2008/98/EC of the European Parliament and of the Council as regards a common methodology and minimum quality requirements for the uniform measurement of levels of food waste. <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L:2019:248:FULL&from=EN>

¹² United Nations General Assembly resolution (A/70.L.1), 2015: Transforming our world: the 2030 Agenda for Sustainable Development. https://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E

2016. It is a coalition of executives from governments, businesses, international organizations, research institutions, farmer groups, and civil society that strive to accelerate progress toward achieving SDG Target 12.3 by 2030.

This series of policy actions shows that food waste is a cross-cutting issue, with strong interrelated implications related to food security, human health, economic development and environmental impact. REFRESH research (Wunder et al., 2018) demonstrated that opportunities for improvement in the prevention or management of food waste exist in ten studied policy areas, namely: waste and resource policy, hygiene and food safety, use of former food for animal feed, agriculture and rural development, fisheries policies, unfair trading practices, bioenergy, on-pack product information and date labelling, changing consumer behaviour and voluntary cooperation in the food chain.

As implicated by the list above, there is a broad range of EU policies which influence food waste generation, prevention and valorisation. This in turn implies that EU legislation related to food waste is very complex and scattered across multiple policy areas. Furthermore, policy differences can be found at the Member State level, such as regarding the further use of food batches that were withdrawn due to food safety requirements, or the design of rural development measures within the Common Agricultural Policy (CAP). Collaboratively addressing these differences at the Member State level to build a coherent EU policy framework would represent a step towards improving food loss and waste reduction.

Most importantly, the lack of an integrated food (waste) approach at the EU and Member State levels limits the ambition of the SDGs to achieve transformative change, including the food waste targets. Major conflicting objectives within different policy areas are not yet resolved, and will prevent the achievement of ambitious targets if they are not considered under an overarching perspective.

The absence of such an integrated food strategy leads to win-lose trade-offs between policy objectives, and creates barriers for the prevention or the valorisation of food waste.

Although the food waste problem has been addressed across the EU, there is a need to maintain momentum by fuelling EU and Member State discussions with policy instruments and recommendations tailored to the current political scene that will build new paradigms and help policy makers take action systemically.

The objective of this report is therefore to provide evidence-based recommendations to national and EU level policy makers that will help them meet the Sustainable Development Goal 12.3¹³ of halving per capita food waste at the retail and consumer level.

¹³"cutting in half per capita global food waste at the retail and consumer level, and reducing food losses along production and supply chains (including post-harvest losses) by 2030"

Scope and approach used to build policy recommendations

The REFRESH policy recommendations presented within this document are based on the outcomes of this four-year long project, which focussed on three key aspects driving both the generation as solutions to food loss and waste and to overcome its encountered (legislative) barriers. Figure 1 below illustrates the three phases carried out to ultimately develop policy recommendations for food waste prevention and valorisation. Within each of the three project phases, research and interactive policy workshops unveiled key findings that shaped the path towards the development of policy recommendations.

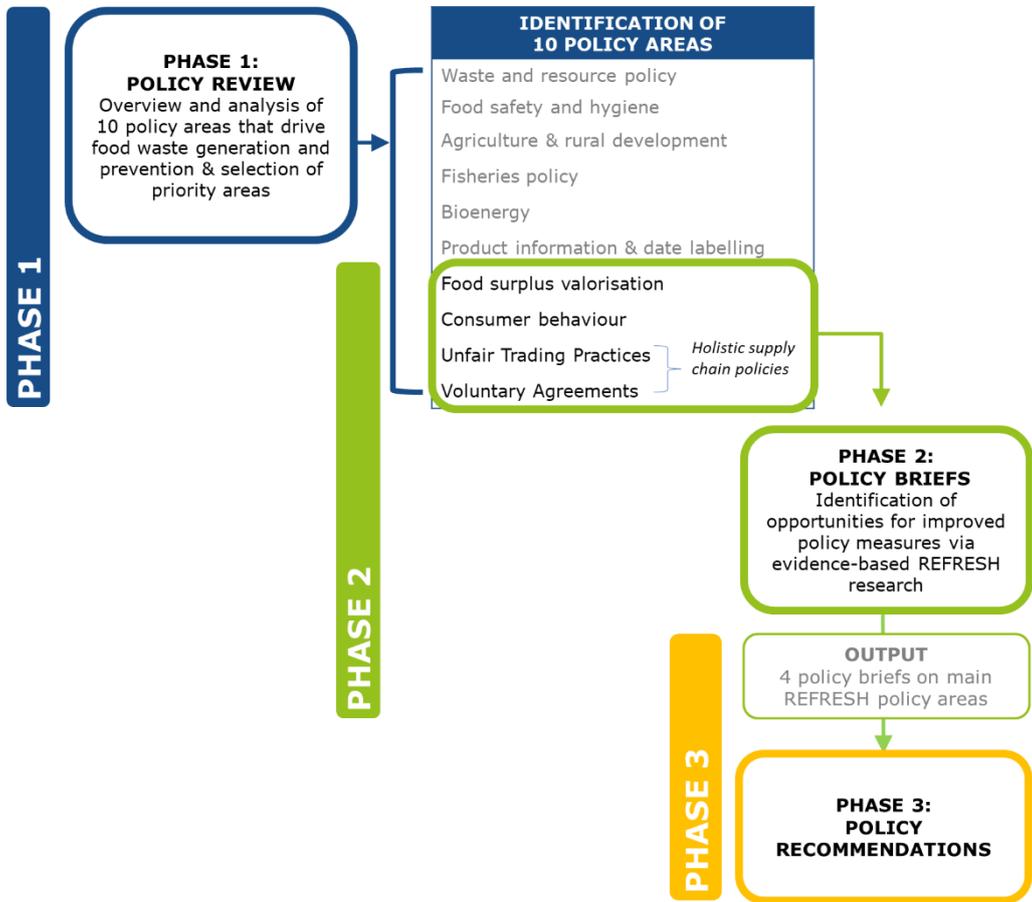


Figure 1: REFRESH approach to build recommendations

Within **phase 1** (2015-2016), background research was conducted including 1) studying the food supply chain in a bottom-up fashion to identify food waste drivers at each stage of the food chain and 2) carrying out a screening of relevant key EU policies affecting or driving food waste (REFRESH Deliverables D3.1 "Mapping food

waste drivers across the food supply chain¹⁴). Based on this screening, 10 EU policy areas were identified as most relevant to FLW.

In **phase 2** (2017-2018) these 10 policy areas were further analysed to provide an overview of the most relevant EU policies and instruments with an impact on food waste generation and/or prevention. It explained the relevance of the different policy areas at EU level and pinpointed the gaps, overlaps and unintended effects of EU regulation. Finally, it identified potential opportunities for improvement in each policy area and described the need for an integrated EU food policy (see REFRESH Deliverable D3.3 "Food waste prevention and valorisation: relevant EU policy areas"¹⁵)

The findings showed that food waste is generated along the entire food supply chain. The magnitude of the problem is a symptom of a multi-faceted dysfunctional supply chain, impacted by a multitude of policy areas, such as food safety, agriculture, energy, fishery etc. Evidence-based policy recommendations were developed further for those policy areas where REFRESH was most relevant, to provide as much added value as possible. Its relevance was linked to a number of criteria, including amongst others availability of supporting evidence from the REFRESH project, where there were windows of opportunity in the policy arena (e.g. upcoming new policy or legislation [revisions]), and where no other processes were yet engaged. These areas were selected after thorough analysis of the other outcomes of the project and challenged through a workshop with experts in the field of food waste¹⁶. This process helped justify the selection and gather input for the following three prioritised key policy areas:

1. Consumer behaviour
2. Integrated supply chain policies (including Unfair Trading Practices and Voluntary Agreements)
3. Food surplus valorisation

These policy areas are not exhaustive and not necessarily the only priorities relevant in tackling food waste. A major selection criteria is that they sit within the areas of interest and scope of the REFRESH Project. The project findings comprise the evidence base underlying the REFRESH policy recommendations.

¹⁴Full report, see: <https://www.eu-refresh.org/mapping-food-waste-drivers-across-food-supply-chain>

¹⁵ Full report, see: <https://www.eu-refresh.org/food-waste-prevention-and-valorisation-relevant-eu-policy-areas>

¹⁶ REFRESH Workshop "Sowing the seeds for short and long term improved EU policies for food waste: REFRESH Policy Workshop" November 8, 2017, Brussels, <https://eu-refresh.org/sowing-seeds-short-and-long-term-improved-eu-policies-food-waste-refresh-policy-workshop>

In **phase 3**, policy briefs for each of the priority policy areas were developed¹⁷. In addition to desktop research, feedback gathered at policy-specific platform meetings was used to validate results and integrate new findings into the briefs. This report highlights the main recommendations identified by articulating an overarching message for each policy area, supported with specific recommendations and project examples.

The full reports and policy briefs are all available online via the REFRESH website www.eu-refresh.org.

1) Consumer behaviour

Based on findings from:

- Wunder, 2019. REFRESH Policy Brief: Reducing consumer food waste¹⁸.
- Wunder et al., 2019. Policies against consumer food waste. Policy options for behaviour change including public campaigns¹⁹.
- Deliverable reports from REFRESH on Consumer Behaviour, including the causes and drivers of consumer food waste (D1.1 and D4.1), qualitative (D1.2) and quantitative (D1.4) consumer insights on food waste, household food waste measurements (D1.3), ICT tools (D1.5), on-pack information (D1.6) and valorization of food surpluses (D1.7), behavioural economic models (D4.4) available on the website www.eu-refresh.org.

2) Integrated supply chain policies (including Unfair Trading Practices and Voluntary Agreements)

Based on findings from:

- Sinclair Taylor et al., 2019. REFRESH Policy Brief: Regulating the role of Unfair Trading Practices in food waste generation²⁰.
- Burgos et al., 2019. REFRESH Policy Brief: Voluntary Agreements as a collaborative solution for food waste reduction²¹.
- REFRESH, 2019a. Building partnerships, driving change - A voluntary approach to cutting food waste²².

¹⁷ See: https://eu-refresh.org/results?field_type_of_result_tid=All&field_issues_tid=All&field_interesting_for_tid=All&field_work_package_tid=58&=Apply (Results, search under work package 3, publication is earmarked as 'Policy Brief')

¹⁸ <https://www.eu-refresh.org/reducing-consumer-food-waste>

¹⁹ <https://eu-refresh.org/node/907/>

²⁰ <https://eu-refresh.org/regulating-role-unfair-trading-practices-food-waste-generation>

²¹ <https://eu-refresh.org/voluntary-agreements-food-waste>

²² <https://eu-refresh.org/VABlueprint>

- Piras et al., 2018. Unfair Trading Practice Regulation and Voluntary Agreements targeting food waste: A policy assessment in select EU Member States²³.

3) Valorisation

Based on findings from:

- Bowman & Luyckx, 2019. REFRESH Policy Brief: Avoiding food waste through feeding surplus food to omnivorous non-ruminant livestock²⁴.
- Luyckx et al., 2019. The safety, environmental and economic aspects of feeding treated surplus food to omnivorous livestock²⁵.

²³ <https://eu-refresh.org/unfair-trading-practice-regulation-and-voluntary-agreements-targeting-food-waste>

²⁴ <https://www.eu-refresh.org/avoiding-food-waste-through-feeding-surplus-food-omnivorous-non-ruminant-livestock>

²⁵ <https://eu-refresh.org/technical-guidelines-animal-feed>

Presentation of the selected key policy areas

Within the scope of the REFRESH policy research, the dynamics of three policy areas were studied: **consumer behaviour**, **integrated supply chain policies** (focus on “**Voluntary Agreements**” and interventions against “**Unfair Trading Practices**” in the food supply chain), and **food surplus valorisation**.

Consumer behaviour (CB) is regarded as the resultant of motivation, ability and opportunity within the practice of household management of food. REFRESH has produced research results on how consumer behaviour on food loss and waste can be framed, measured, compared. Approaches for interventions through IT tooling (Apps), on-pack information and acceptance of valorised products were investigated.

Integrated supply chain policies, represented by:

- **Voluntary Agreements (VAs)** are self-determined commitments or pacts with qualitative and quantitative objectives, developed by private entities and/or other stakeholders in consultation with their signatories. They are used as alternative courses of action to traditional legislation, can be piloted by government officials, businesses or other actors, and can be used in addition to, or independently from existing legislation. REFRESH has produced the proof of principle and concept in setting up VAs in 4 focus countries (NL, GE, HU, ES) through Piloting Working Platforms (PWPs) and the development of a Blueprint approach that guides other MS and countries to do the same.
- **Unfair Trading Practices (UTPs)** Unfair Trading Practices (UTPs) are broadly defined as practices that grossly deviate from good commercial conduct within trading relations between two parties, often as a result of an unequal balance of power in that relationship. REFRESH did not perform empirical research on this topic, but as it is relevant to promote and incentivise positive collaboration across all stages of the supply chain, the adverse effects of their contracept UTPs are included here, based on desk research and scoping interviews.

Valorisation focuses on the exploitation of (un)avoidable side-flows from the food supply chain that do not have a primary process function towards human consumption. This can be achieved via a feedback through animal production or ingredient processing or other highly valued applications. The valorisation approach follows the food-use hierarchy as adopted by REFRESH. REFRESH produced empirical evidence on the technical feasibility and environmental-economic viability of valorisation options, related to the use of surplus for animal feed, and use of unavoidable FLW within the production of ingredients and chemicals.

Box 1: Definitions and REFRESH approach of selected policy areas

Research on **consumer behaviour** uncovered how the factors that cause consumers to waste food are complex and determined by a wide several food management practices (planning, shopping, storing, preparing, and consumption activities) And can be tackle by different policy interventions, based on regulation, economic instruments and nudging approaches. Policy interventions that increase the skills of consumers for food management are likely to have an impact. Campaigns though, that exclusively provide information and increase awareness about the negative impacts of food waste do not seem to have an influence.

Integrated supply chain policy research revealed reasons to focus on voluntary agreements and unfair trading practices in order to reduce food waste and enhance valorisation., In particular the research on 1) **Voluntary Agreements** showed how this form of collaborative and self-driven/voluntary policy structure can be adapted to any country and political context by following the REFRESH Blueprint²⁶ model to set sound and attainable food waste reduction targets; and 2) **Unfair Trading Practices** uncovered how supply chain dynamics between food producers and food buyers may cause pre-consumer food waste. The research also illuminated mitigating actions to reduce the impact of trading practices on food waste generation through a “healthier” supply chain dynamic. The research shows the interaction between healthy supply chain dynamics and the effectiveness of Voluntary Agreements as a food waste reduction approach.

Research on **valorisation**, found that some flows of food waste are unavoidably generated. The REFRESH ‘food use hierarchy’ (see figure 1 below) developed in response to this finding and to serve as a guiding principle for food and food waste management. The hierarchy prioritises waste prevention, followed by food redistribution for human consumption and animal consumption before suggesting other forms of valorisation (composting, bio-energy, etc.). This hierarchy outlines the “ideal” valorisation route for food surplus. However, when using other principles for allocation of available resources, a different hierarchy could be implied.

²⁶ *The REFRESH blueprint model outlines the five key steps to consider for the implementation of a Voluntary Agreement.*

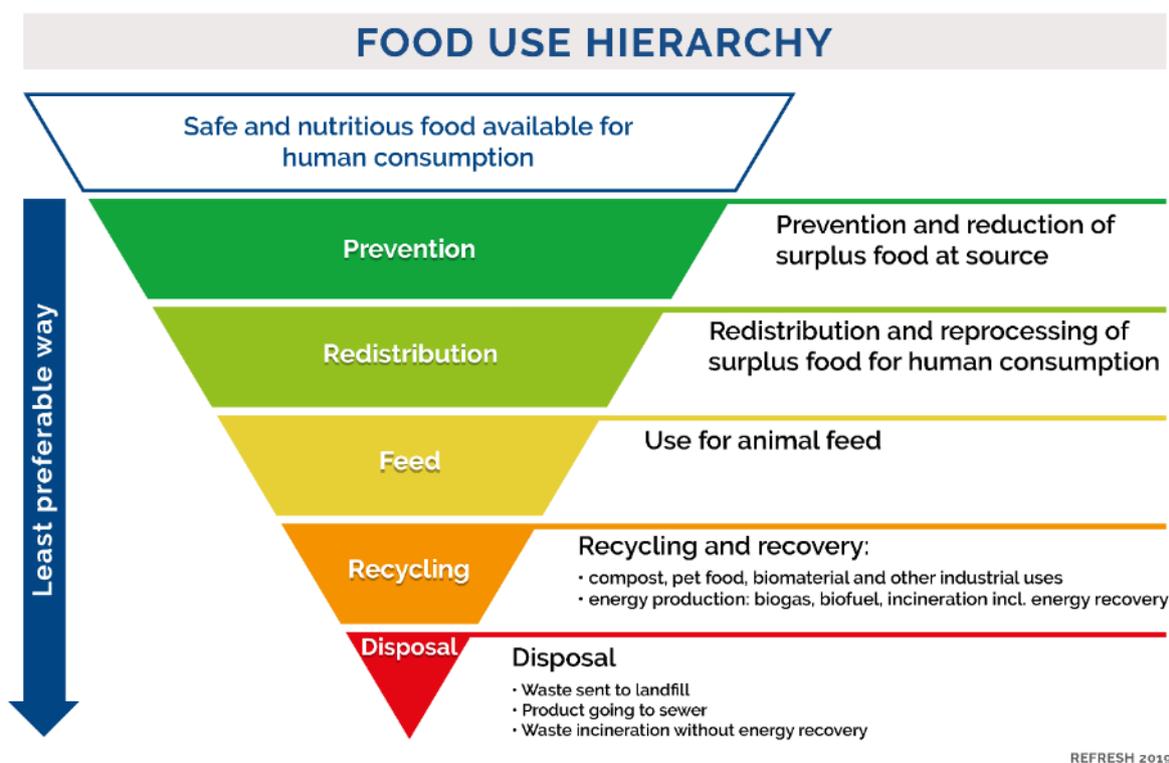


Figure 1: Food use hierarchy as developed within REFRESH

The REFRESH-developed FORKLIFT tool²⁷ has proven to be an advantageous method designed to help stakeholders select the most suitable valorisation route for specific waste flows. The most suitable route is the one which is at the same time aligned with the food use hierarchy and with the lowest cost and environmental impact. For example, producing electricity through Anaerobic Digestion (AD) of food surplus is more environmentally friendly in countries where electricity production is highly fossil fuel dependent than in countries where renewable energy prevails. FORKLIFT is a demonstrably flexible tool that helps to fine tune the recommendations based on a particular situation.

²⁷ <https://eu-refresh.org/forklift>

Policy Area 1: Changing consumer behaviour

1.1 Presentation of the situation

With an estimated contribution of 53%, consumers are the primary contributors to food waste in higher income countries (Stenmarck et al., 2016) . Considering that a large amount of this waste could be avoided, the urgent need to change consumer behaviour is evident. Reducing consumer food waste and policy interventions to support this effort are therefore a key area of REFRESH.

The factors identified that cause consumers to waste food are complex. Often food waste is a result of conflicting goals, such as convenience, taste, and saving money. Consumer food waste behaviour is primarily determined by three factors, consumers':

- Motivation (including attitude, problem awareness, and social norms around wasting food),
- Opportunity (including time availability, access to technologies, and having the quality and quantity of food), and
- Ability (skills and knowledge) to control or change food waste-related behaviour.

Socio-demographic aspects such as age, gender, income and household size are also correlated with food waste, because they influence motivation, ability and/or opportunity, but do not play a causal role.

REFRESH results from a survey in four countries, wherein 3354 households participated, shows that awareness of the consequences of wasting food was not correlated with food waste levels, meaning that it did not show a significant influence (van Geffen, van Herpen, and van Trijp 2017) .

The REFRESH survey however also shows, that social norms have a clear influence, i.e. the more strongly consumers believe that others such as family members and friends waste food, the more food they waste themselves. Also, "busy lifestyles" and the prevalence of unforeseen events strongly influences food waste levels: Consumers who more often encounter unforeseen changes in their schedule tend to waste more food.

It also highlights that households with less food waste tend to exhibit five household food management practices: planning of food shopping and use, less impulse buying, maintaining overview of the food in stock, precisely determining the amounts of food when cooking, and using leftovers.

Policy interventions that increase consumers' food management skills are likely to have an impact on food waste reduction. However, campaigns that exclusively provide information and increase awareness about the negative impacts of food waste have not shown to have an influence. Therefore,

policy makers should implement campaigns that aim to influence social norms. Social norm campaigns are impactful because they take into consideration the tendency of individuals to conform to what they perceive society to say is acceptable behaviour, what people around them are doing.

An integrated approach to food waste reduction within food policy that targets consumers and behavioural change is needed, especially related to health policies, the economic framework, and resource efficiency and waste policies.

1.2 Policy recommendations on consumer behaviour

The REFRESH policy recommendations on consumer behaviour can be summarised as follows:

- (Re)Set the social norm
- Use education to teach respect for food & cooking skills
- Encourage a mindset of flexibility in light of unforeseen events
- Take complexity and multiple-goals into account within communication / campaigning
- Consider interventions based on regulation, economic instruments and nudging approaches
- Use directive guidance in on-pack information to support consumer ability/skills development
- Utilize user-friendly IT tools, include incentives for using new technologies
- Take consumer acceptance into consideration, especially for novel solutions
- Monitor and evaluate interventions to gain insights about the effectiveness and allow for adjustments

Box 2: recommendations on consumer behaviour

Within the EU, the most often used policy intervention for addressing consumer behaviour are public campaigns that have been designed to provide information that increases awareness on the negative impacts of food waste. However, there are very few studies that have evaluated the extent to which these activities H However, meta-analysis of pro-environmental behaviour experiments have shown that intervention strategies that only provide information are the least successful (Osbaldiston and Schott, 2012). Therefore, the common assumption that providing information is sufficient to induce behavioural change is not supported by the evidence and more robust campaigns are needed (?) OR and additional policy interventions are needed

Beyond consumer outreach in the form of information sharing, policy makers should consider other policy interventions based on regulation, economic instruments, Voluntary Agreements, and nudging approaches. REFRESH has identified seven interventions that are relevant entry points for food waste reduction. They are presented below.

1. Social norm campaigns

Research suggests that it could be helpful to design, implement, and test campaigns that aim to influence social norms. Social norm campaigns work with the tendency of individuals to conform to what they perceive those around them to think or do. Therefore, there is an opportunity to shape behaviour by giving people, carefully selected, information about the behaviour or attitudes of others in the population to maximise adoption of positive behaviours. When (re)designing campaigns, policy makers should also consider using positive rather than negative messages, because research has shown messages that blame consumers for waste tend to have backfiring effects.

2. Education and provision of skills

The provision of practical skills aimed at consumers should be a stronger focus of policy interventions. These need to build on an analysis of national particularities (e.g. which food items are wasted most and why) and key target demographic groups (e.g. young people), and be tailored to existing knowledge and skills in order to influence the most relevant household food management practices.

Education interventions, including skill development, can occur via regulation for schools, university curricula, or job/vocational training (e.g. curricula for cook's education).

3. Feedback, prompts, and personal commitments

Feedback, prompts and personal commitments are intervention strategies that are not used very often, but can drive changes in consumer behaviour and should be tested further. They are explained below:

- 1 Feedback** refers to providing information about the frequency and/or consequences of a target behaviour, in this case, the amount of food wasted. Feedback can be individual (e.g. a printed sheet of one week's food waste amount per household) or done in comparison to others.
- 2 Prompts** are verbal or written messages that remind people about a desired behaviour, e.g. a sign at a buffet in a canteen "Come back as often as you want" or information on packaging: "Store me in the fridge".
- 3 Commitment** is when a consumer gives a pledge to change behaviour, and when asked, agrees to perform a target behaviour. Signing pledges or promise cards increases the likelihood of a person performing the behaviour to which they have committed and can be linked back to people's desire to behave, and appear to behave, consistently. Consumer behaviour literature suggests that commitment works best when public (e.g. pledges posted online).

4. Regulation

There are relatively few ways to directly impact consumer food waste levels through regulation. Examples include regulation on date marking, requirements for packaging, or prohibition of certain practices (e.g. potential bans on “Buy one get one free” promotions).

Education activities can be required through regulation, as done through both the Italian food waste law (Law 166/2016) and the French food waste law (Law 2016-138)²⁸.

There are also other areas for regulation that do not directly target consumers but can indirectly reduce consumer food waste and/or which depend on changed consumer behaviour. These include:

- **Relaxing marketing standards:** marketing standards about size, colour, shape etc. of fruits and vegetables are often highlighted as a source of food waste for fresh produce. However evidence on the amounts of waste and savings potential associated with marketing standards mostly anecdotal. Further research into the impact of changing marketing standards is needed.
- **Increasing availability of new products from surplus food:** One barrier to consumption of products made from surplus food and secondary resources is low supply due to the administrative burden of bringing novel food products to market (e.g. soda from coffee cherries or products made from insects fed on food waste). Since 2018 the new Novel Foods Regulation (Regulation (EU) 2015/2283) addresses this problem to some degree. Further research into increasing the availability of new products from surplus food is needed.
- **Prohibition for supermarkets to waste edible food:** The obligation for supermarkets in France with a surface area of over 400m² to establish contracts with charitable organisations to which they must donate their food surplus²⁹ has received extensive media coverage. Although it does not directly reduce food waste on the consumer level, it is a measure with indirect effects on consumers (availability of discounted food, etc.). The impact of this policy on consumer behaviour and food waste should be researched further

²⁸ Article 9 of the Italian so-called “Gadda law” requires food waste education on public media, through ministry activities, and in school and university curricula. It also enables regions and cities to run campaigns about food waste. The French Law (Art 3) amends the education law requiring that food waste education be provided in schools.

²⁹ This obligation is outlined in n°2016-138 Law: fighting against food waste (LOI n° 2016-138 du 11 février 2016 relative à la lutte contre le gaspillage alimentaire) adopted by the French National Assembly.

- **Requirements within public procurement regulation:** The set-up of (green) public procurement rules, for food provision in hospitals, school, and public canteens etc., can be influenced by public policy. Standards can be set related to the portion sizes, staff training, and availability of dishes during daytime. All of these standards have an impact on food waste and provide consumers with the opportunity to reduce food waste. Opportunities to expand such regulations should be explored.
- **Regulation on waste collection and recycling:** Waste regulation, requirements for separate waste collection, potentially combined with fees ("pay as you throw") and recycling of (organic waste) can have an influence on how much consumers waste and what happens to consumer food waste. These factors should be considered when developing food waste regulations.

5. Economic instruments

The price of food and its share in household income plays a role in food waste behaviour. High accessibility to easily consumable, low priced, food in relation to income is thought to be a primary reason for overconsumption and food waste. However, only a few public approaches are known in which fees and taxes are used to reduce food waste (e.g. incentives for donating food in Italy, penalties for supermarkets wasting food in France), and research about their impact is lacking.

At the same time, extensive research has illustrated that if the real cost of natural resource use and the costs of food waste for the society is reflected in prices (i.e. internalize external costs), food prices would need to grow (Willet et al 2019, Sustainable Food Trust 2017). This would in turn provide economic incentives for food waste prevention. The price of food and the cost to dispose food waste should be considered when developing food waste regulations.

6. Nudging

The modification of choice architecture - also called "nudging" - in selecting, processing and disposing (food) waste can be used as a strategy to reduce food waste. Nudging influences behaviour through automatic cognitive processes ("mental shortcuts") in favour of the desired outcome. Nudges "gently push" consumers in the favoured direction without forcing them. Nudges are a response to the so called "intention-behaviour gap.", i.e. deal with the fact that positive intentions (such as wasting less or buying organic) is only partly realised in behaviour Nudges have only recently been applied within the domain of consumer food waste.. Nudges such as changes to plate type and size as well as portion size and availability of trays have led to reduced food waste in schools, cafeterias, and canteens. Nudging can be particularly powerful to reduce out-of-home food waste and is therefore relevant for canteens, caterers, restaurants etc. Learnings from healthy food nudges can be used for decisions about placing certain food products in more visible and salient places in public canteens and other places. Since public policy makers also shape the food procurement of hospitals, schools, prisons etc. nudging is an important element tool that should be considered.

7. Strategies and Voluntary Agreements

In the area of food waste, collaboration across the supply chain is important. Interactions across the food supply chain are generally based on contracts, not on cooperation, and food waste prevention is rarely considered in such contracts. Addressing food waste requires a change. Voluntary cooperation is one option for doing so. Voluntary agreements are self-determined commitments or pacts with qualitative and quantitative objectives. They are developed by private entities and/or other stakeholders in consultation with their signatories. Voluntary agreements can be used as alternative courses of action to traditional legislation, can be piloted by government officials, businesses or other actors, and can be used in addition to, or independently from, existing legislation (Burgos et al. 2019).

A large part of the REFRESH project focused on facilitating and analysing Voluntary Agreements (Osoro and Bygrave 2016; Piras et al. 2018)**Fehler! Textmarke nicht definiert..** The research found that one of the main success factors is having government backing, including but not limited to financial support. More information on the impact of voluntary agreements on food waste is found in the REFRESH policy brief "Voluntary Agreements as a collaborative solution for food waste reduction" (Burgos et al. 2019) .

Agreements made within these processes have an indirect influence on consumers and consumer food waste levels, e.g. through relaxed marketing standards for fruits and vegetables, agreements for on-pack information, out-of-stock or available alternative strategy, reduction/ban on buy one get one free promotions, increasing levels of food donation, etc.

Follow up on interventions

There is a clear need to understand the effectiveness of different policies and interventions designed to reduce household food waste (HHFW). Currently, a lack of evidence hinders this understanding. Specifically, there is a lack of comparable evaluation studies that robustly measure the impact on HHFW of the intervention on food waste. To tackle this lack of evidence, REFRESH has published a guidance document to help stimulate future good-quality evaluation studies (Quested, T., 2019: "Guidance for evaluating interventions preventing household food waste"). In the future, use of this guidance should lead to a step-change in the quality of studies evaluating HHFW. This should provide evidence for policy makers and other decision makers to select the most appropriate approaches, so that they are able to reduce the amount of food wasted from households in a cost-effective manner.

Policy Area 2: Integrated supply chain policies

This policy area provides a combined view on Voluntary Agreements and Unfair Trading Practices, as they both relate to supply chain collaboration.

2.1 Presentation of the situation

Food waste in the supply chain can be less visible to the public and in policy than food waste occurring at consumer level. However, a concerted approach tackling food waste in the supply chain, using both **voluntary** and **regulatory** tools, can yield considerable results. The results come from coordinating and removing friction between supply chain actors (food producers and businesses). This chapter explores one approach to voluntary action at the supply chain level to reduce food waste, **Voluntary Agreements**, and considers the wider market and supply chain context in order to make recommendations which both facilitate collaboration between supply chain actors and prevent practices which may inadvertently cause food waste, such as **Unfair Trading Practices**. The goal of policy recommendations for integrated supply chains is to promote flexible, collaborative supply chain relationships so that food waste can be identified and responded to effectively by and between supply chain actors.

Unfair Trading Practices (UTPs) are defined by the European Commission as 'practices that grossly deviate from good commercial conduct within trading relations between two parties, often as a result of an unequal balance of power in that relationship.' In some cases, this unequal balance may lead to food waste.. For example, when an order is cancelled at short notice for a highly perishable food item and the producer is unable to find an alternative buyer. Producers also have to take into account natural losses and conditions and therefore have a slight bias to overproduce to ensure they can deliver amounts requested in buyer orders. Within the EU legal framework, collaboration and transparency can be encouraged in order to build a flexible supply chain which can respond to excessive product arising at times of growing gluts or lower consumer demand than forecast.

The organisation of the food supply chain is complex and characterised by a relative large number of producers, fewer processers and even less retail organisations. Considering the difficulty of dealing with power imbalances along the supply chain, if soundly implemented, Voluntary Agreements provide an alternative potential solution to facilitate collaboration. Such agreements engage a wide range of players in cooperative action and are sufficiently flexible to be able to respond to dynamic changes in the policy context over time. The benefits that they can bring to actors can help support any regulatory framework, or create a framework of action in the absence of legal measures. As a result of these characteristics, Voluntary Agreements could help support action against UTPs.

2.2 Policy recommendations on integrated supply chains

The REFRESH policy recommendations on integrated supply chains can be summarised as follows:

Voluntary Agreements

- Use **voluntary and regulatory approaches** to build flexible, transparent and collaborative supply chains that are better able to respond to the challenges of FW
- Understand the difference between countries' existing FW policies and the context they exist within
- Apply the **Target-Measure-Act** principle
- Ensure long-term **financing and governance**
- Establish an independent **"third-party" to oversee the Voluntary Agreement**
- Create an EU wide framework to support MSs establishing Voluntary Agreements

Unfair Trading Practices

- Develop a clear and easy to follow **code of practice** to govern trading behaviour in the food supply chain
- Provide **sufficient resources** to implement measures to investigate and prevent infringements
- **Publish** proven cases and fine in relation to turnover
- Provide **financial support** for the Adjudicator based on industry levy rather than fines
- Protect **anonymity** of case filing food business operators and accept civil society's evidence
- Include **international and indirect suppliers** in tackling UTPs, in- and outside EU MSs, and ensure that all covered by the code are aware of their rights
- **Measuring food waste**, at Member State and business level, from the point food is mature enough to be ready to harvest through to the consumer, and the causes of this food waste, in order to get a clear sense of the scale of food waste caused by UTPs, and to understand opportunities for intervention.

Box 3: Recommendations on integrated supply chains

REFRESH presents the opportunity to use voluntary and regulatory approaches to supply chain food waste reduction to build a more flexible, transparent and collaborative supply chain, which is better able to respond to the challenge of waste.

Voluntary Agreements

REFRESH has identified 6 recommendations that are relevant entry points to develop **voluntary agreements** as a solution to tackle food waste by gathering the relevant actors from the supply chain to discuss and collaborate together. The establishment of a VA is thus considered paramount when aiming for food waste reduction.

Voluntary Agreements (VA) are unique from other forms of policy, because their target audience can include a wide array of actors. The success of a VA aiming at food waste reduction is highly correlated with the active involvement and collaboration of actors from each step of the **supply chain**. Although this means that a Voluntary Agreement is mainly composed of **businesses**, the involvement of the **government** is an essential element to spark and ensure the longevity of a VA. Aligning a VA's objectives to pre-existing national policy that is applicable to food waste reduction will help ensure the relevance of and support for the VA in the eyes of government. In the absence of a pre-existing national policy, governmental actors can be brought on board by illustrating how a well-constructed VA following the REFRESH Blueprint model³⁰ could be the necessary tool to jump start a MS' contribution to EU or global food waste reduction goals such as SDG 12.3.

Concrete advantages of governmental involvement include financial support, nation-wide communication opportunities, as well as opportunities to shape future policy with food waste reduction as a focus. When it comes to **leading the VA**, securing leadership from a **neutral third-party** is paramount in order to provide effective oversight of the agreement and ensure that periodic food waste reduction measures are met. Furthermore, this third-party is a fundamental element for signatories to agree to share (possible sensitive) information about their activities, such as data or strategies. Gathering a large group of industry actors in a VA raises awareness about FW challenges and can showcase best practices to address them along the various stages of the supply chain. Through this open collaboration, supply chain actors and government will then have the means to support collective decisions that do not disadvantage actors, but rather builds on their expertise.

³⁰ <https://eu-refresh.org/VABlueprint>

In order to illustrate the concrete steps that actors should follow to introduce a VA in a Member State, the REFRESH project developed a Blueprint illustrating five key steps to follow for the successful implementation of a Voluntary Agreement.



Figure 2: Key steps of a Voluntary Agreement

Within each step of the Blueprint, orienting questions are included to help the policy maker/initiator of the food waste reduction VA gather the necessary information needed to create a baseline scenario. The below sections outline the relevance of each of these steps in order to tackle food waste reduction. Each of these steps should be reviewed at regular intervals throughout the duration of the VA in order to ensure that the VA maintains relevance.

1. Initiation and setup

The first step to setting up a Voluntary Agreement consists of pre-screening the Member State / region / municipality in question by understanding its general readiness to implement a food waste reduction VA (considering its political context, supply chain actors, data availability, pre-launched initiatives).

By creating this pre-screening through research on the food and drink sector, the initiator of a VA has the means to identify information gaps to pinpoint for further investigation in order to ensure that the VA is launched with all necessary information in hand for a maximum food waste reduction potential. For example, gathered information regarding gaps in data on the food and drink sector, and the relationships between industry actors allows the initiator/policy maker to map out the current state of the country's readiness to implement a VA. Thanks to the identified gaps, policy makers can identify

where additional resources are needed for further investigation in certain areas, for example by accessing various data sources, conducting stakeholder interviews, and learning from best practices set up abroad. This type of interaction is also beneficial as it creates awareness about the VA to help it earn the confidence of consulted actors.

Furthermore, through this pre-screening, regional or micro food waste initiatives from the public or private sector may surface that may not have originally been on the policy maker's radar. This is beneficial to meeting a food waste reduction goal as this screening can pre-identify best practices and hurdles experienced in the initiatives to include or avoid in the VA, gather any existing data, and identify actors for potential involvement in the VA. For example, understanding the roles of the actors and the dynamics between other supply chain actors is key when defining the objectives and actions most relevant to food waste reduction in each particular context for the VA's development. This perspective can prevent blocking points in the roll out of the agreement, and anticipate potential actions for food waste reduction if these actors eventually join the VA.

Therefore, as the makeup of the food and drink sector varies between Member States and its regions, this initial pre-screening exercise within its setup is paramount in order to set the stage for a robust food waste reduction strategy.

2. Ambition, goals, and targets

The second step to setting up a Voluntary Agreement lies in dialling in on the motivation for the initiator to aim for food waste reduction within its Member State / region / municipality.

By supporting the achievement of ambitious targets outlined in national food waste reduction strategies or other pre-existing legislative targets linked to food waste reduction, a Voluntary Agreement has a strong potential to reach its food waste reduction targets. If the pre-existing targets or strategies are well-known among food industry actors, a VA that is aligned with these objectives has better chances of being acknowledged by relevant actors. It also has better chances of receiving government-backing, and will benefit from more credibility in its actions. The consideration for the targets defined in national strategies ensures that the VA receives more recognition, and thus potential for it to reach its food waste reduction targets.

If the MS or region does not yet support a national food waste strategy or a related legislative target, defining a target for food waste reduction can fuel the ambition of a Voluntary Agreement. The VA's food waste objective can therefore be aligned to the global SDG 12.3 reduction target. This approach was already used in two REFRESH pilot Voluntary Agreements in the Netherlands and Hungary. Neither of these countries had national food waste reduction targets at the time of the VA's launch. In the case of the Netherlands, the VA was one of the driving factors leading to the inclusion of

the SDG goal within its 2018 food waste strategy.³¹ Similarly, the VA, launched in 2015 in Germany, was the first opportunity to discuss SDG 12.3 among German food supply chain actors and was a precursor to the national strategy conversation that began in 2018. Meanwhile, Spain's "More food, less waste" national strategy launched in 2013 calls to limit food loss and waste, but does not set a food waste reduction target. By aiming to contribute to SDG 12.3, the VA in Spain defined a clear target to reach in the country, fuelling the ambition of the national strategy.

The motivation behind establishing a VA may also be inspired or supported by the efforts carried out by advocates or grassroots movements³² working on food waste. Using such movements as inspiration has the potential to ensure that the VA is aligned with strong public demands, and that it considers the actions and ambitions of "on the field" actors through their ground-up approach on actions. For example, The Hungarian Food Bank Association (HFA) was established in 2005 in response to the growing number of people living in poverty, at risk of hunger and malnutrition. HFA worked closely with businesses, encouraging them to offer the surplus food to local charities who ultimately can get it to people living with food insecurity. As a result of growing public awareness of the situation, the Ministry of Rural Development and the Hungarian Food Bank Association jointly launched a forum to reduce food waste and loss – which became the basis for the Voluntary Agreement in Hungary.

The ambition for food waste reduction varies between Member States, whether it be through pre-existing strategies, legislative targets or movements tackling food waste. Understanding the drive to establish a VA in a country / region / municipality is therefore an essential step in its set-up and success.

3. Governance and funding

The third step to setting up a Voluntary Agreement is ensuring long-term governance and financing to ensure that the planned food waste reduction measures are sustained until objectives are met. A well-defined governance structure, ensuring the organisation and coordination of the VA's food waste reduction measures, is one of the VA's key features for reaching all objectives. For example, including dedicated working groups in the governance structure, in addition to a traditional steering committee, will provide the VA with a focus on specific areas of action for food waste reduction. This will allow the VA to go more in-depth on particular aspects of food waste reduction, while maintaining an overall vision on the activities of its members. Recruiting members with a high added value will ensure an effective uptake the VA's

³¹ <https://eu-refresh.org/national-platforms>

³² *Grassroots movements are types of movements or campaigns which attempt to mobilize individuals at the local level to take action to influence an outcome, often of political nature. (source: Britannica encyclopaedia).*

objectives, thus strongly contributing to the general activity around food waste reduction.

Furthermore, defining a long-term viable funding scheme is critical to maintain the VA and ensure it carries out its food waste reduction measures. Funding should be a mix of private and public sources, to avoid overrepresentation of any sector. Funding a Voluntary Agreement by requiring participation fees from members can also ensure that participants are invested in the agreement, preventing “free riders” from joining, and positively influencing the members’ involvement and ambitions to meet the targets. All four pilot projects received funding from REFRESH. In the Netherlands, the platform received considerable financial support, amounting to €7 million, from the government in 2018, to finance the continuation of the VA after the finalisation of the REFRESH project in June 2019.

Establishing a governance structure and securing a viable funding scheme is therefore of prime importance when setting up a VA: it will ensure the Voluntary Agreement has solid backing and support until its food waste reduction objectives are met.

4. Establishing actions

The fourth step to setting up a Voluntary Agreement is establishing the priority actions with the highest potential for food waste reduction, while ensuring these actions remain feasible.

Determining sub-objectives to break down larger targets such as SDG 12.3, and allocating activities to signatories based on their specificities ensures that members of the VA are comfortable with the agreement’s ambition. This will ensure a smooth application of the VA’s targeted actions, contributing to the success of the food waste reduction agreement. For example, in the REFRESH Voluntary Agreement pilot in Catalunya (Spain), sub-objectives were determined to break down the wide target of SDG 12.3 into actions that are more understandable to signatories on the immediate short term. These sub-objectives brought the members of the VA to discuss the levels and causes of food waste from production to consumption, and the possibilities for encouraging initiatives to reduce and prevent food waste in some of the most critical points of the food chain. Furthermore, while the diversity of members makes it difficult to expect the same achievements of all signatories, allocating each member with specific activities will ensure that objectives are achievable. In Germany for instance, the retailer Aldi organised a consumer campaign on best-before dates, in line with this actor’s capacities, and the target group it set out to reach. The elaboration of a timeline, with defined milestones, can help keep actors on track with their activities, and will motivate the group to achieve the sub-objectives and activities determined for food waste reduction.

Once the sub-objectives and priority actions are defined and allocated to actors, a second step involves identifying those that are most feasible, and determining their timelines for realisation. For example, classifying the actions on a timetable will provide a vision of the activities to be carried out

on the short, medium and long term. Ranking the activities in terms of feasibility will then help actors tackle all activities in a logical order. The priority activities considered as most feasible will make good starting points for signatories, who can then move on to the activities considered as more complex for food waste reduction.

Finally, the unique collaboration of members orchestrated by a Voluntary Agreement is fundamental when planning actions and delivering results to reduce food waste. The overall direction of a VA is discussed and agreed upon by all signatories, but the agreement allows members to choose and adapt their activities. Actors can tailor their activities in the scope of the VA to best match their specificities and capitalise on their added value for food waste reduction (regarding their size, buyers and suppliers, etc.). A VA's structure therefore allows a more effective division of tasks than what a strategy imposing identical actions for all would offer.

Taking advantage of the unique makeup that a Voluntary Agreement offers is essential when determining the agreement's activities. A VA can fill the gaps and complement existing activities to tackle food waste, while allocating the most relevant actors to do so.

5. Measurement & Evaluation

The fifth and last step to setting up a Voluntary Agreement is ensuring a clear measurement methodology and metrics which are feasible for application by all members, in order to have clear visibility on the VA's progress towards food waste reduction.

Prior to any quantitative evaluation or reporting of the benefits (if any) of the actions undertaken, it is essential to define a clear measurement framework. The success of a VA lies in its ability to achieve significant results and quantifiable food waste reduction. Therefore, clear metrics are essential to ensure the credibility of the initiatives in order to justify the resources invested in the VA, but also to gain the trust of stakeholders (and especially consumers). Even if the measurement framework should be context specific, the signatories may implement pre-existing global standards and methodologies to evaluate data. These existing methodologies include the World Resource Institute's Food Loss and Waste protocol (WRI, 2016), or the FUSIONS Quantification Manual (Tostivint et. al, 2016).

By establishing a baseline in the early phases of the agreement, a reference point is defined to quantify the Voluntary Agreement's progress in food waste reduction. This paves the way for a robust and trustworthy evaluation. The baseline should be defined precisely and prior to any action, in order to assess the efficiency of the agreement. In addition to the baseline, the evaluation process needs to be determined before initiating actions. Evaluations either take place on a regular basis for long-term initiatives, or upon finalisation for specific measures. Consistent baseline and evaluation methodologies allow the VA to communicate on its results and guarantee engagement from members and confidence in the agreement's ambition. This is key to keep the momentum going, and to ensure objectives are met. For example, the

absence of results on the successes of the initiatives can lead to a disengagement of members, and to mistrust from consumers or third-parties.

Finally, when reporting data in a transparent and understandable way, signatories' progress on food waste reduction is tracked and quantified to gauge progress towards the VA's targets. In order to track progress, signatories report their data to the neutral third-party following the agreed-upon reporting methodology. Reporting of the data ensures the coherency of the food waste reduction measurement system, and demonstrates the credibility of the commitment made by members. In turn, the neutral third party keeps track of this confidential data, including financial and (tons of) food waste savings to monitor progress and adapt the VA's actions and objectives in an effort to foster maximum food waste reduction levels. The adaptable nature of the VA allows these actions and objectives to be updated, to better reflect the progress or the difficulties faced by members of the VA in their food waste reduction activities. Additionally, aggregated or individual data can be used as a key communication tool to spread awareness on food waste and to incentivise the participation of other supply chain actors.

A clear measurement and evaluation framework is therefore paramount to track progress of food waste reduction in relation to the VA's implemented measure and to have hard figures for communication purposes on the progress of the VA.

Unfair trading practices

REFRESH has identified 6 recommendations that are relevant entry points to utilise regulatory support to address **UTPs** and by leveraging any existing power imbalances that lead to food waste. UTPs are defined by the European Commission as 'as practices that grossly deviate from good commercial conduct within trading relations between two parties, often as a result of an unequal balance of power in that relationship'³³.

More specifically, UTPs can occur within four main categories suggested by the European Commission (EC 2018):

- i) where costs or risks are unfairly shifted from one party to the other;
- ii) where advantages or benefits are requested by one party without any reciprocal benefit or service being offered in relation to the benefit or advantage being asked;
- iii) iii) where unilateral and / or retrospective changes are made to a contract (unless allowed for within the contract terms under fair conditions);

³³ Directive (EU) 2019/633 of the European Parliament and of the Council of 17 April 2019 on unfair trading practices in business-to-business relationships in the agricultural and food supply chain. <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019L0633&from=EN>

- iv) there should be no unfair termination of contract or unjustified threat of termination.

UTPs are a sub-set of competition and fair-trading policy and therefore important to discourage in all sectors of the EU economy. However, the grocery supply chain is particularly susceptible to UTPs and certain types of poor practice have an influence on the level of food waste arising from affected businesses.

Through REFRESH research, Unfair Trading Practices within the scope of “integrated supply chain policies” were identified as a key policy focus because of their relevance to the market dynamics of food waste creation at various stages of the supply chain. This link was explored within a comparative analysis of Voluntary Agreements and Unfair Trading Practices in three European countries, which demonstrated that addressing Unfair Trading Practices is a necessary prerequisite to effectively tackling supply chain food waste (Piras et al 2018). The following key UTPs behaviours have been found to have a causal link to food waste generation:

- Lack of formal contracts: informal contracts between buyers and producers can lead to buyers altering orders at the last minute without accountability.
- Use of Quality Assessment specifications to reject product and flex supply along the supply chain: in particular, inconsistent application of products with a high degree of natural variability, such as fresh produce, as a means to manage over-supply and reject product.
- Data sharing and demand forecasting failures: for example, failure to draw up or share with producers accurate demand forecasts, potentially resulting in overproduction and waste.
- Due to the limited number of retail buyers for many producers, overreliance on single buyers leads to overproduction in order that suppliers reduce the risk of failing to meet required order quantities and subsequently being ‘de-listed’ by the retailer.

While Unfair Trading Practices (UTPs) can occur independently of food waste, they have been found to be one cause of food waste in the supply chain, in particular in connection with poor demand forecasting, quality rejects, last minute order cancellations and overly strict ‘minimum life on receipt criteria’.

Therefore, it is important that regulation serves to provide a protective framework, to set the policy conditions for more flexible and inclusive supply chain relationships. VAs can find their effectiveness at food waste reduction undermined by lack of trust between suppliers and buyers. Policies that reduce UTPs are likely to have a secondary impact in benefiting the establishment of more effective VAs, where representation of primary producers is not incumbered by a lack of trust with other supply chain VA signatories. Looking to operationalise the EU Directive on UTPs, engagement is needed up and down the supply chain by:

- Encouraging primary producers - supplier collaboration and cooperative working to increase their power/value share.

- Monitoring and adjudicating food business operator's relationships through bodies such as the Groceries Code Adjudicator (UK example, described in the REFRESH Policy brief on UTPs³⁴).
- Measuring food waste at primary production level to enable assessment and evaluation of the impact of trading practices (fair and unfair) on FLW occurring at different points of the food supply chain.
- Ensuring VAs cover food waste from farm to fork, not just at retail level.

Follow up on interventions

As illustrated in the above sections, setting up a food waste Voluntary Agreement is a solution which benefits both governmental and food supply chain actors. On the one hand, it has the potential to lessen the need for additional regulation or legislation and reduces the costs for the government to define and implement policy. On the other hand, it offers a voluntary and flexible approach to any member who wishes to become part of the Agreement. The existence of a target at the launch of a VA provides an initial objective that the members can aim towards and take into consideration within the VA's design, thus potentially aligning itself with the Member State's national strategy. However, in the absence of pre-existing targets or strategies relating to food waste reduction, the VA can be the key launching point for further work on food waste in the country, region, or municipality. Thanks to the REFRESH Blueprint on VAs, a tool exists to help actors who are willing to initiate or be part of a VA's design to set up a VA with the support of their government.

There is a need for greater awareness across EU institutions regarding the role of UTPs in driving food waste, and of the importance of addressing farm-level waste in general. Measures will be most effective where major buyers proactively collaborate in creating a more inclusive supply chain: engagement is needed up and down the supply chain.

³⁴ <https://www.eu-refresh.org/regulating-role-unfair-trading-practices-food-waste-generation>

Policy Area 3: Valorisation - Adding value to unavoidable surplus food

3.1 Presentation of the situation

The main guiding principle for tackling food waste is to devote attention and effort on preventative measures. Secondary measures target the reduction of food waste reduction, acknowledging there are technical, economic, cultural and organisational barriers that inhibit preventative measures at the source. In line with the food use hierarchy, the preferential destination of unavailable surplus is human consumption, followed by conversion to animal feed for livestock and the production of biomaterials. Attention must be given to ways in which policy can help **prevent unavoidable surplus food from leaving the food supply chain as waste.**

Valorisation

REFRESH has focused its research on adding value to unavoidable surplus food – also called “valorisation” – that cannot be redistributed directly for human consumption, in three ways:

- 1) new food ingredient streams
- 2) new animal feed products
- 3) production of fuels and chemicals

The technical research performed within REFRESH is supported by the development of a compositional database (FoodWasteExplorer³⁵), tools to evaluate selected environmental impacts (FORKLIFT³⁶) and economic costs³⁷, technical guidelines on food waste reprocessing for animal feed³⁸, Decision Support Tool for food waste conversion³⁹ and an assessment of the extent to which valorisation approach can contribute to meeting the EU target on FLW reduction⁴⁰. Reports on these REFRESH deliverables are available at the REFRESH website www.eu-refresh.org.

³⁵ www.foodwasteexplorer.eu

³⁶ <https://www.eu-refresh.org/forklift>

³⁷ <https://www.eu-refresh.org/food-waste-high-value-exploitation-hypothesis-testing>

³⁸ <https://www.eu-refresh.org/technical-guidelines-animal-feed>

³⁹ <https://www.eu-refresh.org/animal-feed-tool>

⁴⁰ <https://www.eu-refresh.org/role-food-waste-valorisation-potential>

Food use hierarchy and local context

REFRESH results reinforce the value of the food use hierarchy as a guiding principle when deciding the best valorisation route for surplus food and food waste (see figure 1 in previous section). In this respect, REFRESH research has elucidated the significant potential of policy changes to increase the use of surplus food in animal feed.

However, REFRESH results also show the importance of considering local circumstances and taking a case-by-case approach when evaluating different valorisation, recovery, and disposal options of specific food side flows. Deciding whether one option is more environmentally or economically sound than another is very much dependent on the context. It is therefore imperative to support decision-makers to make the best decisions locally in a given context. This is the purpose of the REFRESH FORKLIFT tool²⁷, as well as the guidelines provided in (Davis et al. 2017) for exploring environmental and economic effects of different options for food side flows.

Harmonising food waste, food security, and environmental policy

In its inception, REFRESH identified success regarding food waste reduction initiatives in terms of their ability to support transformation towards a more sustainable and secure EU food system, benefitting Europe's economy, environment and society. The REFRESH research and recommendations contribute to longer-term policy thinking on the recycling and valorisation of unavoidable surplus food within the circular economy and wider environmental and societal transformation.

Moreover, it is important to broaden perspective to include energy policy as well, since food waste is legally classed as bio-waste in the Renewable Energy Directive⁴¹ (2018), which aims to increase the proportion of renewables in the EU energy mix. Bio-waste is one form of biomass, which accounts for about two-thirds of all renewable energy consumption in the EU. The European Commission (2019) also states that "increasing the use of biomass in the EU can help diversify Europe's energy supply, create growth and jobs, and lower greenhouse gas emissions"⁴².

⁴¹ Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources. <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L2001&from=EN>

⁴² SWD (2019) 212: COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS United in delivering the Energy Union and Climate Action - Setting the foundations for a successful clean energy transition. https://ec.europa.eu/energy/sites/ener/files/documents/recommendation_en.pdf

Careful consideration is needed in harmonising food and energy policy to ensure concurrent support to three equally important policy objectives:

- continue to incentivise the increased use in renewable energy production of food waste that is not suitable for human or animal consumption and is currently landfilled or incinerated
- support government and industry stakeholders to opt for the most environmentally beneficial valorisation, recycling or disposal route of food waste given their current local context
- work towards a future-proof policy framework where food and energy policy truly support climate mitigation and food security objectives.

Given the clearly evidenced climate mitigation benefits of using surplus food as animal feed (De Menna et al. 2019; Salemdeeb, Vivanco, et al. 2017; Ogino et al. 2007), meeting the third objective requires careful reflection on the potential introduction of legislation that would support the safe use of mixed surplus food in non-ruminant omnivorous livestock feed (Luyckx et al. 2019). Furthermore, keeping unavoidable surplus food in the food supply chain is also important considering a food security perspective.

3.2 Policy recommendations on valorisation

- Identify valorisation options using the REFRESH Top Waste streams and the FoodWasteExplorer tools
- Perform case-specific Life Cycle Analysis (LCA) assessments and Life Cycle Cost Analysis (LCC) based on the food use hierarchy for valorisation options, to compare environmental benefits and economic viability. The use of the FORKIFT tool developed within REFRESH can support stakeholders' decision making on investments and selection of measures.
- Ensure technical feasibility and (future) legislative compliance of new valorisation options
- Take into account that economically viable valorisation of side flows needs to consider available volume of side flows and logistics for collection and processing
- Raise awareness across the food supply chain including consumers on the environmental and economic impact of food waste, and the opportunities for reduction related to dietary changes (e.g. less meat and consumption of more seasonal produce)

Box 4: recommendations on valorisation

Biofuels and food waste

The new Renewable Energy Directive of 2018 specifies the biomass fraction of industrial waste not fit for use in the food or feed chain, including material from retail and wholesale and the agro-food and fish and aquaculture industry as feedstocks for the production of biogas for transport and advanced biofuels. It excludes feedstocks such as used cooking oil and animal fats classified as categories 1 and 2 in accordance with Regulation (EC) No 1069/2009⁴³. Some academic literature also views food waste as having great potential to be recovered into high-value energy, fuel and natural nutrients. For instance, (Ingrao et al. 2018) found Anaerobic Digestion to be an effective and eco-friendly food waste treatment technology. Overall, critical analysis and sustainability criteria for biomass focus almost exclusively on the issues relating to the use of food crops or forest crops as biomass. In fact, food waste was not considered in the Impact Assessment of Sustainability of Bioenergy by the European Commission (2016⁴⁴). For biofuels, the use of food crops is expected to decrease and be gradually replaced by other sources, including agricultural residues and perennial crops.

Lack of data and standard definitions make it difficult to assess the current food waste destinations, also specifically within biofuel applications. The REFRESH report 'Integration of LCC and LCA results to higher system levels' (2019⁴⁵) provides an overview of the mass and energy flows, as well as GHG emissions of two selected agri-food supply chains (German meat and EU tomatoes). A rough estimate on waste management options for food waste in Europe was calculated, providing insights on the emission reduction potential of different mitigation strategies in an integrated and mass-balance based framework. Calculations were made using EUROSTAT data and assumptions associated with the proportion of AD (set at 20%) to composting (set at 80%) based on available capacities of sites which use bio-waste as source material.

⁴³ Annex IX to Directive (EU) 2018/2001, part A (d) and part B.

⁴⁴ SWD (2016) 418: Commission staff working document – impact assessment – Sustainability of Bioenergy.

https://ec.europa.eu/energy/sites/ener/files/documents/1_en_impact_assessment_part4_v4_418.pdf

⁴⁵ Liu et al., 2019. Integration of LCC and LCA results to higher system levels. REFRESH Deliverable D5.6. <https://www.eu-refresh.org/integration-lcc-and-lca-results-higher-system-levels>

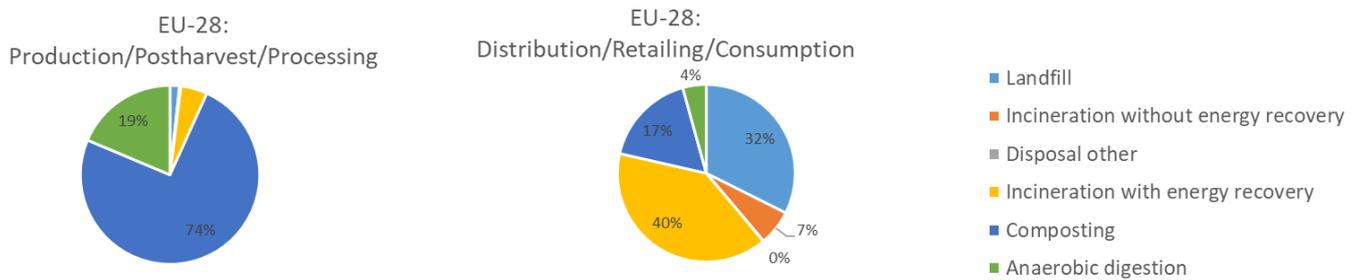


Figure 3: Estimate on valorisation proportions (Source: REFRESH D5.6, 2019)

Generally, available information suggests that only large AD plants use food waste and overall AD plants taking food waste as feedstock are a small proportion of the overall sector.

A current challenge for policy-makers is that waste management statistics are lacking food waste as a separate source type. Food waste volumes used in different waste management options are reported together with other green or organic waste fractions, due to the fact that currently the majority of MSs collect all bio-waste collected in one stream. To target best possible options for food waste, it is necessary to improve further detailing and differentiation in available data, including edible/inedible, avoidable/on-avoidable side flows. There is a long tradition of separately collecting organic waste in a number of MS. In Austria, for example, they introduced separate collection of biodegradable waste 20 years ago, but still a lot of food waste can be found in the residual waste stream, revealed in sorting analysis of household and similar waste (Schneider et al. 2012). It proves difficult to increase sorting discipline for source separation, both on household as well as supply chain level. Sorting practice requires changes that can be perceived as time consuming and costly. Therefore, not only political will is required to introduce the infrastructure and the conditions for source separation, but also consumer and business engagement is necessary to reach an efficient system with a high capture rate. The separation of co-mingled/mixed municipal waste is actively practiced in some MS, but its efficiency is not consistently proven yet. It seems unavoidable that a remaining fraction of discarded food will be diverted towards AD or low level valorisation, including composting and incineration. Alignment of policies that deal with side-flows and discards from the food supply chain should be taken into consideration, when developing a more integrated approach to food waste policy.

Within the current system, there is a tendency supported by competing policies (e.g. bio-energy targets at EU and MS level) and corresponding funding and investments that draw side flows from the food chain that have potential to be valorised at higher levels, towards lower level recycling and recovery routes within the food use hierarchy, such as AD and biomass incineration. As the current Feed Ban prohibits the use of side flows that contain any animal (by-)products, these flows cannot be diverted towards animal feed. REFRESH investigated the potential FW reduction considering a (partial) lifting of this Feed Ban. Albeit showing promising results including

reducing demand for purpose-grown biomass, transporting costs can be a significant challenge to make this valorisation route economically viable. Diverting to incineration is typically the cheaper option.

Until a high food waste capture rate can be achieved, edible/avoidable food waste shall be targeted with prevention, redistribution or valorisation options for human and animal consumption. Unavoidable food waste needs to be targeted by other measures. To prevent them from being discarded, other measures (e.g. incentives) are necessary to foster recycling but not at the cost of other measures further up the waste hierarchy (e.g. animal feeding).

While using food waste to generate energy through AD is preferable over landfill, incineration and composting, it is important to guard against incentivising a bio-energy sector which overly relies on food waste as a feedstock. In cases where the local energy grid mix has significantly reduced reliance on fossil fuels, the use of food waste in AD can lead to higher GHG emissions compared to generating such energy through the average grid mix. For countries with already a high percentage of renewable energy, it could be beneficial to cover increased energy demand if other renewable sources (such as solar, wind or hydro power plant capacities) have reached their maximum capacities. While this may not yet be the case in countries with a current high reliance on fossil fuels, it does not seem logical to plan for increased AD capacity reliant on food waste feedstock as a preferred renewable energy source in countries seeking to increase their overall renewables' capacity.

New animal feed products

The EC's Circular Economy Action Plan (European Commission 2015) sets out to increase the use of surplus from the food chain in livestock feed without compromising feed and food safety. This was further elaborated in the European Parliament report "Initiative on resource efficiency: reducing food waste, improving food safety"⁴⁶ (Borzan, 2017) where the EC is called "to analyse legal barriers to the use of former foodstuffs in feed production and to promote research in this area" while also bringing "food safety risk down to zero". It notes "the potential for optimisation of use of food unavoidably lost or discarded and by-products from the food chain, *in particular those of animal origin*, in feed production".

REFRESH investigated the use of side flows from the food system as animal feed. However, it focused on the use of surplus food that may contain meat or fish from catering, retail and manufacturing as feed for omnivorous non-

⁴⁶2016/2223(INI) Report on the initiative on resource efficiency: reducing food waste, improving food safety. Committee on the Environment, Public Health and Food Safety. Rapporteur Biljana Borzan. 28.4.2017.

https://www.europarl.europa.eu/doceo/document/A-8-2017-0175_EN.pdf

ruminant livestock, such as pigs and chickens. It only focuses on such feed which has been heat-treated and acidified in licensed, tightly controlled treatment facilities that are located off farms. REFRESH did not consider currently permissible former foodstuffs, nor cover ruminant feed, surplus food from households, international catering or transport or surplus food treated on-farm, as these options pose additional risks outside the scope of REFRESH. A consequential LCA carried out by REFRESH shows that using 14 million tonnes of surplus food to replace feed for grower/finisher pigs could lead to an estimated annual reduction of GHG emissions of 5.8 million tons of CO₂ eq. (Luyckx et al., 2019). From a technical point of view, it is possible to produce safe pig feed from surplus food through a combination of heat treatment and acidification (fermentation or adding lactic acid for example) and biosecurity measures to prevent cross-contamination (Luyckx 2018).

To ensure these treatment and biosecurity measures are implemented to the standard required and to allow for adequate monitoring and enforcement of safety requirements, it will be necessary to limit the production of feed from surplus food to licensed treatment plants located separately from farm premises. Given the European context – including the presence of African Swine Fever – treatment and biosecurity measures should be more stringent than those currently applied in Japan. REFRESH research shows that a well-developed disease risk management system consisting of heat treatment, acidification, biosecurity, traceability and official control measures can provide an appropriate level of protection that allows us to maximise the surplus food that is kept in the food supply chain as animal feed.

In modifying existing legislation for the safe use of treated meat-containing surplus food in omnivore non-ruminant feed⁴⁷, decision-makers may wish to consider existing animal disease risks alongside emerging risks of food security, climate change, and unknown disease. REFRESH findings demonstrate the emissions savings potential of using unavoidable surplus food as feed, even when we consider the energy needed to heat-treat such surplus food to ensure the feed is safe. Lifting the ban on feeding treated surplus food to omnivorous non-ruminant livestock may contribute substantially to EU sustainable diet targets and food waste reduction targets.

A new surplus-food-to-feed industry would also support regional circular economies with implications on Europe's food security and farmer livelihoods because a feed industry that increases its uptake of locally-sourced feed

⁴⁷ Including Regulation 999/2001 which bans using animal protein in animal feed (specifically amendments 1923/2006 and 56/2013 which extend this ban to non-ruminant omnivores) Regulation 1069/2009 which bans using kitchen left-overs and catering waste for feed; and Amend Reg 142 / 2011, specifically Annex IV where a processing method for meat-containing surplus food could be added to the existing list of approved processing methods for Animal By Products.

ingredients, can be both more secure and more predictable in terms of cost. The alleviation on land, water, fossil fuels and other resources created by resource efficiency, including food waste reduction, would lead to lower and less volatile food prices. When taking price volatility and food security into account, it is suggested to further investigate this opportunity to decouple feed supply from global agricultural commodity prices.

To incentivise the re-use of food waste into food and feed, several policy instruments can be applied, including tax structures and market-based instruments. This will contribute to minimise the amount of unavoidable surplus leaving the food supply chain. It will support the valorisation sector and thereby maximise the reduction of the amount of unavoidable surplus that ends up as waste.

It is suggested to establish a Bioeconomy Living Lab for processing food into animal feed. The "New bioeconomy strategy for a sustainable Europe"⁴⁸ (2018) proposes to Set-up "living labs" to develop and test place-based innovations based on ecological approaches and circularity in primary production and food systems. REFRESH findings on ideal plant size for best environmental and cost performance suggest typically a processing capacity of 50 kton per year or higher, pending on the plant efficiency and transportation costs (Broeze & Luykx, 2019⁴⁹). This would fit well as part of a living lab pilot.

⁴⁸ https://ec.europa.eu/commission/news/new-bioeconomy-strategy-sustainable-europe-2018-oct-11-0_en

⁴⁹ <https://www.eu-refresh.org/identification-food-waste-conversion-barriers>

Integrative policy action on food waste

4. 1 An integrated perspective

During the project's runtime, REFRESH provided a wide evidence base on its three main focus areas: consumer behaviour, business engagement and valorisation. However, REFRESH is based on a holistic approach, that calls for an integrated perspective in the design, implementation and evaluation of prevention and reduction measures to tackle food loss and waste. During the consultation sessions organised throughout the project, it became evident that stakeholders are supportive of this integrated approach, and are calling for the establishment of a common food (waste) policy and coordination between all related policy areas. This holistic approach requires cooperation along the entire food supply chain, from farm to fork, to identify both problems (hotspots) and solutions. Problems with food waste generation should not be viewed as the problem of one sector or one company, but as an interlinked set of causes and possible intervention options.

Therefore, all policy areas that are dealing with the food system (including loops of derived bio-organic flows), need to be considered as a whole when tackling issues related to food waste. These include food safety, hygiene, nutrition, health, agriculture, waste, trade, climate etc. This requires the involvement of stakeholders from various backgrounds as well as EU bodies and Member States. REFRESH identifies food waste as an entry point to revise the food system against a sustainable and circular design, for the short and long term. Explicitly the word 'system' is used within this context, as it is apparent to look beyond the linear supply chain.

Since the start of REFRESH in 2015, there have been many developments and advancements in the policy domain of food and food waste; the agenda has moved towards more circularity and new policy levers can help to move the food waste agenda faster and with high benefits. **Reducing food loss and waste is an urgent and necessary strategy for ensuring food security and combating climate change. Governments, businesses, farmers, consumers, and everyone in between needs to play a role in accelerating the global action agenda for cutting food losses and food waste in half by 2030.** As more and more becomes known about drivers and causes of food waste, Member States have been called to develop national strategies and are seeking for relevant approaches and activities to tackle food waste. REFRESH demonstrated evidence based decision management support on causes and interventions, blueprints for voluntary agreements and to include consumer acceptance in developing solutions. It identifies an increased need to connect and communicate between system stakeholders, and further explore the link between primary production and consumers. It emphasises the importance and role for national and local institutions to organise collaboration.

Although REFRESH was not set out specifically to tackle quantification issues, our evidence shows that better data availability contributes to:

- Identification of hotspots & opportunities
- Design & implementation of decision tooling
- Initiation and execution of prevention & reduction measures
- Evaluation of interventions and improved selection of efficient and adequate measures.

4.2 Policy recommendations on integrative policy action on food waste

Based on the outcomes of the Project, REFRESH calls for integrative policy action on food waste, including:

- Development of integrated policies to prevent and reduce food waste and to promote sustainable food systems
- Development of integrated supply chains
- Stimulate sharing of data (data transparency) to improve supply chain collaboration, through baseline and impact measurements on business, sector and national level.
- Set priority action on the largest impact areas, by taking the food use hierarchy as leading principle, considering trade-offs and benefits of different valorisation options from an integrated perspective, including environmental, economic and social aspects.
- Focus on:
 - Those food products that have the highest impact on food waste generation and reduction, such as bread and fresh fruit and vegetables (highest volumes) as well as animal-based products (highest environmental impact).
 - Capability to absorb 'gluts' in the food system, the desirability of year round availability of fresh produce, promotion of head-to-tail usage within animal production and consumption as well as investigating the impact of dietary changes on food waste prevention.

Box 5: recommendations on integrative policy action on food waste

4.3 Next steps

Based on the workshop “Integrated policies for food waste and sustainable food systems in the circular economy” (Brussels, March 2019), a number of issues were identified that comprise elements of a roadmap towards an integrated food waste policy for the EU. These issue areas indicated below, structured by the ‘target – measure – act’ principle:

TARGET:

- **Having stronger food waste reduction targets** would create a stronger incentive for Member States to reduce food waste
- **Voluntary Agreements** and setting binding targets for Member States holds strong potential for both food waste reduction and establishing sustainable food systems.
- Getting people to realise the **true price of food** is a key policy driver towards sustainable food systems → incentivising for food systems production, and penalizing for wasting or dumping (based on a polluter pays scheme). Such a scheme exists for plastics in the UK, it could be replicated for food waste.

MEASURE:

- **Measuring and monitoring food waste data has the potential to feed into projects that could drive food waste reduction.** Identify drivers of food waste reduction, and establish a baseline to monitor the progress achieved.
- **Make public reporting of food waste compulsory** for the public and private sector: *“When you report on waste, you act on it”*.

ACT:

- **Design and use tools and technologies** (e.g. ICT based applications) that will create innovative solutions to monitor and forecast the food demand by working with the dynamic of the food supply chain, driven by private sector actors.
- **Target goal-oriented innovations**, related to: business models and business practices, technology, research, holistic approaches to UN SDGs, and social innovations. These innovations should be inclusive, and should have quantifiable and measurable effects.
- **Introduce public (green) procurement** with transparent criteria and/or requirements, such as what can be done in schools e.g. green requirements, limiting the size of portions, etc.

- **Enhance education and awareness at all levels**, including better communication (school programmes, social and traditional media) and engagement of stakeholders.
- **Connect the consumer with primary production**. The consumers' wants and needs must be adapted to the reality of primary production and vice versa. Food producers have a responsibility to educate the public/consumers about the reality of primary production.
- **Impact carbon emissions. Carbon taxes and a functioning carbon trading system** would have a strong impact as it would drive systemic change, notably by setting higher CO₂ reduction goals.

Furthering the roadmap for impact, the following recommendations were noted for the new Commission:

- Action on food waste should start right away. At first, **consolidation of data**, including data at the local level, is needed before implementing any actions. The actions which will be decided should be focused on **achieving the SDGs** (12.3 but not only), and the topic of food waste should remain high on the EU's agenda. Getting Member States to see **SDGs and other targets as hard commitments**. For instance, national level reporting would help Member States become more active in tackling SDG 12.3.
- At the short or medium term, establishing a **food waste action plan**, containing a clear set of actions, part of the circular economy action plan. This plan should be aligned to the key related topics (hygiene, safety, nutrition), involving cross-sectoral teams. New priorities should be set at the EC's DG levels at the long term, including a priority focus given to an **integrated food systems strategy**.
- Establish an **integrated food policy legislation**, in synergy with a vice-president who would act in favour of the food policy and which can promote and organise more **inter-commission work**: for instance, aligning agricultural policies with health outcomes (e.g. the production of healthy food).
- **Better alignment of food policies with other policies**, by working alongside other commissioners, and ensuring there is more communication amongst all, especially concerning the tools that are available to them.

A number of suggestions on a more detailed level include the following:

- **Campaigns at the EU level:** support from the Commission could prove useful to set up campaigns. Retailers have already been invested in communication campaigns activities, but the Commission could use its influence to support and disseminate food waste prevention campaigns.
- **Best practices** that Member States should implement concerning **taxes**, and **subsidies** in the event of **redistribution of surplus food**.
- Proper review of the **competitiveness of the grocery and retail market across Europe:** having the EC consider these topics could avoid market distortion. There is only a small number of large scale buyers across the EU: a review of the market competition could help identify **priority areas for action** (UTPs, added value at the primary production stage).
- Strengthen legislation to **improve farmers' incomes**, and work at the primary production level to avoid the occurrence of Unfair Trading Practices at the short term
- **Standardisation on date marking requirements.**
- Establish **mandatory public procurement** in line with a food waste reduction target defined at the EU level.

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