

# Towards a new zero food waste mindset based on holistic assessment

## D6.1 Regulatory analysis of the food supply chains under study to prevent FW

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## 1. Introduction and scope

ToNoWaste is a project funded by the European Union under the programme Horizon Europe in the topic HORIZON-CL6-2021-FARM2FORK-01-13.

The project starts 01/09/2022 with a project duration of 48 months.

The mission of ToNoWaste is to encourage actors in European food systems, using evidence-based tools and lessons learned, to make better decisions towards more sustainable food production and consumption patterns.

ToNoWaste main objective is to provide farmers, supply chain companies as well as consumers and policymakers with more objective, integrated, and standardized information about the impacts and global co-benefits of their daily actions in terms of food waste. ToNoWaste will inspire them to co-create a portfolio of positively assessed pathways to shift Europe towards a healthier, more resilient, inclusive, and sustainable food production and consumption.

### 1.1. Specific objectives of the project

**(O1)** To design an open innovation ecosystem that engages European researchers, municipalities, farmers, supply chains and citizens to share open access scientific knowledge about FLWPR (Food Losses and Waste Prevention and Reduction) and its assessment. (WP1)

ToNoWaste seeks to create synergies with other ongoing actions related to FLWPR at EU level keeping in touch with four H2020 sister projects to reuse data and collaborate in the actions assessment for avoiding duplication.

**(O2)** To unveil what better decision means in the fresh food value chain (FFVC), supporting the FLWPR actions with the best impacts for the food system sustainability. (WP1)

ToNoWaste has selected FFVC because Milan urban food policy pact prioritized to make fresh food accessible for all due to its potential to solve dietary-related illnesses (e.g., diabetes, heart disease and cancer). Therefore, O2 will investigate how to make FLWPR compatible with FFVC sustainable development with a cost-benefit approach (RO1).

**(O3)** To co-create a new science-based assessment framework (SBF) for evidence-based decision making in food systems. (WP2)

O3 will look for synergies with H2020 sister projects, city councils and JRC to define logical steps for environmental/social/economic holistic impact FLWPR assessment (RO2).

**(O4)** To transform the SBF into Quantitative Decision-Making Methods (QDMM) that supports researchers and professionals in decisions related to FLWPR in the FFVC. (WP2)

O4 requires the SBF decomposition into specific workflows for the fresh products under study, considering its origin and business processes involved to establish the limits of acceptance/significance for each decision maker (R03).

**(O5)** To engage more and more FSC actors in the mindset and behavioural shift offering open access to: i) consumer perception of the FLWPR problem in fresh food value chain (FFVC) and potential solutions; ii) learning contents, technical guidelines to implement the best practices available - including date marking and smart food packaging, as well as iii) apps that automate the participation and monitoring process for facilitating decision making for supply chain actors (WP4 and WP5).

The behavioural change will be prompt by results of social research (RO4) focused on understanding the consumers' and producers' perception of the problem and the solutions proposed by decision-makers. ToNoWaste will facilitate the co-creation of FLWPR guidelines to identify hotspots of problems, plan actions, assess corrective solutions and document improvements. During multi-actor workshops and other networking events, we will validate the tools (PR, DEM) by discussing the practical learnings (KH1) and quantitative data from actions assessment (KH2).

**(O6)** To take advantage of synergies among R&I projects and local/national FLWPR actions to co-create specific accounting tools and an integrated platform for assessing the root causes behind FLW along the value chain as well as fostering the most beneficial FLWPR actions. (WP2 and WP3)

O6 will require the creation of accounting tools for professionals and its integration into an open platform for non-expert users (DEM) to facilitate the decision-making process to all the actors involved in the value chain. DEM will maximize the impact at EU level using open-source technologies as FIWARE. The previous/current FLWPR actions in sister H2020 projects will be compared to detect the best practices that maximise the overall positive impacts.

**(O7)** To foster the organisational change with new coaching services and best practices in food supply chain (FSC). (WP6)

O7 is based on the creation of learning contents, training actions and a business coaching service oriented to support entrepreneurs. ToNoWaste will take advantage from current innovation HUBs related to urban FFVC where food companies (mainly SMEs) can co-create more sustainable business models.

**(O8)** To co-create new EU policies considering the diversity on regulatory ecology about FLWPR. (WP6)

O8 will consider the new accounting and reporting methodology developed for ensuring a deeper integration of sustainability into the corporate governance and regulation of public supporting schemes for innovative businesses (KH4). The project will investigate how to transform the best FLWPR actions in terms of KPIs into new standards and labels for fostering the organisational change. The project will use the Covenant of Majors and Milan

Urban Food POLICY Pact for the open discussion of the white paper where other agencies like DG AGRI and JRC will be invited.

## 1.2. Scope of the deliverable

This deliverable D6.1 is part of the Work Package six (WP6) Cocreation of new policies and guidelines for fostering the change of the ToNoWaste project, which has two objectives: (i) to foster the organisational change with new coaching services and best practices in FSC, and (ii) to co-create new EU policies considering the diversity on regulatory ecology about FLWPR.

According to Task 6.1 (Ecosystem analysis in the FFVC under study), the University of Oslo has monitored public and private market entities for a systemic regulatory ecological analysis of its behaviour in different economic and legal environments. This analysis will deepen in the interrelation of the local, national, transnational and global, public, private and hybrid corporate behaviour. The study will unveil the complexity of public market participation and potential of a new typology of direct ownership, indirect ownership, regulatory ownership and new forms of hybrid public private contractual collaborations. Comparative regulatory ecology will be used to identify and create incentives for public market actors to contribute to FLWPR actions. The result will be a guideline summarising the systematically assessment of the public and private sector market actors in FFVC and through that, their role in its institutional design to promote behavioural change in FW management and prevention.

The main objective of this deliverable D6.1 is to create a summary of the conclusions from the multidisciplinary working group for a holistic comparative analysis of the regulatory ecology in each country. In that it enables introduction of new sustainable business models for FLWPR in FFVC through synergies between the circular economy, eco-efficiency, change management and regulatory ecology approaches (KH3). As a starting point this deliverable takes the regulatory ecology model developed in the Horizon 2020 project Sustainable Market Actors for Responsible Trade (SMART). This deliverable is also a preliminary study for following WP6 deliverables D6.3 White paper for new policies supporting FLWPR ecosystem and its executive summary D6.4 Policy brief.

This deliverable builds on (1) comparative legal research on the regulatory framework of FLWPR on the European Union (EU), country (focusing on Austria, Greece, Spain and Sweden) and regional and local (focusing on the pilots and followers in Austria (Vienna and Graz), Greece (Athens), Spain (Valencia) and Sweden (Hälsingland), workshops with the experts in pilots and followers and the academic partners in WP6) and (3) results of WP1 Collaborative investigation of new decision-making framework and especially Task 1.1 Open discussion for FW causes and potential FLWPR solutions, identification and assessment and Task 1.2 Multidisciplinary research what it means to make better decisions FLWPR, with ToNoWaste Deliverables D1.1 Related Accounting methods and databases for SBF design (24 July 2023) and D1.2 Requirements & science-based decision making standards (24 July 2023)). The literature and regulatory instrument review in Deliverable D.1.1 was used as a background

for the legal survey in this deliverable. The co-creative technical workshops in Valencia, Vienna and Graz in 16 November and 5 December 2022 on agreed requirements and science-based standards to make better decisions regarding FLWPR action reported in Deliverable D1.2 were also used in building the regulatory ecology analysis in this deliverable.

Work on the co-creation processes with a broad range of experts and stakeholders under WP1 framework regarding the FLW causes and potential FLWPR solutions considering a life cycle approach, the factors that influence decision-making processes to prevent/reduce food losses and waste associated with fresh food, and the definition of the initial portfolio of selected FLWPR solutions. In parallel, the scientific background included in this deliverable has been complemented with a view of the current and previous FLWPR actions implemented in the European Union.

In this deliverable, we understand sustainability in the same way we understood in SMART project, covering not only environmental sustainability as understood in the planetary boundaries framework, defining global sustainability criteria for critical environmental processes that regulate the stability of Earth system components, quantifiable based on a scientific assessment of when these critical processes enter a danger zone with risks of large-scale thresholds, but also defining a safe operating space for world development on Earth (Sjåfjell & Taylor, 2019, p. 60-61; Sjåfjell et al., 2019 p. 5; Sjåfjell et al., 2020 p. 6).<sup>1</sup>

There is increasing high-level policy commitment to sustainability in the EU. The European Commission 2019-2024 emphasises its prioritisation of sustainability, launching a European Green Deal (European Commission, 2019a), with a 'just transition' that leaves 'nobody behind', refocusing the coordination of economic policies across the EU to integrate sustainability. The EU's commitment to sustainability is anchored in the EU Treaties, the Treaty on European Union (TEU) and the Treaty of the Functioning of the European Union (TFEU). Sustainability is an overarching objective of the European Union and meant to be the guiding principle for the EU's policies and activities within Europe and in its relations with the rest of the world, to promote 'peace, its values and the wellbeing of its peoples' (Article 3(1) TEU). The internal founding values of the EU set out in Article 3(3) and 3(5) TEU are externalised in Article 21 TEU and reinforced in the EU's development cooperation with developing countries under Article 208 TFEU. Article 11 TFEU requires the implementation of environmental protection requirements in all EU policies where necessary to achieve sustainability (Sjåfjell et al. 2019 p. 5; Sjåfjell et al., 2020 p. 5)

Policy coherence for development (PCD) is set out as an EU legal norm in Article 208 TFEU, requiring that any area of EU law and policy must not work against developmental policies, also with the sustainability aim of 'leaving no-one behind' (European Commission, 2019c). The adoption of the United Nations Sustainable Development Goals (SDGs) in 2015 (United Nations, 2015), together with the Paris Agreement on Climate Change in the same year (Paris Agreement, 2015), has given a new impetus to the public discourse concerning what we need

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<sup>1</sup> Sustainable Market Actors for Responsible Trade (SMART), Our research, available at <https://www.smart.uio.no/research/>.

to do to achieve sustainability. The EU's commitment to implementing the SDGs is elaborated on in the European Commission's 2016 communication 'Next steps for a sustainable European future – European action for sustainability' (European Commission, 2016), and the EU's 2017 Consensus on Development (European Union, 2018b). Among the positive initiatives from the EU are the Sustainable Finance Initiative, including its Action Plan action 10 on the role of boards and corporate governance (European Commission, 2018c), and the Green Deal (European Commission, 2019a), including its plan for new Circular Economy Action Plan (European Commission, 2020a) (Sjåfjell et al., 2020 pp. 5-6).

However, much of the EU's emphasis on how to achieve sustainability is concentrated on mitigating climate change. There is however an emphasis on other environmental issues, including ambitions of preserving and restoring ecosystems and biodiversity and reduce pollution such as microplastics. The EU Green Deal refers to key environmental reports. Yet, there is no reference in the EU Green Deal to the planetary boundaries or the 'limits of our planet'. Further, sustainability as an overarching commitment of the EU encompasses the social dimension, including the protection of human rights, social policy, and policy coherence for development. As laid out above, this has a clear Treaty basis. Yet, in the important initiative of the EU Green Deal, the emphasis on creating a Just Transition and leaving nobody behind is limited to ensuring justice in the transition to sustainability within the EU Member States (Sjåfjell et al., 2019 p. 5; Sjåfjell et al., 2020 p. 6).

## 2. Regulatory ecology approach to FLWPR

### 2.1. Regulatory ecology approach

For the regulatory ecology<sup>2</sup> analysis in this deliverable, the 'Pathetic Dot Theory' or interchangeably, the 'New Chicago School Theory' is used as indicated in the ToNoWaste Grant Agreement. The 'Pathetic Dot Theory' was originally introduced by the US legal scholar Lawrence Lessig, who assigns its important role to law (Lessig, 1998; Lessig, 1999; Lessig, 2006; of the impact of the Pathetic Dot Theory, see Jansen, 2019). At the same time it is polycentric (Baldwin et al., 2010), recognising the limited regulatory power of law, interacting with three other regulatory powers, namely social norms, markets and material constraints (Sjåfjell & Taylor, 2019).

The 'Pathetic Dot Theory' starts with the assumption that there are boundaries in the idea of law (legal norms) being the only regulatory power. There are many techniques to escape or evade the regulatory power of law. Regulation and enforcement entail a reference to the political process of legislative and executive institutions. These institutions try to bring changes in societies through several types of legislation and regulatory activity. However, also other factors are of influence to social relations between people, for example political, cultural, religious, physical and economic aspects inhibit and regulate human behaviour. Lessig's Pathetic Dot Theory explains how four forces ('modalities') are generally capable of

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<sup>2</sup> Not to be confused to regulation of ecology as protection of species and ecological areas, see Moghissi et al, 2022.

regulating the lives and the behaviour of individuals. These are, besides law and regulation, social norms, the market, and the architecture (technical infrastructures, both human-made and natural). The four regulatory modalities or regulatory forces are depicted in Figure 1.

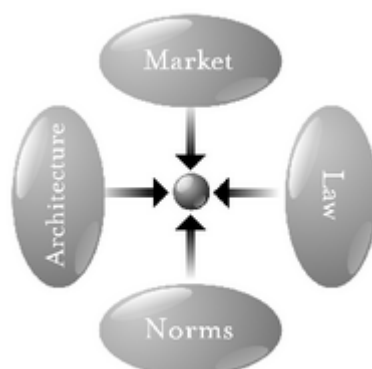


Figure 1: Four constraints regulating the Pathetic Dot (Lessig, 2006 p. 123)

The lives and behaviour of individuals are the 'Pathetic Dot' in the middle of the figure. Law, social norms, markets and material constraints, called by Lessig as 'architecture' apply to any pathetic dot through a system of formal and informal sanctions and obstacles. The sanctions can be of a legal or social nature. Lessig also writes that social 'norms constrain through the stigma that community imposes' (Lessig, 2006 p. 124).

In addition, Lessig's framework focuses on market and architecture. Market and architecture do not impose sanctions on people, but they can generate obstacles. Market generally refers to the (real or virtual) place of the gathering of the supply and demand of a certain good or service. Technical infrastructure or architectural obstacles are physical obstacles such as rivers, building materials or walls: "[A]rchitectures constrain through the physical burdens they impose' (Lessig, 1999 p. 124). For example, someone who lives on a riverbank will use the river more than someone who does not live on a bank. And if there would be a bridge over the river, this would regulate human behaviour as people can more easily go to the other side of the river and bring their cars and goods to the other side. These four constraints form an analytical framework that can assist in answering questions concerning which types of legal regulations would be most appropriate and/or most effective to regulate certain behaviour. It can help by revealing how legislation integrates or segregates with other regulators such as social, cultural and/or religious drivers (social standards), financial and economic factors (markets), and/or architectural forces.

Although the four regulating forces are different, they are very clearly interrelated with each other. This is displayed by Lessig in the example of regulating the subject of 'Smoking'. If the government's objective is to reduce the consumption of cigarettes, there are various ways in which the government could use Lessig's Pathetic Dot Theory to regulate: (i) law could ban smoking, e.g. as has been done in many jurisdictions regarding public authorities' buildings and other public spaces. In this way, law regulates the behaviour that must change in a direct way; (ii) law could tax the sale of cigarettes, i.e. law regulates indirectly the market to reduce the supply of cigarettes, in order to decrease the consumption of cigarettes; (iii) law could fund a public advertisement campaign against smoking. Hence, law indirectly regulates social norms with the ultimate aim to regulate smoking behaviour; and/or (iv) law could



regulate the allowed quantity of nicotine per cigarette, thereby requiring manufacturers to reduce or eliminate nicotine. Following this path, law regulates the physical reality, i.e. the architecture of cigarettes, in order to reduce their addictiveness, and hence to limit the consumption of cigarettes. Each of the above-described actions by the government can be expected to have some effect on the consumption of cigarettes. Each action also requires activities and time in order to succeed, both involving a certain cost (Lessig, 2019 p. 124). Thus, the legislator must test whether the expected results and costs of each option compare and which option or combination of options contributes in a most efficient way to achieving the legislator's end (Lessig, 1999 p. 124).

Sjåfjell and Taylor refer to this type of mapping of various types of legislation as the 'Regulatory Ecology' (Sjåfjell & Taylor, 2019), and it was used in the Horizon2020 SMART project as theoretical approach (van der Velden, 2019),<sup>3</sup> to analyse how the four regulatory modalities affect business models, both as a driver to and an obstacle of sustainability.

As developed by van der Velden (2016) and Sjåfjell and Taylor (2019) regulatory ecology interacts in all four modalities with businesses: (1) law, (2) social norms, (3) market influences (e.g., through pricing), and (4) 'architecture', the influence or constraints consisting of the natural world and human-made physical and technological elements. These four constraints, or 'modalities of regulation', operate together (Sjåfjell & Taylor, 2019). Together, they constitute a sum of forces that guide business to behave or act in a given way, affecting the business model of a company through its governance, its finance and its assessment and accounting systems (see Figure 2).

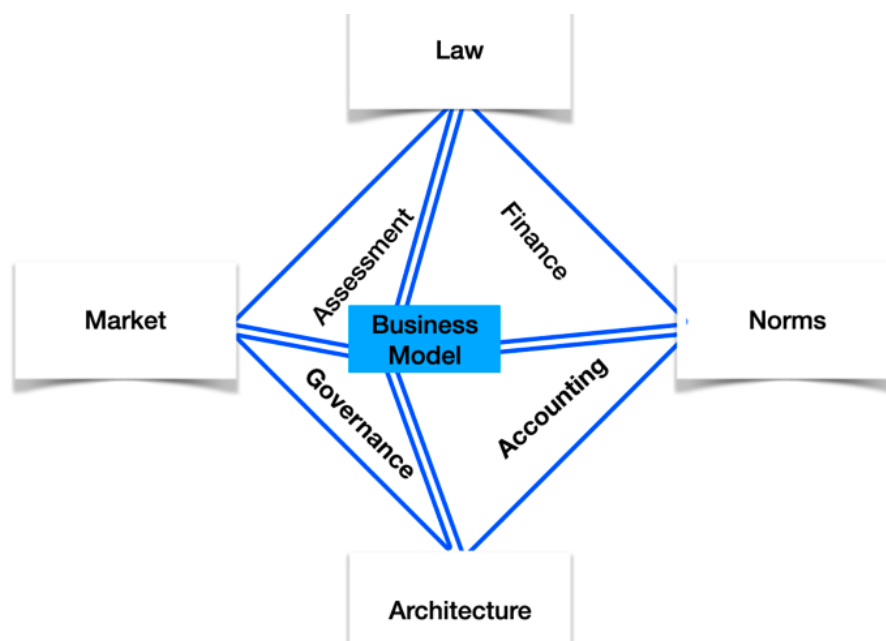


Figure 2: Regulatory ecology approach to business models

<sup>3</sup> Horizon2020 Sustainable Market Actors for Responsible Trade (SMART), Regulatory Ecology of Hotspots in the Mobile Phone Life Cycle, available at [https://www.smart.uio.no/material-for-conference/regulatory\\_ecology\\_mobile\\_lifecycle\\_14\\_02\\_final.pdf](https://www.smart.uio.no/material-for-conference/regulatory_ecology_mobile_lifecycle_14_02_final.pdf).

This polycentric approach to regulation assumes that markets and social norms have regulatory effects not unlike law, in that they constrain actors in certain ways. Social norms and markets can either promote respect for a rule or encourage non-compliance. In addition, law, social norms and markets not only constrain an actor separately, but they do so in interaction with each other, forming a system or 'regulatory ecology' (Sjåfjell & Taylor, 2019 p. 42).

When businesses are concerned, these interactions are often complex in practice (Sjåfjell & Taylor, 2019 pp. 42-43). For example, manufacturing is traditionally reliant on labour, for which there is a market, regulated by labour law. However it is hard if not impossible to understand compliance with labour law on wages or working conditions by a particular company without understanding how the management of that company is influenced by wages set in the labour market based on labour supply and demand which in turn will be influenced by the relationship between labour and technology in the production process, social relations between workers and management, the existence or non-existence of collective bargaining and agreements, and on attitudes of both management and workers to each other and to social ideas about social justice and equity more broadly.

The act of respecting a rule is the result of a complex set of power relationships. Thinking about regulation as a system or an ecology allows for consideration of the complexity of factors, both legal and non-legal, which go into generating respect for a rule. In such an ecology, the state is merely one regulator, albeit one of the most important, in a system in which other regulators, such as markets and communities, also exert influence (Black, 2008).

In understanding the operation of a regulatory ecology, it is important to be able to identify the potential for the exercise of *interpretive flexibility* (Sjåfjell & Taylor, 2019 p. 44), emphasising the role of the agency of actors themselves within a regulatory ecology. It is through this agency of actors that compliance with and avoidance or evasion of constraints are developed. There is also difference between the constraints as markets and architecture constrain immediately through pricing or physical and technological constraints while law and social norms sanction after the fact (breach of a norm). Still, one may feel the constraint of a social norm or law immediately, independent of any sanction that may be likely (with high expectation value). The efficiency of constraints also varies depending how quickly they change behaviour: for example, labour markets can change quickly, or prices of commodities can be volatile. In economic terms, constraints are externalities we internalise and make them subjective, and so more efficient. They become a part of who we are (Lessig, 2006 p. 237-238).

Polycentrism offers us a framework through which to better understand the dynamics leading to a regulatory ecology of FLWPR. Thinking in terms of an ecology also helps when considering the potential impacts of changes that affect the food system. Small changes in one mode of regulation can have widespread effects in the rest of the ecosystem, resulting in either positive or negative effects with respect to compliance (Sjåfjell & Taylor, 2019 p. 45).



## 2.2. Regulatory ecology approach to FLWPR

Causes and risk factors for FLW generation are often complex and interconnected in the food system, making them difficult to solve by single actions or solutions. Moreover, a solution that is suitable for one stakeholder may just shift the burden of food waste to another stakeholder in the food chain. The European regulation discussed in section 3.3.1 concentrates on measures to FLWPR. However, this is not enough, we need also policy instruments that enforce or incentivise a behaviour where all participants in the food chain strive to FLWPR. Such instruments can affect participants' social behaviour, they can be market-based that for instance make it more expensive to waste food, they can encourage to use technology for FLWPR as apps helping for finding different kind of food products, they can be binding regulations that enforce a certain behaviour, or a combination of all types of instruments (Eriksson et al., 2023).

So, FLWPR is a regulatory area where all four modalities of regulation, laws, social norms, markets and technology (architecture is relevant). Binding regulations force actors to meet specific standards, but detailed knowledge and insights are required to set appropriate standards and an authority is needed to monitor compliance. Knowledge is also required on where in the food chain regulations should be implemented in order to have the best effect and a minimum of unwanted side-effects. The alternative, a softer and flexible system of market-based instruments, would create economic incentives through tax exemptions, refund schemes and deductions, with the purpose of triggering behavioural changes. Market-based instruments have the benefit of requiring less governance and could therefore be more cost-effective to implement than legal instruments. Economic incentives could also be iterated to fine-tune the level needed for compliance. However, all economic incentives may fail to reduce waste if the stakeholders are motivated by factors other than finances (Eriksson et al., 2023). According to Eriksson et al. (2023), a system that combines the cost-effective implementation and fine-tuning possibilities of economic instruments with the standards detailed through legislation could therefore be the best approach to drive the food system in the direction of less resource consumption.

As with any business, regulation on FLWPR on local, regional, national, transnational and international level is complex. The ToNoWaste relevant countries Austria, Greece, Spain and Sweden are all EU member states and also members in the United Nations. Norway, the home country of the University of Oslo is not an EU member state but a member of the European Free Trade Association (EFTA). The European Economic Area (EEA) established by the EEA Agreement of 2 May 1992 brings together the EU member states and three of the EFTA States (Iceland, Liechtenstein and Norway). The EEA Agreement integrates the three EFTA states on the Single Market, covering the four EU Treaties based freedoms, the free movement of goods, capital, services and persons. It covers also the EU competition and state aid rules and horizontal areas related to the four freedoms.

All relevant EU legislation in the field of the Single Market is integrated into the EEA Agreement so that it applies throughout the whole of the EEA, ensuring uniform application of laws relating to the Single Market. The EEA Agreement also covers consumer protection, company law, environment, social policy, statistics. In addition, the EEA Agreement provides

for cooperation in several flanking policies such as research and technological development (as a example the Framework Programmes), education, training and youth, employment, tourism, culture, civil protection, enterprise, entrepreneurship and small and medium-sized enterprises. The EEA Agreement guarantees equal rights and obligations within the Single Market for citizens and economic operators in the EEA. Through Article 6 of the EEA Agreement, the case law of the Court of Justice of the European Union is also of relevance to the EEA Agreement, as the provisions of the EEA Agreement shall be interpreted in conformity with the relevant rulings of the Court given prior to the date of signature).

However, the EEA Agreement does not cover the following EU policies: common agriculture and fisheries policies (although the EEA Agreement contains provisions on trade in agricultural and fish products); customs union; common trade policy; common foreign and security policy; justice and home affairs (the EEA EFTA States are however part of the Schengen area); direct and indirect taxation; or economic and monetary union.

This means that when concerning FLWPR, the EU legislation and EU legal instruments discussed below applies also to Norway as long as it does not regulate the common agriculture and fisheries policy, let to the sovereignty of Norway.

FLWPR is one of the focal points of EU sustainability policies. As stated in preamble 31 of the 2018 amendments to the Waste Framework Directive (European Union, 2018a),

‘[i]n order to contribute and ensure to be on track towards the attainment of the UN Sustainable Development Goal, Member States should aim to achieve an indicative Union-wide food waste reduction target of 30 % by 2025 and 50 % by 2030. Having regard to the environmental, social and economic benefits of preventing food waste, Member States should establish specific food waste prevention measures, including awareness campaigns to demonstrate how to prevent food waste, in their waste prevention programmes. Member States should measure progress made in the reduction of food waste. To measure that progress and to facilitate the exchange of good practices across the Union both between Member States and between food business operators, a common methodology for such measurement should be established. Based on those methodologies, reporting on food waste levels should take place on an annual basis.’

To fulfil these policies and especially SDG Target 12.3 (‘By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses`), a complex regulatory framework has been constructed. Unlike in many other fields of EU regulation in which the Treaty objectives is fulfilled with substantive EU legislation as Regulations and Directives, a Union-wide substantive FLWPR regulation is scarce. Instead, FLWPR measures take place on national, regional and local levels using a broad array of regulatory modalities, besides law social norms, markets and technology. In FLWPR, efficiency of measures do not depends only on regulation, but foremostly social norms in local communities. They are also dependant on market structures in the food value chain and need to catch up with the fast-evolving technical alternatives FLWPR.

For these reasons, it is more fruitful than in many other areas of sustainability regulation, to use the regulatory ecology framework in Austria, Greece, Spain and Sweden and in the pilot

and follower communities in these countries to understand how law, social norms, the market and architecture affect the governance, finance, assessment, and accounting of food value chain participants, supporting and creating obstacles to sustainability decisions and organizational change. Food value chain (un)sustainability is the aggregate outcome of multiple actions by individual entities as well as systems of business across time, space, and sectors.

In WP6, the University of Oslo leads the stakeholder's co-creation of new supporting schemes for food losses and waste prevention and reduction (FLWPR) that ensure all the entities in food ecosystem contributes to staying within planetary ecological boundaries and social foundation, using FLWPR actions as an example of how profit-making can be transformed into broader sustainable value creation, considering protection of employees and workers and integrating the interests of today's especially vulnerable groups and of future generations in business decision-making. We also focus on:

- Necessary investments as crucial elements in supporting business transitions to sustainable circularity.
- Assessment and accounting of business connecting governance and finance of business.
- Accounting regulations that define what is value, and influence public and private finance and systems of business by determining social, environmental, and economic issues.

### 3. Objective and context of FLWPR regulatory ecology study

#### 3.1. Objective

In the EU Waste Framework Directive 'food and kitchen waste from households, offices, restaurants, wholesale, canteens, caterers and retail premises and comparable waste from food processing plants' is classified as 'bio-waste' in the EU Waste Framework Directive (Article 3(4), European Union, 2008), covering all food as defined in Article 2 of the General Food Law Regulation (European Union, 2002a) that has become waste, ie, 'any substance or product, whether processed, partially processed or unprocessed, intended to be, or reasonably expected to be ingested by humans'.<sup>4</sup>

The specific role food losses and waste has in European policies was first time recognised by the European Commission in its first Circular Economy Action Plan in 2015 (European Commission, 2015). Since then, the Commission has taken initiatives to clarify and harmonise relevant legislation and regulation on FLWPR, as the adoption of EU guidelines on food donation to facilitate safe food donation practices (European Commission, 2017) and for the feed use of food no longer intended for human consumption (European Commission, 2018a). However, the specific nature of food waste separate from other bio-

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<sup>4</sup> According to Article 2, 'food' includes drink, chewing gum and any substance, including water, intentionally incorporated into the food during its manufacture, preparation or treatment. It should be noted that 'food' does not include animal feed. live animals unless they are prepared for placing on the market for human consumption, plants prior to harvesting, medicinal products, cosmetics, tobacco and tobacco products, narcotic or psychotropic substances, residues and contaminants, nor medical devices.

waste was recognised just in the 2018 amendments of the Waste Framework Directive, connecting FLWPR to UN SDGs and becoming one of the focal points of EU policies.

Several research projects under EU Research and Innovation Framework programmes Seventh Framework Programme, Horizon 2020 and Horizon Europe have addressed FLWPR, giving policy recommendations. In ToNoWaste, we have analysed 21 of them (ToNoWaste deliverable D1.1 Related Accounting methods and databases for SBF design). Of these, the European Commission has recognised four, Waste Quantification Solutions to Limit Environmental Stress (WASTELESS)<sup>5</sup> Bringing knowledge and consensus to prevent and reduce FOod LOss at the primary production stage. Understanding, measuring, training and adopting (FOLOU)<sup>6</sup> Changing practices and Habits through Open, Responsible, and social Innovation towards ZerO (CHORIZO)<sup>7</sup> and ToNoWaste in its recent proposal for new amendments to Waste Framework Directive (European Commission, 2023).

Based on the research in WASTELESS, FOLOU, CHORIZO and ToNoWaste, the Commission has noted that food waste is one of the largest sources of inefficiency in the global agri-food chain, resulting in negative environmental and climate impacts and contributing to the negative environmental impacts and biodiversity footprint of EU consumption (European Commission, 2023 p. 3). Additionally, as emphasised by the Commission in its legislative proposals (European Commission, 2023 pp. 34), when food is discarded, all the embedded energy and resources and their environmental consequences, such as GHG emissions – that accumulate along the food chain – still materialise with no benefit for human nutrition. Food waste also puts unnecessary pressure on limited natural resources. According to the Commission, wasting food has important social consequences. It leads to unnecessary spending of resources that could be otherwise allocated. The average share of food expenditure (agri-food and food services) in total household expenditure in the EU is around 19 per cent. Discarding food that is fit for human consumption – rather than redistributing that food to those in need, including through food donation – also represents a missed opportunity in the light of growing challenges to food security (European Commission, 2023 p. 4 and the research referred to in it).

When evaluating the regulation of FLWPR in the European Union, it must be so remembered – as emphasised by the European Commission,<sup>8</sup> although households generate 54 per cent of food losses and waste and 70 per cent arising at household, food service and retail,<sup>9</sup> food is lost or wasted along the whole food supply chain: on the farm, in processing and manufacture, in shops, in restaurants and canteens and in the home. According to the

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<sup>5</sup> <https://cordis.europa.eu/project/id/101084222>.

<sup>6</sup> <https://cordis.europa.eu/project/id/101084106>.

<sup>7</sup> <https://chorizoproject.eu/>.

<sup>8</sup> European Commission, Food Waste, available at [https://food.ec.europa.eu/safety/food-waste\\_en](https://food.ec.europa.eu/safety/food-waste_en).

<sup>9</sup> Eurostat, Food waste and food waste prevention – estimates, available at [https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Food\\_waste\\_and\\_food\\_waste\\_prevention\\_-\\_estimates](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Food_waste_and_food_waste_prevention_-_estimates).

European Commission,<sup>10</sup> factors contributing to food waste include (see also ToNoWaste Deliverable D1.2 p. 13):

- Insufficient shopping and meal planning
- Shopping environment (e.g. promotions like 'buy one, get one free' that may lead to impulse buying and over-purchase)
- Misunderstandings about the meaning of 'best before' and 'use by' date labels leading to edible foods being thrown away
- Insufficient food management skills (e.g. meal preparation, use of food/food ingredients in-stock, use of leftovers)
- Packaging difficult to empty or too large
- Aesthetic considerations (bruised fruit and vegetables etc.)
- Standardised portion sizes in restaurants and canteens
- Difficulty in anticipating the number of customers (a problem for catering services)
- Stock management issues for manufacturers and retailers
- High quality standards (e.g. for produce sold at retail)
- Overproduction or lack of demand for certain products at certain times of the year
- Production errors, products and/or labelling not meeting specifications
- Product and packaging damage (farmers and food manufacturing)
- Inadequate storage/transport at all stages of the food chain including households (e.g. refrigerator temperatures)
- Lack of knowledge and/or misinformation on the environmental, social and financial impacts of food waste
- Low perceived value of food
- Busy lifestyle and conflicting priorities
- Underlying all these problems is an overall lack of awareness, by many actors, of the sheer scale of the problem, the possible solutions and the benefits that come from reducing food waste.

Taking into consideration the complexity of incentives to food losses and waste creation there is no one solution to solve them. The relationship between different regulatory modalities for FLWPR varies based on architecture, including the natural environment where food is produced, processed, transported and consumed, market structures and conditions in the food value chain.

The incentives for food waste creation are a combination of social norms, market structures and architecture. Therefore, in order to get an overview of regulatory ecology of FLWPR in Europe, a review of different regulatory modalities is necessary.

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<sup>10</sup> European Commission, Food Waste, available at [https://food.ec.europa.eu/safety/food-waste\\_en](https://food.ec.europa.eu/safety/food-waste_en).

## 3.2. Methodology

The study on the regulatory ecology is based on legal research on regulation of FLWPR on the European Union, country (especially in the pilot and follower countries Austria, Greece, Spain and Sweden) and regional and local (Athens, Graz, Hälsingland, Valencia and Vienna) level. Legal and other normative text are studied, using original sources and both authoritative sources (legislative proposals, legislative opinions, rules and guidance from authorities), as well as legal and other research literature, information received from the media, research conducted in the other FLWPR projects, and workshops conducted in ToNoWaste. In ToNoWaste WP2 Development of a new impact measurement system and ICT tools and especially Deliverable D2.1 Technical report on the operationalization of ToNoWaste SBF a survey on the multifaceted character of sustainability in the FLWPR assessment considering the most relevant international and European policy initiatives regarding sustainability, such as the SDGs, the European Green Deal, and the Farm to Fork Strategy was conducted, and used in this study. Of the Seventh Framework Programme, Horizon 2020 and Horizon Europe projects mentioned above in section 2.1 the four emphasised by the European Commission (2023) (WASTELESS, FOLOU and CHORIZO), the research done in CHORIZO has been crucial for the study. Concerning workshops, the technical workshops in city pilots Graz, Valencia and Vienna organised in ToNoWaste WP1 Collaborative investigation of new decision-making framework in 16 November and 5 December 2022 were used in analysing what are the main causes of the problem of fresh food losses and waste (FFLW) throughout the supply chain and what are the main characteristics of the current actions for the prevention/reduction of food losses and waste associated with fresh food in the city pilots. The results were summarised in ToNoWaste deliverable D1.2 Requirements & science-based decision-making standards. Additionally, two online workshops were organised in WP6. The first one was organised by the (University of Gävle, the University of Oslo and Hälsinglands Utbildningsförbund) on 28 April 2023 to the academic partners and the pilots and the followers and their stakeholders to discuss on successful approaches on food waste reduction with a particular focus on regulatory approaches. The second one was organised by the University on 20 February 2024 to the academic partners and pilots and followers on the preliminary outcomes of the regulatory ecology study. The outcomes of the workshops are discussed in section 5. In the following we report the outcomes of the study on FLWPR regulatory ecology in the European Union, selected EU Member States (Austria, Greece, Spain and Sweden) and selected regions and cities (Athens, Graz, Hälsingland, Valencia and Vienna).

## 3.3. Law

### 3.3.1. European Union law

Austria, Greece, Spain and Sweden are all European Union Member States and their legal systems are a hybrid of directly applicable **European Union law** as the primary law of the EU Treaties (Treaty on European Union (TEU) and the Treaty on the Functioning of the European Union (TFEU)), and the secondary law of both directly applicable European



Parliament and the Council Regulations and Commission Delegated Regulations and Decisions, and Directives to be implemented in the Member States' legislation and non-binding Commission recommendations. The sole power to issue proposals for EU legal instruments is vested to the European Commission. The Commission builds its legislative programme to action plans and strategies. On the other hand, on policy level of great importance are **public international law** instruments the European Union and its Member States are members, especially the United Nations Agenda 2030: Sustainable Development Goals and so, SDG Target 12.3. on food losses and waste. In order to support achievement of the Target 12.3 on food losses and waste and maximise the contribution of all actors, the Commission established in 2016, a multi-stakeholder platform dedicated to food losses and waste prevention,<sup>11</sup> inspiring for instance the Commission Farm to Fork Strategy (European Commission, 2020b). However, already the 2012 Bioeconomy Strategy (European Commission, 2012) called for actions to reuse, reduce and recycle bio-waste streams. The reduction of food waste contributes to core principles of the strategy such as the circular economy, the cascading use of biomass and the application of the waste hierarchy.

Target 12.3 was however a major trigger for EU legislative action to FLWPR. The Commission started to implement a dedicated action plan to reduce food losses and waste, including both regulatory and non-regulatory actions, already in 2015 initially as part of the first Circular Economy Action Plan (European Commission, 2015) and, since 2019, in the European Green Deal (European Commission, 2019a), the Circular Economy Strategy (European Commission, 2020a) and the Farm to Fork Strategy (European Commission, 2020b), identifying food lost and waste a key to achieving sustainability. The Farm to Fork Strategy foresaw the establishment of a baseline for food waste levels, considering new data reported by the Member States, and the setting of legally binding targets to reduce food waste across the EU by 2023.

Target 12.3 was implemented in the EU secondary legislation in 2018: according to Article 9(1)(g) of the Waste Framework Directive (European Union, 2008), as amended by Directive 2018/851 (European Union, 2018a), the EU Member States shall take measures to prevent waste generation. Those measures shall, at least, 'reduce the generation of food waste in primary production, in processing and manufacturing, in retail and other distribution of food, in restaurants and food services as well as in households as a contribution to the United Nations Sustainable Development Goal to reduce by 50 % the per capita global food waste at the retail and consumer levels and to reduce food losses along production and supply chains by 2030.'

In the aftermath of the amended Waste Framework Directive the SDGs was meant to continue being the backbone of the Commission sustainability policies, especially after the European Green Deal (European Commission, 2019a) and the new European Circular Economy Action Plan (European Commission, 2020a). Although the EU and its Member States committed with the amended Waste Framework Directive (European Union, 2018a)

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<sup>11</sup> European Commission, EU Platform on Food Losses and Food Waste, available at [https://food.ec.europa.eu/safety/food-waste/eu-actions-against-food-waste/eu-platform-food-losses-and-food-waste\\_en](https://food.ec.europa.eu/safety/food-waste/eu-actions-against-food-waste/eu-platform-food-losses-and-food-waste_en).

to achieving Target 12.3 to halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including postharvest losses, by 2030, food is still the first most resource intensive sector, requiring additional legislative action (European Commission, 2023 p. 1).

Reflecting the slow progress, the Commission proposed in July 2023 new amendments to the Waste Framework Directive, especially to reduce the environmental and climate impacts of food systems associated with food waste generation and to contribute to food security (European Commission, 2023). The proposal is discussed in Section 4 below.

The European Union FLWPR policy is not only to lay down clear legislative obligations for Member States as regards reduction of food waste but also to create a policy environment that supports Member States in taking effective action using measures, they see appropriate to achieve targets set on the Union level. For this, the amended Waste Framework Directive (European Union, 2018a) was supplemented by a Commission Delegated Decision (European Commission, 2019b) on common methodology and minimum quality requirements for the uniform measurement of levels of food waste. The methodological and quality requirement provisions in the Decision are set out pursuant to the amended Waste Framework Directive, which lays down an obligation for Member States to include food waste prevention into their waste prevention programmes and to monitor and assess the implementation of their food waste prevention measures by measuring the levels of food waste on the basis of a common methodology.

The aim of the Decision was to establish a common methodology and minimum quality requirements for the uniform measurement of levels of food waste. It stipulates that the amounts of food waste shall be measured separately for the following stages of the food supply chain: (a) primary production; (b) processing and manufacturing; (c) retail and other distribution of food; (d) restaurants and food services; (e) households (Article 1(1)). Food waste shall be attributed to each of the stages of the food supply chain referred to in paragraph 1 in accordance with Annex I of the Decision (Article 1(2)):

- Primary production: agriculture, forestry and fishing, divided to crop and animal production, hunting and related service activities and fishing and aquaculture
- Processing and manufacturing: manufacturing, divided to manufacture of food products and manufacture of beverages
- Retail and other distribution of food: wholesale and retail trade; repair of motor vehicles and motorcycles, divided to wholesale trade, except of motor vehicles and motorcycles and retail trade, except of motor vehicles and motorcycles
- Restaurants and food services: accommodation and food service activities, divided to accommodation and food and beverage service activities, and activities in which food services are provided (such as staff catering, healthcare, education, travel catering)
- Households: waste generated by households

The measurement shall cover food waste that is classified under the waste codes referred to in Annex II of the Decision or under any other waste code for waste that includes food waste (Article 1(3)):

- Primary production
  - o 02 01 02, Animal tissue waste
  - o 02 01 03, Plant tissue waste
- Processing and manufacturing
  - o 02 02, wastes from the preparation and processing of meat, fish and other foods of animal origin
  - o 02 03, wastes from fruit, vegetables, cereals, edible oils, cocoa, coffee, tea and tobacco preparation and processing; conserve production; yeast and yeast extract production, molasses preparation and fermentation
  - o 02 04, wastes from sugar processing
  - o 02 05, wastes from the dairy products industry
  - o 02 06, wastes from the baking and confectionery industry
  - o 02 07, wastes from the production of alcoholic and non-alcoholic beverages (except coffee, tea and cocoa)
- Retail and other distribution of food
  - o 20 01 08, biodegradable kitchen and canteen waste
  - o 20 01 25, edible oil and fat
  - o 20 03 01, mixed municipal waste
  - o 20 03 02, waste from markets
  - o 16 03 06, organic wastes other than those mentioned in 16 03 05
- Restaurants and food services
  - o 20 01 08, biodegradable kitchen and canteen waste
  - o 20 01 25, edible oil and fat
  - o 20 03 01, mixed municipal waste
- Households
  - o 20 01 08, biodegradable kitchen and canteen waste
  - o 20 01 25, edible oil and fat
  - o 20 03 01, mixed municipal waste

On the other hand, the measurement of food waste shall not cover the following items (Article 1(4)):

(a), agricultural material;

(b), animal by-products;

(c), food waste residues collected within packaging waste classified under waste code '15 01 — Packaging (including separately collected municipal packaging waste)' in the European list of waste;

(d), food waste residues collected within waste classified under waste code: '20 03 03 — Street cleaning residues' in the European list of waste;

(e), non-food materials that are mixed together with food waste when collected, to the extent possible.

The measurement of food waste shall not cover the following items, without prejudice to the voluntary measurement referred to in Article 3 of the Decision (see below) (Article 1(5)):

(a), food waste drained as or with wastewater;

(b), substances that are destined for use as feed materials.

The methodology for the measurement of food waste is described in Article 2 of the Decision. Member States shall measure each year the amount of food waste generated in a full calendar year (Article 2(1)). Member States shall measure the amount of food waste for a given stage of the food supply chain using the methodology set out in Annex III of the Decision at least once every four years (Article 2(2)). According to Annex III, the amount of food waste within a stage of the food supply chain shall be established by measuring food waste generated by a sample of food business operators or households in accordance with any of the following methods or a combination of those methods or any other method equivalent in terms of relevance, representativeness and reliability:

Stage of the food supply chain	Methods of measurement			
Primary production	— Direct measurement	— Mass balance		— Questionnaires and interviews
Processing and manufacturing				— Coefficients and production statistics.
Retail and other distribution of food			— Waste composition analysis	
Restaurants and food services			— Counting/scanning	
Households				— Diaries

The following methods shall be used by an entity with direct (physical) access to food waste in order to measure the food waste or to carry out an approximation:

- Direct measurement (weighing or volumetric assessment): Use of a measuring device to determine the mass of samples of food waste or fractions of total waste, directly or determined on the basis of volume. It includes measurement of separately collected food waste
- Scanning/Counting: Assessment of the number of items that make up food waste, and use of the result to determine the mass.
- Waste composition analysis: Physical separation of food waste from other fractions in order to determine the mass of the fractions sorted out.
- Diaries: An individual or group of individuals keeps a record or log of food waste information on a regular basis.

The following methods shall be used when there is no direct (physical) access to food waste or when direct measurement is not feasible:

- Mass balance: Calculation of the amount of food waste on the basis of the mass of inputs and outputs of food into and out of the measured system, and processing and consumption of food within the system.

- Coefficients: Use of previously established food waste coefficients or percentages representative for a food industry sub-sector or for an individual business operator. Such coefficients or percentages shall be established through sampling, data provided by food business operators or by other methods.

When the methodology set out in Annex III is not used, Member States shall measure the amount of food waste for a given stage of the food supply chain using the methodologies set out in Annex IV (Article 2(3)):

(a), Calculation of the amount of food waste on the basis of the latest available data on the share of food waste in a given stage of the food supply chain (established in accordance with Annex III) and total waste generation in that stage. The total waste generation in a given stage of the food supply chain shall be established on the basis of the data reported in accordance with the requirements of Regulation (EC) No 2150/2002 (European Union, 2002b) for each of the stages of the food supply chain referred to in Annex I. In cases where such data is not available for a given year, the data for the previous year shall be used.

(b), Calculation of the amount of food waste on the basis of socioeconomic data relevant for the respective stages of the food supply chain. The calculation of food waste shall be based on the latest data on amounts of food waste generated within a stage of the food supply chain and the increase or decrease, in the period from the year of the latest measurement of that data to the current reporting period, of the level of one or more of the following socioeconomic indicators:

Besides mandatory measurement obligations, the Member States may measure and provide the Commission with further data related to food waste levels as well as data related to food waste prevention. Such data may include the following: (a) amounts of food waste regarded as composed of parts of food intended to be ingested by humans; (b) amounts of food waste drained as or with wastewaters; (c) amounts of food which has been redistributed for human consumption; (d), amounts of food no longer intended for human consumption placed on the market for transformation into feed by a feed business operator; and (e), former foodstuffs.

Besides the methodology, the Commission Delegated Decision sets minimum quality requirements for reliable and accurate measurement of food waste (Article 4). In particular, Member States shall ensure that (Article 4(1)) (a), the measurements conducted in accordance with the methodology set out in Annex III are based on a representative sample of the population to which its results are applied, and adequately reflect the variations in the data on food waste amounts to be measured; and (b), the measurements conducted in accordance with the methodology set out in Annex IV are based on the best information available. Annex IV deals with methodology for the measurement of food waste where an in-depth measurement in accordance with the methodology referred to Article 2 and set out in Annex III is not used. Instead, the amounts of food waste generated within a given stage of the food supply chain shall be measured by using any of the following methods or a combination of those methods:

(a) Calculation of the amount of food waste on the basis of the latest available data on the share of food waste in a given stage of the food supply chain (established in accordance with Annex III) and total waste generation in that stage. The total waste generation in a given stage of the food supply chain shall be established on the basis of the data reported in accordance with the requirements of Regulation (EC) No 2150/2002 on waste statistics (European Union, 2002b) for each of the stages of the food supply chain referred to in Annex I. In cases where such data is not available for a given year, the data for the previous year shall be used.

(b) Calculation of the amount of food waste on the basis of socioeconomic data relevant for the respective stages of the food supply chain. The calculation of food waste shall be based on the latest data on amounts of food waste generated within a stage of the food supply chain and the increase or decrease, in the period from the year of the latest measurement of that data to the current reporting period, of the level of one or more of the following socioeconomic indicators:

Stage of the food supply chain	Indicator
Primary production	— Food production in agriculture, fishery and hunting
Processing and manufacturing	— Production of processed food — based on PRODCOM <sup>(1)</sup> data.
Retail and other distribution of food	— Turnover of food products — Population
Restaurants and food services	— Turnover — Employment (in Full Time Equivalents)
Households	— Population — Households disposable income <sup>(2)</sup>

<sup>(1)</sup> Commission Regulation (EC) No 912/2004 of 29 April 2004 implementing Council Regulation (EEC) No 3924/91 on the establishment of a Community survey of industrial production (OJ L 163, 30.4.2004, p. 71).

<sup>(2)</sup> As reported by Eurostat.

Member States may use other indicators, if they are better correlated with the generation of food waste within a given stage of the food supply chain.

Member States shall provide the Commission with information on the methods used for measurement of food waste for each of the stages of the food supply chain and on any significant modifications to the methods used in comparison with the methods used for a previous measurement Article 4(2)).

The EU Statistical Office (Eurostat) developed a Questionnaire and a Guidance document to help Member State experts with their food waste measurement activities.<sup>12</sup> The first data collection on food waste according to the Commission Delegated Decision was undertaken by Member States in 2020, in view of reporting on national food waste levels by mid-2022. In 2021, around 131 kilogrammes (kg) of food waste per inhabitant were generated in the EU. Households generated 54 per cent of food waste, accounting for 70 kg per inhabitant. The remaining 46 per cent was waste generated upwards in the food supply chain.

<sup>12</sup> Eurostat, Food waste and food waste prevention, 30 June each year, available at <https://ec.europa.eu/eurostat/web/waste/methodology>.

Household food waste is nearly twice the amount of food waste arising from the sectors of primary production and manufacture of food products and beverages (11 kg and 28 kg per inhabitant; 9 per cent and 21 per cent, respectively), sectors in which strategies exist for reducing food waste, for instance with the use of discarded parts as by-products. Restaurants and food services accounted for 12 kg of food waste per person (9 per cent), while retail and other distribution of food was the sector with the least amount of food waste (9 kg; 7 per cent); however, the impact of the COVID-19 lockdowns on these two sectors is still being analysed.<sup>13</sup>

The purpose for data collection is to help the Member States to fulfil their obligations under Waste Framework Directive to prepare food waste prevention programmes (specific and/or as a part of general waste prevention programmes), encourage food donation and other redistribution for human consumption, prioritising human use over animal feed and the reprocessing into non-food products as part of measures taken to prevent waste generation; and provide incentives for the application of the waste hierarchy, such as facilitation of food donation.

The waste hierarchy is a central concept in the Waste Framework Directive that establishes an order of preference for managing and disposing of waste: prevention first (including re-use) followed by waste management operations: preparing for re-use, recycling, recovery and last disposal. It is operationalised through specific rules and performance targets, such as setting separate collection obligations and targets for prevention, recycling or diversion from landfill. According to Article 4(1) of the Waste Framework Directive, the following waste hierarchy shall apply as a priority order in waste prevention and management legislation and policy: (a) prevention, (b) preparing for re-use, (c) recycling, (d) other recovery, e.g. energy recovery, and (e) disposal. Application of the hierarchy to food losses and waste can be shown in a following manner (European Commission, 2020c p. 8, see also ToNoWaste Deliverable 1.1 p. 80):

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<sup>13</sup> Eurostat, Food waste and food waste prevention – estimates, available at [https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Food\\_waste\\_and\\_food\\_waste\\_prevention\\_-\\_estimates&stable=0&redirect=no](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Food_waste_and_food_waste_prevention_-_estimates&stable=0&redirect=no).

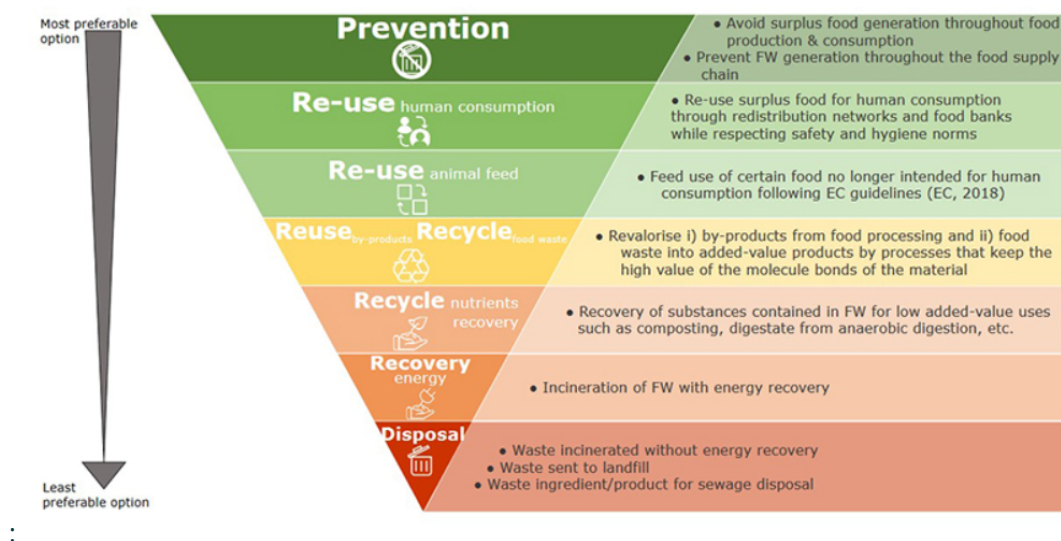


Figure 3: Hierarchy for prioritisation of food surplus, by-products and food waste (FW) prevention strategies (European Commission, 2020c p. 8)

The ToNoWaste project will focus on those actions directly related to the green part (prevention at origin and reuse), which will have a direct impact on the reduction of food losses and waste generation (ToNoWaste Deliverable D1.1 p. 81)

The food waste hierarchy guides the development of strategies that tackle food waste. Such strategies are underpinned by actions whose performance should be evaluated in terms of quality, effectiveness, efficiency, sustainability over time, transferability and scalability, and intersectoral cooperation (European Commission, 2020c p. 8). The amended Waste Framework Directive requires Member States to reduce food waste at each stage of the food supply chain, monitor food waste levels and report on progress made. The Commission Delegated Decision a common food waste measurement methodology (European Commission, 2019b), is to be utilised as a basis for EU-wide food waste monitoring.

The guiding principles of European FLWPR are enshrined in the amended Waste Framework Directive, which requires Member States to (Article 9 of the Waste Framework Directive):

- reduce the amount of food lost during production and distribution
- reduce food waste in households
- encourage food donation
- monitor and assess the implementation of the EU's food waste prevention measures.

Other measures aimed at reducing food losses and waste include the repurposing of surplus food products, for example as animal feed or compost.



Although the amended Waste Framework Directive are the main tool for FLWPR, it is not the only policies the Commission has introduced. The Transition Pathway for Tourism published in February 2022<sup>14</sup>, among its key actions highlights the reduction of food waste in the hospitality sector. In December 2022, Member States adopted Council Conclusions on the European Agenda for Tourism 2030, calling Commission and Member States to support improved circularity of tourism services, including food waste (Council of the European Union, 2022).

A separate issue from Waste Framework Directive is date marking. EU rules on the labelling of foodstuffs are defined in Regulation (EU) No 1169/2011 concerning consumer information on food (European Union, 2011). According to regulation foodstuff should be marked based on minimum durability or freezing, 'best before' when the date includes an indication of the day and 'best before' in other cases, the first referring to the quality of products, the second to their safety.

The Food Information to Consumers Regulation (EU) No 1169/2011 (European Union, 2011) gives general rules on minimum durability date, 'use by' date and date of freezing (Article 24). According to Article 24(1), in the case of foods which, from a microbiological point of view, are highly perishable and are therefore likely after a short period to constitute an immediate danger to human health, the date of minimum durability shall be replaced by the 'use by' date. After the 'use by' date a food shall be deemed to be unsafe in accordance Food Safety Regulation (EC) No 178/2002 (European Union, 2002). An exception to the Regulation is raw, shell eggs which require a 'best before' date as set out in Regulation (EC) No. 589/2008 as regards marketing standards for eggs (European Commission, 2008).

Apart from specific legislation (such as for eggs for direct human consumption), the marketing of foods after their 'best before' date has passed is not prohibited by EU legislation, under the condition that it is still safe and their appearance is not misleading. The 'best before' date does not refer to safety but to how long the product will retain its quality: flavour, colour, crispness, resilience and firmness.<sup>15</sup> Quality gradually deteriorates after the best-before date. But the food may still be perfectly edible. Besides labeling, the 'best before' dates are not regulated by the Union law but remains in the realm of national regulation.

According to European Commission, a better understanding and use of date marking on food, i.e. 'use by' and 'best before' dates, by all actors concerned, can prevent and reduce food waste in the EU. For instance, how date marking is utilised by food business operators and regulatory authorities in managing the supply chain can also have an impact on food waste. The approaches followed by food business operators in defining date marking (e.g. whether to utilise a 'use by' or 'best before' date), market practices (such as the amount of shelf life required by retailers on product delivery) and national rules on the further

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<sup>14</sup> European Commission, The Transition Pathway for Tourism, February 2022, available at <https://op.europa.eu/en/publication-detail/-/publication/404a8144-8892-11ec-8c40-01aa75ed71a1>.

<sup>15</sup> Swedish Food Agency, Best before and use by dates, available at <https://www.livsmedelsverket.se/en/food-habits-health-and-environment/food-loss-and-waste/plan-wisely-and-use-leftovers/vad-betyder-datummarkningen>.

distribution and use of foods past the 'best before' date, can all influence the generation of food waste in the supply chain. A study carried out by the European Commission (2018b), estimates that up to 10 per cent of food waste generated annually in the EU is linked to date marking.

In the Farm to Fork Strategy (European Commission, 2020b), the Commission pledged to propose a revision of EU rules on date marking. In doing so, the Commission aims to prevent food waste linked to misunderstanding and/or misuse of these dates, whilst ensuring that any proposed change meets consumers' information needs and does not jeopardise food safety. Additionally, a dedicated sub-group of the EU Platform on Food Losses and Food Waste on date marking has been established to discuss possible options and help guide work in this area involving all actors concerned: public authorities in EU Member States, food business operators, consumer - and other NGOs (European Commission, 2022). The main EU legal and policy instruments can be summarised in the following table. As a general FLWPR policy, the EU legislation concentrates on setting targets and facilitate collection of information on food waste based on common methodology and measurement. The concretisation of policies is left on national, regional and municipal level. The last stage, the European Commission July 2023 proposal for amending the Waste Framework Directive (European Commission, 2023) with mandatory targets for FLWPR is discussed below in section 4.

Initiative	Main objectives of the initiative and strategies for fulfilment in the Member States
Bioeconomy strategy (European Commission, 2012)	<ul style="list-style-type: none"> <li>• Promotion of sustainable FLWPR solutions in bio-based sectors.</li> <li>• National bioeconomy strategies including a broad spectrum of targets, including food security, eg the German and the Finnish national bioeconomy strategy (German Federal Government, 2020; Government of Finland, 2022)</li> </ul>
Circular Economy Action Plan (European Commission, 2015)	<ul style="list-style-type: none"> <li>• Adoption of a life cycle approach in FLWPR</li> <li>• Promotion of the most sustainable fresh FLWPR solutions</li> </ul>
UN Sustainability Development Goals (Agenda 2030)	<ul style="list-style-type: none"> <li>• Promotion of the contribution to the different SDGs, paying special attention to target 12.3: 'By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses'</li> <li>• Awareness about the interconnected impacts of FLWPR solutions across different SDGs.</li> <li>• Background for the amended Waste Framework Directive (European Union, 2018a)</li> </ul>

Amended Waste Framework Directive (European Union, 2018a)	<ul style="list-style-type: none"> <li>• Food waste hierarchy</li> <li>• Requires Member States to reduce food waste at each stage of the food supply chain, monitor food waste levels and report on progress made.</li> <li>• Contribution to the environmental management to ensure a safe operating space for humanity within the Earth's ecological limits, given the connections between the impact categories of the Environmental Footprint and the planetary boundaries (see Muñoz et al. 2017).</li> </ul>
Commission Delegated Decision (European Commission, 2019b)	<ul style="list-style-type: none"> <li>• A common food waste measurement methodology, to be utilised as a basis for EU-wide food waste monitoring.</li> </ul>
European Green Deal (European Commission, 2019a)	<ul style="list-style-type: none"> <li>• Contribution to the different European proposals (including those related to EU's climate ambition for 2030 and 2050) addressing the environmental, social and economic dimensions of the sustainability of the FLWPR solutions.</li> <li>• Promotion of the reduction of environmental footprint of the FLWPR solutions.</li> <li>• Strengthen the EU food system's resilience, considering the analysis of contextual uncertainties.</li> </ul>
Farm to Fork strategy (European Commission, 2020b)	<ul style="list-style-type: none"> <li>• Provision of science-based information about the sustainability impacts of measures that address food losses and waste throughout the supply chain, from production to consumption.</li> <li>• Contribution to sustainable food systems by fostering FLWPR solutions that are more resilient, safe, inclusive, healthy, circular, and resource efficient.</li> </ul>
Proposal for amending Waste Framework Directive (European Commission, 2023)	<ul style="list-style-type: none"> <li>• Mandatory targets for FLWPR.</li> </ul>

Table 1: The most important EU initiatives for regulatory ecology of FWPR

Taking into consideration the structure of the EU legislation (so far), it is crucial to look in detail national regulation in the Member States and regulation on regional and municipal level.

### 3.3.2. National law

One of the landmarks of implementation of the 2018 amendments to the Waste Framework Directive is the separate collection of food waste, to be implemented in national legislation from 1 January 2024. According to Article 22(1), Member States shall ensure that, by 31 December 2023, bio-waste is either separated and recycled at source, or is collected separately and is not mixed with other types of waste. According to Article 10(4), Member States shall take measures to ensure that waste that has been separately collected for preparing for re-use and recycling pursuant to Article 22 is not incinerated (burned), with the exception of waste resulting from subsequent treatment operations of the separately collected waste for which incineration delivers the best environmental outcome.

Otherwise, due to lack of mandatory coordinated EU level regulation on FLWPR, there is room for national legislation, and so, differences between the Member States. As mentioned above, for instance 'best before' labelling varies from country to country. According to a survey by the European Environmental Bureau (EEB) in June-September 2022 of EU member state positions towards binding FLWPR targets, Romania, the Netherlands, Luxembourg, and Estonia were 'leading the world' by expressing support for the introduction of legally binding targets for member states to reduce EU food waste by 50 per cent from farm to fork by 2030. Other member states like Austria, Denmark, the Czech Republic and Croatia also expressed support for legally binding EU food waste targets, but for now stopped short of clearly back 50 per cent farm to fork reduction by 2030. In contrast, Poland, Malta, Slovenia and Portugal opposed the setting of any legally binding food waste targets for EU member states. Greece and Latvia also oppose setting targets at 50 per cent or farm to fork, preferring lower targets for only limited parts of the supply chain. Many other member states remained neutral or undecided.<sup>16</sup>

In waiting for EU level binding FLWPR reforms, several member states has taken legislative action. As leading examples can be mentioned France, Italy, Lithuania, Denmark, Sweden and potentially Spain.

1. *France.* France is the only EU Member State with a comprehensive FLWPR legislation. The Act on fighting food waste (loi n° 2016-138 du 11 février 2016 relative à la lutte contre le gaspillage alimentaire) aims to avoid food waste through incentivising food donation and forbidding the destruction of unsold food products. It focused on the retail sector first to limit food waste in the sector as a whole, but also established a frame for food waste prevention through the adoption of a food waste hierarchy. Then, several other provisions were adopted through decrees and laws strengthening and widening the scope of the 2016 law to catering and food distribution but also through general objectives to reduce food waste by 50 per cent by 2025.<sup>17</sup>

2. *Italy.* Italian law has a narrower scope. The Act on the donation and distribution of food and pharmaceutical products for the purposes of social solidarity and limiting waste law

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<sup>16</sup> European Environmental Bureau, Revealed: The countries championing and blocking EU food waste action, 21 November 2022, <https://eeb.org/revealed-the-countries-championing-and-blocking-eu-food-waste-action/>.

<sup>17</sup> See: [https://zerowasteurope.eu/wp-content/uploads/2020/11/zwe\\_11\\_2020\\_factsheet\\_france\\_en.pdf](https://zerowasteurope.eu/wp-content/uploads/2020/11/zwe_11_2020_factsheet_france_en.pdf).

(legge 19 agosto 2016, n. 166, Disposizioni concernenti la donazione e la distribuzione di prodotti alimentari e farmaceutici a fini di solidarietà sociale e per la limitazione degli sprechi) or the Good Samaritan Law has as its overall objective to reduce waste for each of the stages of production, processing, distribution and administration of food, pharmaceuticals and other products, through the implementation of some priorities. To do so, the focus is put on encouraging and facilitating solidarity donations of food surpluses and pharmaceuticals, with the priority given to human consumption. For food waste, the law is about products in supermarkets but also agricultural products directly coming from farms.<sup>18</sup>

3. *Lithuania*. Lithuania has adopted rules aiming to reduce food waste by easing donations for charity purposes by defining. According to Lithuanian law, food products past their 'best before' deadline are still suitable for donations and gives clear guidelines for a safe process. Additionally, the Lithuanian law allows a deduction of up to 40 per cent of tax profits if acting under the charity rules.<sup>19</sup>

French. Italian and Lithuanian law may serve their purpose, or at least send a clear signal, but they only regulate the relationship between food donors and food banks, making food donations easier. This will increase sustainability but is unlikely to be sufficient to meet the target of halving food waste generation (Eriksson et al., 2023). There is also other piecemeal legislation as the Danish food labelling regulation.

4. *Denmark*. Denmark is developing food labeling by developing a climate labelling system for food, to be the first country in the world to have a state-controlled climate label for food (Limb, 2022).

5. *Spain*. The latest legislative initiative in national FLWPR legislation is the ambitious Spanish legislation proposal on the prevention of food losses and waste, approved by the Spanish Council of Ministers on 9 January 2024. A previous attempt for a PLWPR act<sup>20</sup> failed in 2024 in the Spanish legislature, but now the government takes a new try. Given its importance for Spanish society in terms of social justice, environmental protection and economic growth, the Government has considered it a priority to take up this legislative initiative again and approve the bill for its subsequent parliamentary processing.<sup>21</sup> The main elements in the bill are:

- Companies in the food chain will have to have a prevention plan in place to identify where losses occur and implement measures to minimise them:

<sup>18</sup> [https://zerowasteurope.eu/wp-content/uploads/2020/11/zwe\\_11\\_2020\\_factsheet\\_italy\\_en.pdf](https://zerowasteurope.eu/wp-content/uploads/2020/11/zwe_11_2020_factsheet_italy_en.pdf).

<sup>19</sup> [https://zerowasteurope.eu/wp-content/uploads/2021/11/zwe\\_11\\_2020\\_factsheet\\_lithuania\\_en.pdf](https://zerowasteurope.eu/wp-content/uploads/2021/11/zwe_11_2020_factsheet_lithuania_en.pdf).

<sup>20</sup> Boletín Oficial de las Cortes Generales aprobación por el pleno, 121/000107 Proyecto de Ley de prevención de las pérdidas y el desperdicio alimentario, Congreso de los Diputados, XIV Legislatura serie A: Proyectos de ley 18 de mayo de 2023 Núm. 107-6 Pág. 1, available at [https://www.congreso.es/public\\_oficiales/L14/CONG/BOCG/A/BOCG-14-A-107-6.PDF](https://www.congreso.es/public_oficiales/L14/CONG/BOCG/A/BOCG-14-A-107-6.PDF).

<sup>21</sup> Ministerio de agricultura, pesca y alimentación, Aprobado el proyecto de ley en el Consejo de Ministros El Gobierno pone en marcha el proyecto de ley de prevención de las pérdidas y el desperdicio alimentario, 9 de enero de 2024, available at [https://www.mapa.gob.es/es/prensa/240109cmproyectoleydesperdicioalimentario\\_tcm30-673094.pdf](https://www.mapa.gob.es/es/prensa/240109cmproyectoleydesperdicioalimentario_tcm30-673094.pdf).

- Regulation based on waste hierarchy: top priority will always be human consumption, through donation or redistribution of food and, where this is not possible, other uses will be sought, for example, jams, animal feed or compost;
- Establishment of best practices measures, such as encouraging the consumption of products considered 'unaesthetic', and consumption of seasonal and organic foods.

### 3.3.3 National waste management plans

However, mandatory FLWPR legislation is still rare. To implement the Waste Framework Directive, the member states implement national waste management plans. The comparability of available country data and indicators is however limited.<sup>22</sup> There are differences in municipal waste definitions, reported waste types and data processing. For example, some countries include only waste from households, whereas others include similar wastes from commercial activities and offices. Some countries have changed their definition of municipal waste over time, and recycled amounts can also be calculated differently, depending on whether they include the weight of materials collected but discarded during the recycling process. However, the data used in this assessment are currently the best available.

In the best case, food waste management is regulated separately in specific sections in these plans. For instance, the Austrian Federal Waste Management Plan 2023,<sup>23</sup> Finnish National Waste Plan 2027,<sup>24</sup> Latvian National Waste Management Plan 2021-2028<sup>25</sup> and the Hungarian Waste Management Plan 2021-2027<sup>26</sup> present food waste separately from other waste dimensions.

### 3.3.4. National food strategies

There are also some national FLWPR strategies. The most important are the Austrian Strategy to prevent food waste (Strategie zur Vermeidung von Lebensmittelabfällen)<sup>27</sup> and

<sup>22</sup> European Environmental Agency, Municipal waste management across European countries, <https://www.eea.europa.eu/publications/municipal-waste-management-across-european-countries>.

<sup>23</sup> Bundesministerium für Klimaschutz, Umwelt, Energie, Mobilität, Innovation und Technologie, Bundes-Abfallwirtschaftsplan (BAWP) 2023, especially Teil 1 pp. 187-189 and Teil 3 pp. 37-41), available at [https://www.bmk.gv.at/themen/klima\\_umwelt/abfall/aws/bundes\\_awp/bawp2023.html](https://www.bmk.gv.at/themen/klima_umwelt/abfall/aws/bundes_awp/bawp2023.html).

<sup>24</sup> Ministry of the Environment, Finnish National Waste Plan 2027 - From Recycling to Circular Economy, available at <https://ym.fi/en/national-waste-plan>.

<sup>25</sup> Ministru kabineta, rīkojums Nr. 45, 2021. gada 22. janvāra, Atkritumu apsaimniekošanas valsts plans 2021.-2028, <https://likumi.lv/ta/id/320476>; European Environment Agency, Waste prevention country profile: Latvia, April 2023, [https://www.eea.europa.eu/themes/waste/waste-prevention/countries/2023-waste-prevention-country-fact-sheets/latvia\\_waste\\_prevention\\_2023](https://www.eea.europa.eu/themes/waste/waste-prevention/countries/2023-waste-prevention-country-fact-sheets/latvia_waste_prevention_2023).

<sup>26</sup> FAOLEX Database, Hungarian National Waste Management Plan 2021-2027, available at <https://www.fao.org/faolex/results/details/en/c/LEX-FAOC211499/>.

<sup>27</sup> Bundesministerium für Klimaschutz, Umwelt, Energie, Mobilität, Innovation und Technologie, Strategie zur Vermeidung von Lebensmittelabfällen: Gemeinsam für ein Ziel, 2021, available at [https://www.bmk.gv.at/themen/klima\\_umwelt/abfall/abfallvermeidung/publikationen/strategie-vermeidung.html](https://www.bmk.gv.at/themen/klima_umwelt/abfall/abfallvermeidung/publikationen/strategie-vermeidung.html).

the German National Strategy for Food Waste Reduction.<sup>28</sup> The Austrian the Strategy to prevent food waste developed by the Interministerial Coordination Centre for Food Waste Prevention is important building block in the implementation of SDG Task 12.3. The Strategy forms the political framework for the joint projects for FLWPR. It defines structures and processes for future cooperation in order to support increased coordination between ministerial actors, strengthen the systematic involvement of all relevant stakeholders and achieve positive effects for the overall framework conditions in Austria. United Against Waste Austria is a successful intersectoral platform for companies from the food service market, the federal government, the federal states, science and NGOs with the aim of reducing food waste in the catering sector through consulting services waste monitoring programmes and campaigns such as the 'Nothing left for waste' campaign.<sup>29</sup> The aim of the German Strategy is to halve per-capita food waste in Germany at retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses, by 2030. The measures to be taken to attain this goal include the refinement of the National Strategy for Food Waste Reduction and the continued incorporation of the entire food supply chain. The aim is to identify the most promising potentials for reduction of waste and to develop and implement specific measures within the sectors. Different measures are used to significantly cut food waste. It is also being considered whether legislative changes are required in order to make the strategy more binding, as was agreed in the coalition agreement. The main goal, however, is to prevent surpluses from being generated in the first place and to structure the food supply chain in all sectors in such a way that food waste is avoided at all stages — to achieve that, all stakeholders must change how they operate.

### 3.3.5. Regional regulation

On regional level can be mentioned The Catalan Act on food losses and waste prevention (Llei 3/2020, de l'11 de març, de prevenció de les pèrdues i el malbaratament alimentaris) for the Catalonia autonomous community, focusing on all steps of the food supply chain and seeking to promote food waste prevention, rather than encouraging food donation as in many countries. This is carried out through various obligations for stakeholders across the supply chain on the adoption of specific measures, thus including the primary sector. The act has the overall objective to raise awareness of the problem of food wastage and provide some tools to enable its prevention as well as to promote measures that provide incentives for wastage reduction. To do so, it covers the entire food supply chain-- from primary production to households-- by setting food waste prevention obligations for all stakeholders and not only redistribution. Among the obligations, there are provisions on data measurement and preparation of reduction plans. The legislation also states citizens' rights-- for instance, asking for a doggy bag-- and regulates gleaning practices.<sup>30</sup>

<sup>28</sup> The German Federal Ministry of Food and Agriculture, National Strategy for Food Waste Reduction. Available at Germany: <https://www.bmel.de/EN/topics/food-and-nutrition/food-waste/national-strategy-for-food-waste-reduction.html>.

<sup>29</sup> Strategie zur Vermeidung von Lebensmittelabfällen p. 16.

<sup>30</sup> [https://zerowasteurope.eu/wp-content/uploads/2021/11/zwe\\_11\\_2021\\_factsheet\\_catalonia\\_en.pdf](https://zerowasteurope.eu/wp-content/uploads/2021/11/zwe_11_2021_factsheet_catalonia_en.pdf).

### 3.3.6 Local regulation

In Vienna, the most important regulatory instrument is the Vienna waste management plan and waste prevention programme 2019-2024 (Wiener Abfallwirtschaftsplan und Wiener Abfallvermeidungs-programm (Planungsperiode 2019-2024)) and its section on foodwaste.<sup>31</sup>

## 3.4. Social norms

As said, it is sometimes difficult to separate legal norms and social norms. A successful legal norm may have its origins in social or moral norms and may over time create social norms and even moral norms (Elster, 2007 pp. 358-359). Corporate and consumer sustainability and responsibility can be seen as a social norm, either incentivised or disincentivised by other regulatory modalities, law, markets and use of technology. With hope, consumers can be seen well informed rational beings without legal regulation, promoting internationalisation of externalities caused by food loss and waste. So, of the factors identified by the European Commission contributing to food waste as social norms can be identified<sup>32</sup>

- Insufficient shopping and meal planning
- Insufficient food management skills (e.g. meal preparation, use of food/food ingredients in-stock, use of leftovers)
- Aesthetic considerations (bruised fruit and vegetables etc.)
- Lack of knowledge and/or misinformation on the environmental, social and financial impacts of food waste

Busy lifestyle and conflicting priorities that can be also identified as targets for social behaviour change and so, change of social norms based on a combination of social justice and the physical limits imposed on human activity by planetary boundaries and the planet's limited resources for FLWPR, to create fundamental constraints on food production and consumption. Co-locating planetary boundaries with social boundaries supports a narrative that is socially normative and our understanding of what is right and wrong (Sjåfjell & Taylor, 2019 p. 64). Change of social norms does not come out of the blue. It can be supported by education and information. For instance, the Horizon Europe project Changing practices and Habits through Open, Responsible, and social Innovation towards ZerO food waste

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<sup>31</sup> Stadt Wien, Wiener Abfallwirtschaftsplan und Wiener Abfallvermeidungs-programm (Planungsperiode 2019-2024), especially section 9.4 Lebensmittelabfälle (food waste), available at <https://www.wien.gv.at/umwelt/ma48/beratung/umweltschutz/awk.html#:~:text=Abfallwirtschaftsplan%20und%20%2Dvermeidungsprogramm%20f%C3%BCr%20die,auch%20Umweltauswirkungen%20ber%C3%BCcksichtigt%20werden%20konnten>. On FLWPR projects, see also Stadt Wien, Strategische Umweltprüfung zum Wiener Abfallwirtschaftsplan (Wr. AWP) 2019-2024 und zum Wiener Abfallvermeidungsprogramm (Wr. AVP) 2019-2024 ANHANG I Ist-Zustand der Wiener Abfallwirtschaft 2017 (Langfassung), pp. 32-34, available at <https://www.wien.gv.at/umwelt/ma48/service/pdf/awp-avp-19-24-anhang1.pdf>.

<sup>32</sup> European Commission, EU Platform on Food Losses and Food Waste, available at [https://food.ec.europa.eu/safety/food-waste/eu-actions-against-food-waste/eu-platform-food-losses-and-food-waste\\_en](https://food.ec.europa.eu/safety/food-waste/eu-actions-against-food-waste/eu-platform-food-losses-and-food-waste_en).



(CHORIZO)<sup>33</sup> aims to improve the understanding about how social norms (rules and expectations that are socially enforced) influence behaviour related to food waste generation. In order to understand what food loss and food waste (FLW) actions have and are taking place, and their current impacts, the project started by undertaking a comprehensive evidence-based analysis of actions addressing FLW. In their survey for FLWPR actions the importance of change in social norms in the whole food value chain was revealed (CHORIZO Deliverable D1.2 p. 25). According to the CHORIZO survey of 395 FLWPR actions in the EU Member States, the United Kingdom and Norway, FLWPR actions ranged from actions that were being implemented at the international, EU, national, regional, and municipal level (CHORIZO Deliverable D1.2 p. 30). This strengthens our view that the scope of all four regulatory modalities vary geographically from international to local level. Of the 395 actions surveyed, only 8 was European, 189 being national, 47 regional and 136 municipal (CHORIZO Deliverable D1.2 p. 30). As an example how to affect social norms by industry action at national level can be taken from Denmark, Norway, Germany and the Netherlands.

1. *Denmark.* The Stop Wasting Food movement (Stop Spild Af Mad) is Denmark's largest non-profit movement against food waste.<sup>34</sup> Founded in 2008, it has worked in collaboration with the Danish government, the EU and the UN. For example, in an annual national charity project CHRISTMAS SUPRIus, volunteers collect tonnes of Christmas surplus food from supermarkets and distribute it free to food-insecure families. Stop Wasting Food is a co-founder of the REFOOD label, a national certification scheme for the food service sector, such as canteens and restaurants, which highlights their efforts towards less food waste and more recycling. Stop Wasting Food has also published a Leftovers Cookbook with the participation of Danish celebrity chefs.

2. *Norway.* In Norway the food industry agreed in 2018 to add 'best before, often good after' or 'not bad after' to products, making it clear that consumers aren't necessarily compromising on taste beyond this point, and so, changing consumer behaviour for PLWPR (Limb, 2022).<sup>3</sup> *Germany.* After releasing its national strategy on food waste in February 2019 (see above section 3.3.4), the German government released. to mobilise the public, the Zu Gut für die Tonne (Too Good for the Bin) programme, with a website offering background information and useful tips for everyday life, and an app with more than 700 cooking ideas including recipes from top chefs.<sup>35</sup>

4. *The Netherlands.* In the Netherlands, the Dutch Taskforce, a coalition of companies across the food supply chain, as well as national and local authorities, was launched in January 2017, in collaboration with the initiative Samen tegen Voedselverspilling (Together against food waste). Different organisations and institutions jointly work to arrive at innovative solutions to prevent and reduce food waste throughout the food chain. The Ministry of Agriculture launched in 2020 a consumer campaign on date marking (difference between 'use by' and 'best before' dates).<sup>36</sup>

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<sup>33</sup> <https://chorizoproject.eu>.

<sup>34</sup> <https://stopwastingfoodmovement.org/our-projects/>

<sup>35</sup> <https://www.zugutfuerdietonne.de/navigation/sub-footer-navigation/english/>.

<sup>36</sup> <https://eu-refresh.org/dutch-taskforce-connects-initiatives-against-food-waste>.

However, as the CHORIZO survey shows, 'cities are unique' due to their potential to address food waste because they are at the nexus of where the majority of food waste is generated across the supply chain (CHORIZO Deliverable D1.2 pp. 36-37). Addressing food waste is not only good in terms of tackling environmental and social concerns such as the carbon footprint of commodities or food insecurity, but it can also be used by local government and stakeholders to create new sources of revenue, with redistribution and valorisation being key examples. Nearly three-quarters of the municipal actions identified in the CHORIZO survey were related to food redistribution, food services, and retail. In this respect, surplus food fit for human consumption is being redistributed to people, either through established networks such as food banks and non-profits, but also via restaurants, retailers, and newly established apps and on-line platforms connecting consumers to surplus food at a discounted price. (CHORIZO Deliverable D1.2 pp. 36-37). In the ToNoWaste workshops one initiative connected to cities came into focus in the change of social norms: the Milan Urban Food Policy Pact (MUFPP).<sup>37</sup> The MUFPP is an international agreement of Mayors. Of the ToNoWaste pilots and followers, Athens, Valencia and Vienna are signatories of the Pact. The MUFPP is more than a declaration, it is a concrete working tool for cities. On the other hand, it is not a legal instrument but more of a guidance to city behaviour and so, a social norm. The MUFPP is composed by a preamble and a Framework for Action listing 37 recommended actions, clustered in 6 categories. For each recommended action there are specific indicators to monitor progresses in implementing the Pact. The Milan Pact Awards offer concrete examples of the food policies that cities are implementing in each of the 6 Pact categories.

Specifically, signatory cities commit to:

- (1) Work to develop sustainable food systems that are inclusive, resilient, safe and diverse, that provide healthy and affordable food to all people in a human rights-based framework, that minimise waste and conserve biodiversity while adapting to and mitigating impacts of climate change.
- (2) Encourage interdepartmental and cross-sector coordination at municipal and community levels, working to integrate urban food policy considerations into social, economic and environment policies, programmes and initiatives such as food supply and distribution, social protection, nutrition, equity, food production, education, food safety and waste reduction.
- (3) Seek coherence between municipal food-related policies and programmes and relevant subnational, national, regional and international policies and processes.
- (4) Engage all sectors within the food system (including neighbouring authorities, technical and academic organizations, civil society, small scale producers, and the private sector) in the formulation, implementation and assessment of all food-related policies, programmes and initiatives.
- (5) Review and amend existing urban policies, plans and regulations in order to encourage the establishment of equitable, resilient and sustainable food systems.
- (6) Use the Framework for Action as a starting point to address the development of the urban food system and share developments with participating cities and national governments and international agencies when appropriate.
- (7) Encourage other cities to join our food policy actions.

<sup>37</sup> Milan Urban Food Policy Pact, available at <https://www.milanurbanfoodpolicypact.org>.

In the Framework of Action, food waste is a separate set of four actions:<sup>38</sup>

- Action 34: Convene food system actors to assess and monitor food loss and waste reduction on all stages of the city region food supply chain (including production, processing, packaging, safe food preparation, presentation and handling, re-use and recycling) and ensure holistic planning and design, transparency, accountability and policy integration.
- Action 35: Raise awareness of food loss and waste through targeted events and campaigns, identify focal points such as educational institutions, community markets, company shops and other solidarity or circular economy initiatives.
- Action 36: Collaborate with the private sector along with research, educational and community-based organisations to develop and review, as appropriate, municipal policies and regulations (e.g. processes, cosmetic and grading standards, expiration dates, etc) to prevent waste or safely recover food and packaging using a 'food use-not-waste' hierarchy.
- Action 37: Save food by facilitating recovery and redistribution for human consumption of safe and nutritious foods, if applicable, that are at risk of being lost, discarded or wasted from production, manufacturing, retail, catering, wholesale and hospitality.

Based on our WP6 workshops, the guidance role of the MUFPP and its Framework of Action cannot be underestimated, and they act as a basis of the municipal actions in the signatory cities.

### 3.5. Markets

Markets constrain human behaviour through price (defined by Lessig as a signal for 'the point at which a resource can be transferred from one person to another', Lessig, 2006 p. 236). When we speak of 'market' as a regulatory modality, we are referring to the constraints imposed by, for example, price, costs and risk, not least with respect to the principal factors of production, such as capital, labour, or natural resource commodities (Sjåfjell & Taylor, 2019 p. 43).

In economic terms, food waste is a market failure, because retailers do not bear its full social cost. As a respond, grocery chains for instance in the United States are increasingly experimenting with dynamic pricing with the goal of reducing food waste. Dynamic pricing allows a perishable product's price to vary with its time until expiration, better helping match demand with the retailer's supply before its inventory expires. Somewhat ironically—given the scope of the problem—grocery-chain managers have been late adopters of dynamic pricing, which is common in other perishable-product markets (e.g. airlines or train services) (Sanders, 2023).

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<sup>38</sup> Milan Urban Food Policy Pact, Discover the Framework for Action, available at <https://www.milanurbanfoodpolicypact.org/framework-for-action/>.

Of the factors identified by the Commission to incentivise food waste as market failures can be identified of example<sup>39</sup>

- Shopping environment (e.g. promotions like ‘buy one, get one free’ that may lead to impulse buying and over-purchase)
- Misunderstandings about the meaning of ‘best before’ and ‘use by’ date labels leading to edible foods being thrown away
- Packaging difficult to empty or too large
- Standardised portion sizes in restaurants and canteens
- Difficulty in anticipating the number of customers (a problem for catering services)
- Stock management issues for manufacturers and retailers
- Overproduction or lack of demand for certain products at certain times of the year
- Product and packaging damage (farmers and food manufacturing)
- Low perceived value of food

As creation of food losses and waste is a market failure, tackling market failures shows the interlinkage between all four regulatory modalities. Markets are not self-repairing based on pricing reflecting supply and demand, but the regulatory environment, social norms in market interaction and technology either support or create obstacles to efficient pricing. This applies also to food.

According to ToNoWaste, FLWPR actions increasing cost efficiency and improving resource efficiency create sustainable market advantages to market actors over competitors (ToNoWaste Deliverable 2.1 pp. 35-37). However, pricing is not taking place in a vacuum as supply and demand is affected by the three other regulatory modalities, law, social norms in production and consumption, and used technology Taking into consideration this, the efficiency of markets-only solutions for FLWPR is limited

### 3.6. Architecture

The last and obvious – and yet widely overlooked – constraints businesses and consumers face are those imposed by the physical world (van der Velden, 2016). Physical constraints, would they be natural or human-made, emanates from physical matter, such as naturally occurring phenomena as the location of natural resources, or human-built physical constraints, including information and communications technology inventions used in contracting. Unlike sanctions on breaching law or social norms, and like pricing on the market, one often cannot choose to ignore a material constraint and pay the cost later (as fines when breaching the law), although one will always have interpretive flexibility as to how to respond to them for example by changing methods of obtaining key factor inputs as natural raw materials (Sjåfjell & Taylor, 2019 p. 44).

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<sup>39</sup> European Commission, EU Platform on Food Losses and Food Waste, available at [https://food.ec.europa.eu/safety/food-waste/eu-actions-against-food-waste/eu-platform-food-losses-and-food-waste\\_en](https://food.ec.europa.eu/safety/food-waste/eu-actions-against-food-waste/eu-platform-food-losses-and-food-waste_en).

Some factors identified by the Commission can be seen as architectural:<sup>40</sup>

- Inadequate storage/transport at all stages of the food chain including households (e.g. refrigerator temperatures)

The United Nations Food Systems Summit in 2021 highlighted innovation as paramount to determining how food can be transformed and re-produced in the battle against food waste, with green and digital technologies leading the way (UNEP, 2022). In the survey conducted by CHORIZO project, technology and innovation played a prominent role in the FLWPR actions surveyed, with 100 of 395 total linked to technology or an app (CHORIZO Deliverable D1.2 p. 26).

As examples of technological FLWPR can be mentioned FoodCloud, the Phenix and Too Good To Go apps.

In Ireland, the FoodCloud smartphone app connects the food industry with charities in an attempt to eradicate food waste by redirecting surplus produce. Retailers can upload a description of perfectly good food that they cannot sell on the app. Local charities connected to the retailer through the platform get notified that food is available for collection at a specified time. The charity then responds to the offer either accepting or declining.<sup>41</sup>

In Italy, the Phenix anti food waste app allows citizens to find local groceries, restaurants, bakeries etc that offer discounts on products nearing their expiration date.<sup>42</sup>

Too Good To Go is an app that lets consumers find and rescue unsold food at cafes, restaurants, hotels, shops and supermarkets, so that it will be eaten instead of thrown away.<sup>43</sup>

An app can be combined to change of social norms. The German Zu Gut für die Tonne (Too Good for the Bin) programme offers a website offering background information and useful tips for everyday life, and an app with more than 700 cooking ideas including recipes from top chefs.<sup>44</sup>

According to CHORIZO survey, use of technological solutions was most common in the processing and manufacturing sector, where out of the 45 actions identified as pertaining to this stage, 41 of them involved technology to ensure that food waste or by product from food processing was valorised into new products. There were also other scientific developments, such as new solutions in the field of temperature monitoring for transport logistics and utilisation of food cultures to delay food spoilage in dairy products such as yogurt. There were also several apps and on-line platforms aimed at redistribution of food,

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<sup>40</sup> European Commission, EU Platform on Food Losses and Food Waste, available at [https://food.ec.europa.eu/safety/food-waste/eu-actions-against-food-waste/eu-platform-food-losses-and-food-waste\\_en](https://food.ec.europa.eu/safety/food-waste/eu-actions-against-food-waste/eu-platform-food-losses-and-food-waste_en).

<sup>41</sup> <https://food.cloud>.

<sup>42</sup> <https://www.wearephenix.com/en/application-anti-waste/>

<sup>43</sup> <https://www.toogoodtogo.com/en-gb>.

<sup>44</sup> <https://www.zugutfuertietonne.de/navigation/sub-footer-navigation/english/>.

serving as the ‘middleman’ connecting, via a mobile application, retailers or food service providers to consumers when it came to surplus food. The surplus food could then be sold via the app or platform to consumers at a discounted rate. The ‘Foods!’ app in Poland and the ‘Foodie Save’ app in Ireland are two such examples ((CHORIZO Deliverable D1.2 p. 26).

In the ToNoWaste workshops it was noted that technology is developing so fast that the other regulatory modalities have difficulties to keep in its pace. Technology is affecting social norms, ‘nudging’ for a change, and quicker than for instance legal regulation can react.

### 3.7. A comprehensive regulatory ecology view to FLWPR

As the factors identified by the Commission show, the borders between the four modalities are not clear but diffused, and a factor can be counted to more and one regulatory modality.

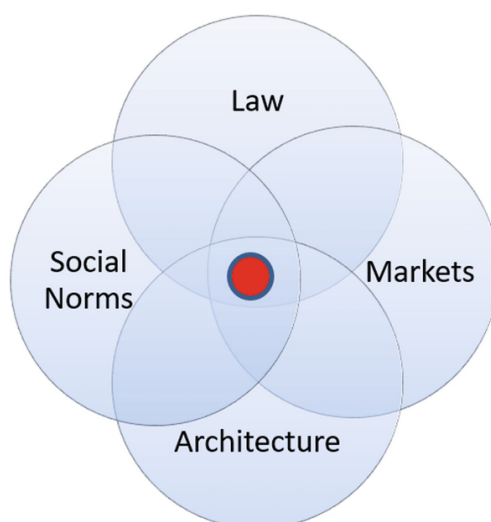


Figure 4: The four modalities of regulation in regulatory ecology (Sjåfjell, 2023)

A major source for market failure in food waste are regulatory errors. On the other hand, a major part of especially consumer behaviour creating food waste is a regulatory error: either the legal regulation or the markets fail to incentive the end-users to FLWPR. As the Commission itself states: Underlying all these problems is an overall lack of awareness, by many actors, of the sheer scale of the problem, the possible solutions and the benefits that come from reducing food waste.<sup>45</sup>

<sup>45</sup> European Commission, About food waste, available at [https://food.ec.europa.eu/safety/food-waste\\_en](https://food.ec.europa.eu/safety/food-waste_en).

As an example, can be mentioned date marking discussed above in section 3.3.1. A Commission study published in 2018 estimated that 10 per cent of food waste in the EU supply chain is linked to date marking (i.e. 'use by' and 'best before' dates indicated on food labelling). Findings also revealed a wide variation in date marking practices in the EU.<sup>46</sup> Greater coherence in the use of date marking can help optimise supply chain management and facilitate consumer understanding of the meaning of these dates.

## 4. Regulatory change in the European Union

A regulatory change comes so using all four modalities of regulation: law is not the silver bullet to solve all social problems, but it must be supported by social norms committed to change, favourable market structures and usable technology. The EU FLWPR policy realises this, recognising also that regulation takes place on several levels: international, transnational (the EU), national (the Member States), regional and local, issues that we have discussed above.

However, the change is slow. Despite all EU actions targeted to all four modalities of regulation, including the growing social awareness of the negative impacts and consequences of food waste, political commitments made at the EU and Member State levels and the EU measures implemented since the original 2015 Circular Economy Action Plan (European Commission 2015), food waste generation is not sufficiently decreasing to make significant progress towards SDG Target 12.3. Despite the existing legal obligations in the 2018 amended Waste Framework Directive (European Union, 2018a) and the supporting activities of the Commission as the 2019 Delegated Decision (European Commission, 2019b), action taken to date in Member States is disparate and has not allowed a significant reduction of food waste levels.

In the midst of our work in WP6, the European Commission took action and launched a new legislative proposal of June 2023 for amending the Waste Framework Directive (European Commission, 2023). In the proposal, the Commission set new regulatory steps to FLWPR:

- to assign clear responsibility to Member States for accelerating reduction of food waste along the food supply chain and in households, in their respective territories, and thus make a solid contribution towards achieving SDG Target 12.3
- to ensure sufficient and consistent response by all Member States to reduce food waste, in line with that of front-runners.

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<sup>46</sup> Market study on date marking and other information provided on food labels and food waste prevention: Final report, 2018, available at <https://op.europa.eu/en/publication-detail/-/publication/e7be006f-0d55-11e8-966a-01aa75ed71a1/language-en>.

The proposal shows that the Commission's previous strategy to use a smart mix of different regulatory modalities with framework regulation, guidelines and platforms described above to change social behaviour in the food value chain is both too slow and too inefficient. FLW is still one of the largest sources of inefficiency in the agri-food chain. In particular, it results in negative environmental and climate impacts. Food consumption is the main contributor to the environmental impacts (Sanyé Mengual & Sala, 2023) and biodiversity footprint (Sanyé-Mengual et al, 2023) of EU consumption (European Commission, 2023 p. 3).

Instead, the Commission believes now that legally binding targets to Member States should lead them to take ambitious action – deploying the most effective measures, tailored to its specific national situation – and aiming to support consumer behavioural change as well as strengthen coordination of actions between actors across the whole food value chain as well as with other relevant actors (e.g., academia, NGOs, financial institutions, social economy actors, etc). It is not only regulation however: after the Conference on the Future of Europe,<sup>47</sup> food waste was selected as the first subject for deliberative European Citizens' Panels. The Citizens' Panel's recommendations will support the Commission's work and will support Member States in designing national strategies and action plans to prevent food waste (European Commission, 2023).

However, the general legislative policy based on proportionality has not been changed. Setting of food waste reduction targets does not set new measures at EU level, giving the Member States the freedom as regards the selection of the most effective measures, tailored to its specific national situation. Member States are not obliged to take any new measures relating to food waste reduction other than those already established by the WFD (Waste Framework Directive) (i.e. reducing food waste at each stage of the food supply chain, preparing food waste prevention programmes, implementing related actions, monitoring and reporting on progress achieved). Moreover, the Commission believes that the Member States have already committed, since the adoption of the Sustainable Development Agenda in 2015, to take action to reduce food waste in order to contribute to SDG Target 12.3, which is de facto a nonbinding, aspirational target (European Commission, 2023).

Social norms change and market change is so still the main tool for FLWPR in the Member States. The proposal for amending the Waste Framework Directive builds on retail and consumption stage action, setting no target for primary production, a 10 percent target for processing and manufacturing and a 30 target for retail and consumption stages (Article 9a(4), European Commission, 2023). The measures to achieve these targets are divided in the proposal to four groups:

- (a) developing and supporting behavioural change interventions to reduce food waste, and information campaigns to raise awareness about food waste prevention;

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<sup>47</sup> European Commission, Conference on the Future of Europe, available at [https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/new-push-european-democracy/conference-future-europe\\_en](https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/new-push-european-democracy/conference-future-europe_en).



- (b) identifying and addressing inefficiencies in the functioning of the food supply chain and support cooperation amongst all actors, while ensuring a fair distribution of costs and benefits of prevention measures;
- (c) encouraging food donation and other redistribution for human consumption, prioritising human use over animal feed and the reprocessing into non-food products;
- (d) supporting training and skills development as well as facilitating access to funding opportunities, in particular for small and medium sized enterprises and social economy actors.

Important part of the efficiency of the implementation of measures is public supervision. Clear accountability and governance of food waste prevention measures are essential to ensure effective coordination of action to drive change and reach the targets set out in the Waste Framework Directive. Due to the shared agenda amongst many authorities and the variety of stakeholders engaged in the fight against food waste in Member States, there is a need for a designated competent authority in charge of overall coordination of actions at national level. For this reason, it is proposed that each Member State shall designate the competent authorities responsible for the coordination of the food waste reduction measures implemented in order to reach the target set out in Article 9a(4) of the Waste Framework Directive (Article 29a(2), European Commission, 2023).

The Commission proposal for amending the Waste Framework Directive is still under discussion in the European Parliament and the Council.<sup>48</sup> The European Parliament Environment Committee adopted on 14 February 2024 its proposals for amendments to the Commission proposal.<sup>49</sup> The Council held a policy debate on the proposal on 25 March 2024.<sup>50</sup> Although the tone in both the Parliament and the Council is positive, there is no time to approve the directive before the next European Parliament elections. After them, the fate of the directive is unsure.

It is so to the actors to implement FLWPR measures, would they be the national governments, regions and municipalities, and actors in the food chain from producers to consumers. All measures proposed should be tested among the actors. As emphasised in the WP6 workshops (see section 5 below), actors anticipate in their behaviour ongoing legislative proposals, adopting to them. However, in the workshops there were no anticipation to the Commission proposal. This is understandable as the Commission proposal has attracted a mixed response and has unsure future also after the European

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<sup>48</sup> The European Parliamentary Research Service (EPRS), Waste framework directive: A more sustainable use of natural resources [EU Legislation in Progress], available at <https://eprthinktank.eu/2023/12/14/waste-framework-directive-a-more-sustainable-use-of-natural-resources-eu-legislation-in-progress/>.

<sup>49</sup> European Parliament, Textiles and food waste reduction: New EU rules to support circular economy, 14 February 2024, <https://www.europarl.europa.eu/news/en/press-room/20240212IPR17625/textiles-and-food-waste-reduction-new-eu-rules-to-support-circular-economy>.

<sup>50</sup> Council of the European Union, Main results: Waste framework directive, 25 March 2024, <https://www.consilium.europa.eu/en/meetings/env/2024/03/25/>.

Parliament elections. While non-governmental organisations criticised the lack of ambition in the binding targets, farm lobbies expressed satisfaction with the derogation for the primary sector.

## 5. Workshops on regulatory ecology

WP6 (University of Gävle, University of Oslo and Hälsinglands Utbildningsförbund) organised 28 April 2023 online workshop: fostering successful approaches on food waste reduction with a particular focus on regulatory approaches. The workshop was addressed to the pilots and followers in Austria, Greece, Spain and Sweden and their stakeholders to discuss

- Efforts on food waste reduction
- Stakeholders involved in food waste reduction
- Regulatory approaches effects on food waste reduction
- Support needed to improved food waste reduction

These four were selected by the organising group consisting of members in the University of Oslo, the University of Gävle and Hälsinglands Utbildningsförbund based on the objectives set to Task 6.1 Ecosystem analysis in the FFVCs under study. To fulfil the task's requirement for a comparative analysis of the regulatory ecology of the pilot and follower countries Austria, Greece, Spain and Sweden six discussion themes was created:

- Theme 1: What efforts has your organisation undertaken to reduce food waste?
- Theme 2: With whom do you work (inside and outside your organisation) to reduce food waste?
- Theme 3: What regulatory approaches affecting your organisation (regarding the reduction of food waste) positively and negatively?
- Theme 4: What support do you need (or offer) to help your organisation (or other organisations) reduce food waste?
- Theme 5: How do you support other organisations to reduce food waste?
- Theme 6: What role does food waste reduction has in your business model?

As a methodological starting point for the selection of the six themes was *comparative regulatory ecology* developed in the Horizon 2020 SMART project, a systematic comparative trans-disciplinary method comprising comparative law, comparative economics and finance and comparative behavioural law and economics (Mähönen & Rapp Nilsen, 2019 p. 41).

There were 21 participants in the workshop from the University of Jaume I, the University of Oslo, the University of Gävle, the Austrian Academy of Sciences, AKARYON GmbH, Perspektive Handel Caritas GmbH and Stratego OG (Austria), EROSKI SCOOP and Cooperatives Agro-Alimentàries C.V. (Spain), municipality of Halandri (Greece), and Hälsinglands Utbildningsförbund, municipality of Söderhamn, region Gävleborg and Matvärden (Sweden). The workshop was organised online in Teams.

The main conclusions of the discussion on the regulatory constraints to FLWPR were:

- Regulatory oversupply is a real problem for all actors, especially non-profit organisations
- Need for a cost-efficient competent authority designed to reduce SME administrative burden
- Public actors are important. Public procurement bids for eg hospitals and schools should take FLWPR more seriously, including SME suppliers
- On municipal level: organisation of food waste processing is crucial
- Regulatory constrains preventing use of edible food left-overs for donations and food banks is an efficient way to FLWPR
- Requirement to prioritise human use over animal feed might be problematic
- Packaging is a weak link in FLWPR
- Technological bottlenecks preventing FLWPR, eg lacking freezing
- Public engagement is crucial for increasing awareness of FLWPR
- Training for food waste management is crucial for its efficiency
- Siloing between competent authorities is creating conflicts in implementing FLWPR
- Role of open labs.
- What is left after FLWPR is waste – garbage . FLWPR is garbage elimination and driver for a business case.
- Creating a theory for FLWPR based on regulatory ecology, business model, agency, systems thinking, and transparency is important, role of ToNoWaste

The result from the workshop was compared with the co-creative workshops conducted in Valencia, Vienna and Graz in WP1 on 16 November and 5 December 2022 on agreed requirements and science-based standards to make better decisions regarding FLWPR) action (ToNoWaste Deliverable 1.2). The main contributions of the 16 November 2022 workshop in Valencia were (pp. 15-17):

- Disconnected actors along the chain. There is a need to establish greater interconnection between different actors in the chain, from agricultural producers to consumers.
- Three different parts of the chain (production, marketing and consumption) that do not know the others' problems and needs. If the different actors in the chain come closer together, better decisions could be made.
- Change in the destination of production from a first class to other uses is not contemplated from the beginning. (Loss of commercial value. One of the actors has a loss vision associated with an economic perspective).
- Rejection by the food chain of fresh production. Aesthetic quality requirements in supermarkets.
- Different consumption and purchasing habits (cultural and social theme): you cook less, you buy worse, everything faster, culture of immediacy, etc.
- More demanding consumers.
- Problem of consumer education (products are considered second quality when they are not).
- Losses and waste of fresh food were not considered a problem until 2012.

- Food waste is often falsely linked to the most disadvantaged people.
- Lack of sufficient public policies.
- Standardization of gauges. It is necessary to avoid productions that are not transferred to the market.
- Need to measure fresh food waste and its impact. From the consumption side, measurements are beginning to be made, but it requires greater awareness among final consumers (starting with schools) about the need to know the impact of their actions. Education of families.
- Indeterminacy of the definition of waste. Propose that the standard be revised (what has been produced to be consumed and has not been consumed).
- Need to review the regulations of the expiration date. Review of dates. Better inform and train consumers so that they are clear about what is the 'best before date' and what is the 'expiration date', etc. (dietary culture).
- Food manufacturing has become industrialized and systematized production is poorly differentiated. Need to diversify products.
- Packaging in supermarkets that generate food waste.
- How to sanction food waste produced by each individual.
- Waste associated with a planning problem. Solution e.g. kitchen of use, return to previous solutions.
- Need to make greater use of technological applications to measure waste.
- Lack of information to take effective solutions. You need to go to the root cause of the problem to come up with effective solutions. Example: consumers throw away a lot of products because they expire, but why does a product expire at a consumer's home? Why has a product been purchased that is going to expire soon?
- Waste may be located in one stage of the product cycle, but the origin of waste may be found in another stage; e.g.: expiration date. The flow of information between the various actors in the chain may not work well.
- Delegated Decision (EU) to quantify food waste that includes total edible and nonedible waste (could be differentiated, although not mandatory under the directive) Need to discuss the aspects that the Delegated Decision (EU) has determined to include in the quantification of food waste (e.g. packaging waste, etc.).
- Lack of the ability to better manage waste.

Also in the Vienna/Graz workshop on 5 December 2022 several problems were identified by the attendants, connected to food production, trade and consumption (pp.19-20):

#### Production

- Overproduction.
- Planning: dependence on orders and legal framework conditions.
- Secure purchase cannot be guaranteed due to legal framework conditions.
- Evaluation criteria for tenders should consider local/ national and EU levels.
- Production goes over entire vegetation period. Farmers will strive for operational optimization and grow crops that generate income.

- No federal coordination – for example, which amount of tomatoes is needed. Also related to changing consumption preferences. Fresh Food is in demand before the products are ripe and if they are ripe, sales are not big enough.
- Inflexibility of production must be considered.
- Uncertainty about demand for the coming year.
- Other ways of using the products must be enabled and allowed to be implemented, e.g.: processing cannot be implemented by everyone / hardly any producing company, would need for this.
- Devaluation of food - agricultural business wants to generate income, it is not only about the products being consumed, but the business should also be able to earn something with it.

## Trade

- It is necessary to differentiate between a retailer who is self-employed and a group-controlled retail company.
- Big difference between rural and urban areas. Passing the overproduction on in the city is less difficult.
- It is difficult for retailers to survive due to changes in consumer behavior and economic crisis, more bulk purchases/promotions/cheap private labels.
- Income issue - applies to farms, but also to retail.
- Food retail: small retailers have become very familiar with food waste; in comparison, supermarkets organized by corporation care less.
- Stakeholder list: differentiate wholesale and food retail.
- 'Nobody believes in labels anymore' - audit system does not have to end in a label - can run on supply chain level.

## Consumption:

- District work - consumption side: oversupply tempts people to buy too much.
- Behaviors are strongly characterized by uncertainty, even when food is tasted - people are afraid of food poisoning.
- Planning security along the entire value chain. How to optimize planning as much as possible?

The conclusions from the workshops, organised before publication of the European Commission's proposal for amending the Waste Framework Directive in July 2023 (European Commission, 2023), strengthened our conception that regulatory ecology is a feasible theoretical approach to FLWPR regulation. Legal regulation must be mandatory but enabling, encouraging both public actors as states, regions and municipalities and private actors in the whole food value chain for action to FLWPR. It also shows bottlenecks in regulation and the danger of conflicting regulatory frameworks.

Second WP6 workshop was organised online on 20 February 2024. In this workshop the draft deliverable D6.1 was discussed by a group of experts from the academic partners, pilots and followers. In the discussion one main regulatory tool, connected to cities fighting

FLWPR was emphasised: the Milan Urban Food Policy Pact (MUFPP).<sup>51</sup> Launched by the Milan Municipality in 2015, the Milan Urban Food Policy Pact is an international agreement among cities from all over the world, committed 'to develop sustainable food systems that are inclusive, resilient, safe and diverse, that provide healthy and affordable food to all people in a human rights-based framework, that minimize waste and conserve biodiversity while adapting to and mitigating impacts of climate change'. Its main aim is to support cities wishing to develop more sustainable urban food systems by fostering city to city cooperation and best practices exchange. Of the pilots and followers, Athens, Valencia and Vienna are signatory cities in the MUFPP.

Second important aspect on the regulatory ecology model raised in the workshop was the proactive nature of market actor behaviour. Market actors take into consideration in their governance not only regulation already approved but also regulation planned, in its phases from preliminary discussions to governmental and other proposals, legislative discussions and final decisionmaking. The Spanish bill for FLWPR expired in 2023 was given as an example, although it expired and the Spanish government had to start the process from the beginning in the beginning of 2024. Second example is the European Commission proposal for a Corporate Sustainable Due Diligence Directive discussed now two years in the EU institutions and Member States.

## 6. Operationalization of FLWPR regulatory ecology study: way forward

The importance of FLWR research for regulatory change cannot be underestimated. Although we know based on our experience from the Horizon 2020 SMART project and its recommendations (Sjåfjell et al., 2019; Sjåfjell et al., 2020), the possibilities to intensify legal regulation through research are limited in business law especially in the EU where regulatory outcomes are unsure and sometimes even arbitrary due to the tripartite legislative mechanism between the European Council, the European Parliament and the Council where the Member State governments are represented (see Sjåfjell and Mähönen, 2024). However, the impact can take place on national level and research can intensify social change, changes in market arrangements and new solutions in technology. Regulatory ecology is a powerful tool to explain regulatory change, its limits and its possibilities. We see already now possibilities of ToNoWaste for regulatory change in FLWPR if we see regulation more broadly than legal regulation, and take into consideration regulatory change through social norms, market changes and technological advancements.

The regulatory power of research especially in the Framework Programmes has been recognised also in the EU and especially in FLWPR. As emphasised by the European Commission in its proposal for amending the Waste Framework Directive (European Commission, 2023), EU Research and Innovation Framework Programme Horizon 2020 and

<sup>51</sup> Milan Urban Food Policy Pact, available at <https://www.milanurbanfoodpolicypact.org>.

Horizon Europe are important tools in offering new opportunities for research and innovation to address food losses and waste. Several research projects under EU Research and Innovation Framework programmes Seventh Framework Programme, Horizon 2020 and Horizon Europe have addressed FLWPR, giving policy recommendations.

In ToNoWaste WP1, 21 of the Framework Programme projects were analyzed in detail (ToNoWaste deliverable D1.1 Related Accounting methods and databases for SBF design). Of these, the European Commission has recognised four, Waste Quantification Solutions to Limit Environmental Stress (WASTELESS) Bringing knowledge and consensus to prevent and reduce FOod LOss at the primary production stage. Understanding, measuring, training and adopting (FOLOU), Changing practices and Habits through Open, Responsible, and social Innovation towards ZerO (CHORIZO) and ToNoWaste (European Commission, 2023 p 3). Besides ToNoWaste, CHORIZO aims to improve the understanding of how social norms influence behaviour and food losses and waste generation and use this knowledge to improve the effectiveness of decision-making and engagement of food chain actors, towards zero food waste.<sup>52</sup>

This preliminary regulatory ecology study paves way to WP6 Task 6.1 and Task 6.2. In Task 6.2 Development of supporting resources and coaching to promote organizational change in the supply chain actors we deepen our collaboration with key actors in the two ToNoWaste pilots, Fundacion de la comunitat valenciana para la promocion estrategica el desarrollo y la innovacion urbana (Valencia, Spain), Strateco (Graz, Austria) and Hälsinglads Utbildningsförbund (Sweden) to develop publications and learning contents for urban accelerators that support more sustainable business models in the food systems. In Task 6.3 Task 6.3 Open discussion forums for facilitating new policy decisions aligned with FLWPR we organise local workshops in each participating city to discuss of FLWPR actions, resulting a white paper to policy makers at (i) ToNoWaste progress in FLWPR and the relevance of the impacts achieved, (ii) a comparative regulatory ecology analysis and (iii) new supporting policies schemes for FLWPR actions.

The result shall be three deliverables: D6.2 Supporting resources to promote organizational change in the supply chain actors, D6.3 White paper for new policies supporting FLWPR ecosystems and D6.4 Policy brief (executive summary of D6.3).

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