

Towards food supply chain decarbonisation: Challenges of the European policies and stakeholders' initiatives

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Overview

This brief gives an overview of current policies, regulations, food standards, ecolabels, industry and consumer initiatives and financial mechanisms addressing decarbonisation in the European food supply chain.

Key outcomes

Multi-stakeholder initiatives are key to support political agendas and propose political priorities.

More emphasis is needed to promote decarbonisation in processing, distribution, and retailing stages in Europe.

1 Background

Climate change is one of the most pressing challenges of the 21st century (König & Araújo-Soares, 2021), and urgent interventions are required to avoid the 1.5°C threshold established by the Paris Agreement (United Nations, 2015). Such interventions represent a set of actions to achieve net zero emissions across productive sectors by 2050. The food sector deserves special attention not only for being essential to feed the world population, but also because food systems are estimated to contribute to a third of anthropogenic global greenhouse gas (GHG) emissions (Crippa et al., 2021). With the current population and economic growth trends, food systems must go through pivotal modifications to ensure food security while reducing environmental impacts (Lipper et al., 2020). In Europe, the food industry is a central economic sector (Wijnands et al., 2007) with several interlinked actors that produce, add value and supply food to final consumers (Timmermans et al., 2014). Thus, addressing sustainability in food sector requires integrated approaches examining the stakeholders involved in the entire food chain within the farm gate and beyond (Camanzi et al., 2017).

2 GHG emissions of food supply chains

A food supply chains (FSC) consists of several interlinked stages (Figure 1). Despite high emissions of food production (e.g. livestock, land use), other stages (e.g. retailing, distribution) are likewise key GHG emitters. Using the EDGAR database (Crippa et al., 2021), retail and distribution contribute to approximately 24% and 17% of GHG emissions from European FSC, respectively. Thus, decarbonising food systems requires continuous commitment along the entire FSC.

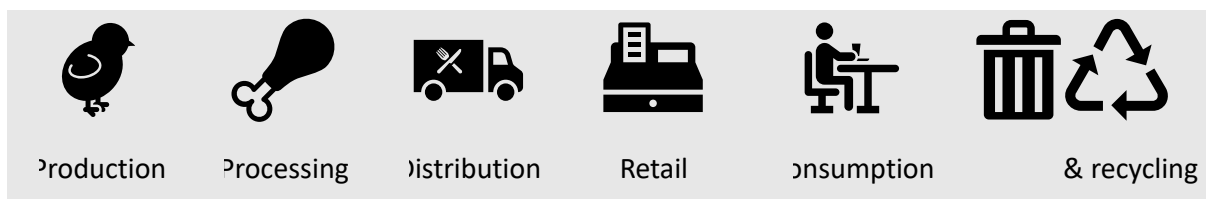


Figure 1. Food supply chain

Box 1. GHG emissions in the European food supply chains

The Emissions Database for Global Atmospheric Research ([EDGAR](#)) quantifies GHG emissions in the European food systems. The database distinguishes carbon dioxide (CO₂), nitrous oxide (N₂O), methane (CH₄) and F-gases (e.g. hydrofluorocarbons). Considerable amounts of CO₂ are released during packaging and processing stages altogether. By contrast, most N₂O and CH₄ are emitted within the farm gate activities, the latter also originates from solid waste decomposition. F-gases are mainly emitted in the retail stage. They are, among other uses, employed in refrigeration and for cooling purposes and are known for their high global warming capacity. In addition to emissions of F-gases, the impact of CO₂ emissions from fossil fuels used to operate refrigeration systems should be considered.

The Horizon 2020 ENOUGH project aims at quantifying GHG emissions at the different stages of the FSC and evaluating the potential and effectiveness of alternative decarbonisation strategies. As part of the project, the first task consists of mapping European (i) policies and regulations, (ii) standards and eco-labels, (iii) consumer initiatives, (iv) industry initiatives, and (v) financial mechanisms that aim at decarbonizing the European FSC. In the first phase of this project, European Union (EU) level initiatives are collected, supplemented by some national and regional initiatives. The mapped initiatives directly or indirectly affect decarbonisation, which may be their main goal or part of a set of goals. The Supplementary Material lists the mapped initiatives and provides more details on them, while the following sections provide an overview of the main findings.

3 Categorisation framework

A categorisation framework (Figure 2) is developed to organise and analyse the mapped data. The categorization aims to obtain information related to the context of the mapped policies, regulations, standards, eco-labels, initiatives and financial mechanisms. This is achieved by identifying their final users, timeframe and the stage in the FSC and food sector that they apply to. It also includes categories related to their technical aspects of decarbonization by specifying their scope, main goal, and type of action. In total, (i) 37 policies and regulations, (ii) 19 standards and eco-labels, (iii) 13 consumer initiatives, (iv) 18 industrial initiatives, and (v) 27 European financial mechanisms at the EU level are reviewed and mapped.

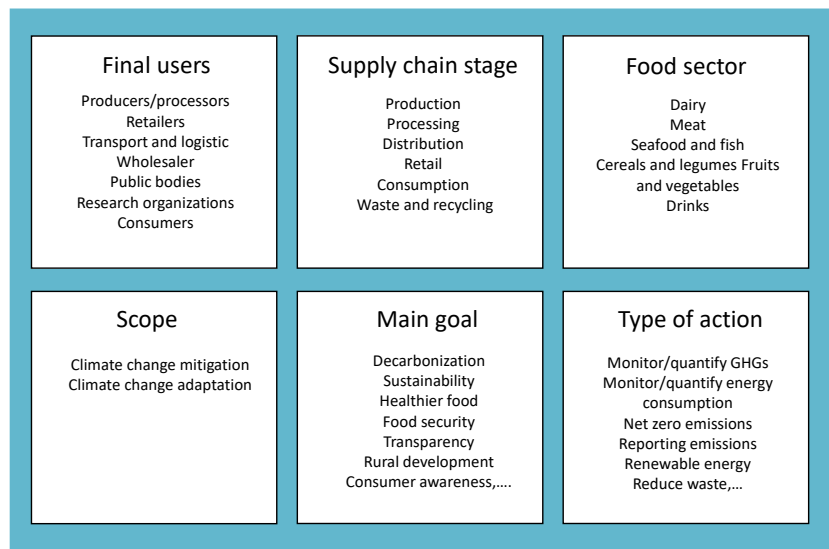


Figure 1. Categorisation framework

4 Policies and regulations

At a global scale, [the Paris Agreement](#) and [the 2030 Agenda for Sustainable Development](#) jointly set the overarching goals for climate action in the policy arena: The Paris Agreement demands "holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels" (United Nations, 2015a). It aims to strengthen the global response to climate change through mitigation, adaptation, and finance. The 2030 Agenda for Sustainable Development defines 17 integrated Sustainable Development Goals (SDGs) that stimulate action in areas of critical importance for humanity and the planet. SDG 13 "Climate Action", through target 13.2, aims to "integrate climate change measures into national policies, strategies and planning" (United Nations, 2015b). [The European Green Deal \(EGD\)](#) is part of the European Commission's strategy to implement the 2030 Agenda for Sustainable Development (EC, 2019). As part of the EGD, the EU is committed to climate neutrality by 2050. To fulfil this, the EU Member States pledged to reduce emissions by at least 55% by 2030, compared to 1990 levels (EC, 2020). The first [European Climate Law](#) entered into force in July 2021, which enshrined the 2030 and 2050 climate goals in legislation (EC, 2021).

The aforementioned climate policies have led to several other policies and regulations to facilitate the realisation of the European climate goals. While some policies and initiatives directly address decarbonisation in the food sector (e.g. [F2F](#)), others cover sectors that FSC rely on (such as the energy sector), address FSC stages other than food production (such as [Sustainable and Smart Mobility Strategy](#) related to food distribution) or have other goals in addition to decarbonisation (e.g. [Common Agricultural Policy](#)). This shows the importance of maintaining a broad perspective on policies and regulations not only within the food sector, but across sectors that affect FSC directly and indirectly.

Box 2. Governance background toward sustainable food supply chains in Europe

Various policies and regulations facilitate the contribution of the food sector to meeting the European climate goals. Some examples are as follows:

- 2.1. The [F2F](#) is central to EGD and outlines a framework to promote a “fair, healthy and environmentally-friendly food system”. F2F ensures that agriculture, fisheries, aquaculture, and the FSCs contribute appropriately to the 2030 and 2050 climate goals. To ensure sustainable food production, among others, the EU rules will be set to reduce the dependency on critical feed ingredients (e.g., soya grown on deforested land) by fostering EU-grown plant proteins as well as alternative feed ingredients, such as by-products (e.g., fish waste).
- 2.2. As part of F2F and to stimulate sustainable food and retail sectors, the Commission aims at developing an [EU Code of conduct for responsible food business and marketing practice](#), accompanied with a monitoring framework.
- 2.3. The proposal for a [legislative framework for sustainable food systems](#) is among the flagship initiatives of the F2F and aims at facilitating the transition to sustainable food systems. It will promote policy coherence at the EU and national levels, mainstream sustainability in all food-related policies, and strengthen the resilience of food systems.
- 2.4. While the primary focus of F2F strategy is on agriculture, it notes the lower carbon footprint of seafood than animal production on land. In June 2022, the [EU’s International Ocean Governance Agenda](#) was updated, which, among others, highlights the importance of reducing GHG emissions from fisheries and aquaculture.
- 2.5. The [Fit for 55 package](#) is a set of proposals to revise EU legislation and introduce new initiatives to align EU legislation with EU’s 2030 climate target. Several of the proposals directly or indirectly affect the decarbonisation of FSCs, such as the proposal to combine the agriculture non-CO2 GHG emissions with the land use, land use change and forestry (LULUCF) sector, thereby creating a newly regulated land sector.

5 Standards and eco-labels

Over the last decades, voluntary certification and eco-labelling programmes have proliferated in the food sector. Non-governmental organizations (NGOs) together with industry associations have led these initiatives in response to environmental and social concerns of consumers and activists’ groups

Box 3. Food product standards

This box includes the most relevant product footprint standards that contribute to decarbonisation in the food sector along the entire supply chain.

- 3.1 [The Product Environmental Footprint \(PEF\)](#) is defined as “as a multi-criteria measure of environmental performance of a good throughout its life cycle”. This standard was developed in the context of Europe 2020 Strategy – “A Resource-Efficient Europe”. The mentioned strategy and the respective roadmap propose ways to decouple economic growth from resource use and environmental impact, considering the life cycle perspective. PEF was aimed to be the EU’s harmonised Life Cycle Assessment (LCA) methodology, which consider environmental performance criteria, includes all stages from raw material to end-of-life processes, and all the relevant environmental impacts.
- 3.2 [ISO 14067](#) standard specifies principles, requirements and guidelines for the quantification and communication of the carbon footprint of a product (CFP), based on International Standards on life cycle assessment for quantification (ISO 14040 and ISO 14044) and on environmental labels and declarations for communication (ISO 14020, ISO 14024 and ISO 14025).
- 3.3 [PAS2050](#) standard was prepared by BSI British Standards and co-sponsored by the Carbon Trust and the Department for Environment, Food and Rural Affairs (Defra). It is an independent standard developed with significant input from international stakeholders and experts across academia, business, government, and NGOs. It assesses GHG emissions of an individual product, either a good or a service, across its entire life cycle.
- 3.4 [GHG Protocol Product](#) standard is a multi-stakeholder partnership of business, non-governmental organizations, governments, and others convened by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD). The GHG protocol aims to develop GHG accounting and reporting standards and tools. It provides general framework for companies to make informed choices to reduce emissions from the products they manufacture, design, sell, purchase or use.

(Gulbrandsen, 2006). Standards provide methodological guidelines to quantify food products’ carbon footprint. These are used to establish the baseline needed to implement a GHG reduction strategy.

Eco-labels aim to enable consumers to make informed decisions, sustainable choices, and encourages producers and other agents to increase their environmental standards. According to Galarraga

Gallastegui (2002) there are three types of labels: *Type I*: A third party uses several criteria to assess products. It analyses the environmental impacts through the life cycle of products and awards a license, which authorises the use of an eco-label. *Type II*: Based on environmental self-declaration. Industries (manufacturers, importers, and distributors) claim the environmental characteristics of a product. *Type III*: Provide quantified data of a product using pre-set categories of parameters verified by a qualified third party and based on life cycle assessment.

Currently, there is no common framework that allows consumers to compare different food groups or product categories. Food eco-labels remain voluntary in European countries, a fact that may change since the European Commission announced that the new legislative framework for Sustainable Food Systems may include mandatory sustainability food labelling. Additionally, the [F2F](#) includes a proposal for a “Sustainable Food Labelling Framework” expected by 2024 (EC, 2022).

6 Consumer initiatives

Reducing emissions and transitioning towards a resilient food system needs to be addressed across food production stages and by multiscale and multi-stakeholder initiatives. Consumers are important actors to promote the green transition. According to Gustavsson et al., (2011) in 2017, global food

Box 4. Consumers and the green transition

Consumer initiatives are mainly engaged in fostering civil awareness by facilitating the communication among several consumer organizations. They also represent international movements following a common action plan. Their general goals encompass topics like food waste, consumers’ rights, products’ origins, and food sustainability. Some examples are:

- 4.1. The [Slow Food](#) is a grassroots organization working to ensure that everyone has access to good, clean and fair food. By acquiring public and private funds, the initiative develops projects related to food sustainability.
- 4.2. In partnership with FAO and UNEP, the [Think.Eat.Save](#) contributes to the so-called “One Planet Network” to reduce food loss and waste along the FSC. The initiative invites societal groups and actors to integrate the network and offers recommendations and practice implementation to improve food handling.
- 4.3. [Generation Climate Europe](#) is the largest climate coalition of youth-led networks in Europe to advocate together with European institutions for more climate action.
- 4.4. [Food Watch](#) is a European advocacy group that focuses on protecting consumer rights pertaining to food quality. Food Watch provides independent research and analysis, makes legislative proposals and mobilizes consumer resistance.
- 4.5. Aiming to improve sustainability and food security [FoodSharing](#) acts to reduce food waste. All food sectors are targeted, while food distributors and consumers have a network to redistribute unsold food products.

waste accounted for 1.3 billion tons, which are partly lost at the consumer level. In this regard, food losses signalize not only sustainability issues, but also contribute to the increase in GHG emissions. Understanding consumption patterns is essential to sustainable development (Sandberg, 2021), given that community engagement gathers industry representatives, civil society, policy actors and regulators to facilitate policy implementation (EC, 2017). The European Commission has advocated for the importance of multi-stakeholders’ platforms to bring public, private and civil society together and exchange best practices to the success of sustainable development in Europe. Consumer initiatives comprise collective efforts by consumer associations, NGOs, and civil associations to promote sustainable food consumption in Europe. Results point to stronger emphasis on awareness and waste reduction actions having mostly consumers as main actors.

7 Industry initiatives

In 1922, the United Nations Conference on Environment and Development (UNCED) was a milestone to acknowledge the role of industries to facilitate and implement sustainability targets (Veleva et al., 2001). Therefore, incorporating incentives to reduce GHG emissions at the level of industries should be a high priority.

Box 5. European industries and food sustainability

European industries have shown increasing commitment to implement sustainable strategies into their productive systems. They allocate public and private funds to enable research, development, innovation, foster collaboration with other companies, and design action plans to reduce GHG emissions. Some examples are as follows:

5.1 The [Food-Processing Initiative e.V.](#) is a network of large, medium and small food companies to strengthen their competitiveness. The objective is to facilitate and implement innovations and sustainable solutions in the food sector.

5.2 [The Agricultural European Innovation Partnership \(EIP - AGRI\)](#) is a partnership to the “Europe 2020” strategy for smart, sustainable, and inclusive growth. Focusing on agriculture and food production, it brings several actors – farmers, advisers, researchers, businesses, NGOs and others– together to work on issues regarding natural resources and sustainable cropping systems.

5.3 The [Roadmap 2050](#) is an action plan to reduce GHG emissions by 2050. The initiative provides ways to reduce GHG emissions at least 80% by 2050 (compared to 1990) in Europe. It was elaborated by an expert consortium founded by the European Climate Foundation (ECF) and is an independent and objective project to provide decarbonisation pathways.

Since industrial activities are crucial to pave the road towards decarbonisation, the EGD calls for transformations in production systems to reduce GHG emissions (EC, 2021). With the “new industrial strategy”, companies in all supply chain stages should gradually implement and use low-emission technology to develop sustainable products and services. Given the importance of the industrial food sector to achieve a low-emission transition, food industries should gradually integrate initiatives to reduce GHG emissions along the value chain. The industrial initiatives mapped in the project comprise of collective actions from associations, private or public actors that promote the implementation of decarbonization initiatives in the operations of the firms that belong to the industries in the FSC. Initiatives mainly involve private investments for research and development (R&D) in early FSC stages to promote decarbonisation in agricultural production.

8 Financial mechanism

Investments are core to achieve a sustainable and resilient economy. Low-emission systems require structural modifications along FSCs that will only be met by sufficient investments and access to finance. Meanwhile, European governments have launched financial investment programmes to support the green transition. Following the legal commitments from the Paris Agreement and the UN-SDG Agenda, the EGD Investment Plan was launched to engage €1 trillion in sustainable ventures in the next decade (EC, 2020). The plan also proposes annual investments of approximately 350 billion Euros until 2030 to achieve the climate targets. Financial initiatives refer to public or private investments, whose main objectives are to decarbonise and reduce environmental impacts in the European FSCs. Financial mechanisms are very broad and cover a high spectrum of sustainability-related projects. In general, most of them have an indirect link to the FSC and climate. However, they can potentially grant funds to small and medium-sized enterprises (SMEs) and research institutes, with overarching food and climatic projects.

Box 6. Investing in sustainable development

Europe has a solid history of sustainable finance. Within the last two decades, financial programmes have targeted innovative programs to foster sustainability in several productive systems. Some examples are as follows:

6.1 The [Adaptation for Small holder Agriculture Programme \(ASAP\)](#) addresses climate resilience strategies in large-scale rural development programmes. It acknowledges the growing impacts of climate change in rural areas and the need to reduce and diversify climate-related risks.

6.2 The [Just Transition Fund](#) is an instrument of the Cohesion Policy. It was launched to support regions bearing strong climate change impacts and socioeconomic costs to transit and adapt to a green economy.

6.3 The [Climate-Smart Agriculture Booster \(CSA Booster\)](#) brings multi-stakeholders together and supports the adoption of innovative and sustainable climate-smart agricultural practices. Financial resources are allocated for capacity-building, knowledge management and project portfolios under five main themes: Agrotechnology, Agri finance, insurance, innovation, and technical assistance.

6.4 The [Climate Action 100+](#) aims to improve climate change governance, cutting emissions and strengthening climate-related financial disclosures. A central target is to ensure that big GHG emitters would act in favor of reducing emissions and climate impact.

9 Synergies and gaps

There are several **policies and regulations** that directly and indirectly affect GHG emissions and food systems sustainability, while having synergies or even conflicts. Thus, there is a need to focus not only on the policies that directly aim at decarbonising food systems, but also on those with indirect effect, as well as their interactions. In this regard, the F2F is timely, ambitious, and at the heart of Europe's political agenda for facilitating the transition to sustainable food systems. It covers the whole FSC, and ensures that agriculture, fisheries, and aquaculture contribute appropriately to climate goals. However, it does not provide a clear definition for "sustainable food". Sustainability is a multi-faceted concept, covering social, economic, and environmental aspects, which may call for different definitions in various food sectors. In addition, stakeholders may have a different understanding of sustainability and, hence, a definition for sustainability in the context of this strategy is needed. The EU taxonomy for sustainable activities and its definitions for food sector could be a desirable blueprint for actions and directions. Considering the several facets of sustainability, a systematic definition covering various sectors, stakeholders, and disciplines is needed to find synergies, pinpoint tradeoffs, and address conflicts while finding "sustainable" solutions. A timely initiative within the F2F is the proposal for a legislative framework for sustainable food systems. The framework aims at policy coherence in the EU and national levels and mainstream sustainability in all food-related policies.

In terms of **carbon footprint standards**, there is a lack of international agreements on standards for eco-labelling and the type of data that should be measured. In the EU, however, the PEF standard was developed as a common methodological approach to assess, display, and benchmark the environmental performance of products over their life-cycle. The PEF standard is currently in a transition phase before its potential adoption in European policies. Food eco-labels remain voluntary in Europe and there is no common framework among the States Members. As a consequence, the information included in the eco-levels (e.g. reduction, best-in-class, measure CO₂, categorical labels) differ widely within countries, labels, and products. However, in the last years new types of eco-labels have emerged and gained popularity in the market, like graded labels and "traffic light" systems. These eco-labels seem to be more effective since they allow easy comparisons between products and often include multiple environmental criteria that provide more complete and reliable information to consumers. For instance, multiple private and public initiatives developed a new environmental label for food products, including several environmental criteria to meet consumer and market needs. The lack of a common framework and regulation in place have led to a wide variety of standards and, especially, eco-labels for European food products. Nevertheless, the emerging regulations and policies in the EU are expected to contribute to the transition towards a more standardized and transparent carbon footprint measuring and labelling in the food sector.

Multi-stakeholders' initiatives support political agendas by offering inclusive and effective approaches to assess and design applicable solutions to decarbonise the European FSC. The SDG Agenda and political and scientific debates acknowledge that stakeholders' efforts should bring together public bodies, companies, NGOs, and civil society to design applicable sustainable solutions (Williams et al., 2020). Likewise, the EU calls for stronger societal commitment as a tool to facilitate debates, promote events, trainings, and exchange best practices to the green transition. The collected European initiatives have diverse arrangements from governmental to private and civil participation. Even single initiatives have, *per se*, strong abilities to involve several groups (e.g., farmers, NGOs, researchers, policy makers) into their action plans.

Parallel to the policy framework, there is a clear priority shift **towards financial, industrial, and consumer initiatives** aligned to recent political aspirations. While in the 1990s and 2000s, consumer initiatives emphasized aspects such as consumer rights and improving food access, recently, they became active on climate awareness, green transition, and reducing food waste. Industry initiatives, in turn, were originally committed to foster innovation and competitiveness directed to achieve the targets set at the national and sub-national levels, whereas following the current political goals, the initiatives prioritize decarbonisation strategies and climate-resilient food production. Similarly, financial means enable ongoing societal mobilization and are useful to support governmental investment priorities and strategies to facilitate policy implementation. The financial mechanisms initially targeted investments in SMEs to strengthen their competitiveness, funds for R&D and Research and Innovation (R&I). In addition, clean and efficient energy projects were supported by the early initiatives in the mid-2020s. However, since 2018, investments prioritise projects focused on the SDGs, climate change governance, and reducing GHG emissions.

Frequently, **industrial and consumer initiatives** access available public funds, but also mobilise private ones, to implement sustainable and innovative practices. The latter tend to have a civil character by gathering groups of people, NGOs, and civil associations to raise consumer awareness, responding to food waste and food quality. Differently, **financial mechanisms** have a broader scope, granting investments to several projects and initiatives not targeting the food sector directly, yet potentially embracing sustainable FSC proposals.

Although in general the collected initiatives commonly aspire to achieve sustainability, many are directly or indirectly related to decarbonization. For instance, concerning natural resources

management, initiatives are especially involved in the food production stage (e.g. [KLIMACO](#), [Life Clean Air Farming](#)) and are designed to reduce negative food system impacts –such as emissions– and preserve biodiversity. Additionally, waste management is linked to financial (e.g. [JICE](#), [InnovFin](#)), industrial (e.g. [Milan Urban Food Policy Pact](#)) and consumer (e.g. [Foodsharing](#), [Think.Eat.Save](#), [Save Food](#)) initiatives, which address waste reduction mainly at the consumption stage. Furthermore, there are several funds targeting projects related to climate change and emissions reductions (e.g. [ASAP](#), [Innovation Fund](#), [Climate Action 100+](#), [EFSI](#)). Industrial initiatives deal with decarbonisation strategies mainly at the production stage (e.g. [Life Clean Air Farming](#), [Beef Carbon](#), [4 per 1000](#)), but also in a general framework that includes the FSC (e.g. [Roadmap 2050](#)).

All in all, the findings indicate that the contribution of all stakeholders involved in the FSC is crucial not only to establish policy priorities, but also to support political agendas. Moreover, the FSC is a complex system requiring integrated sustainable actions across all stages, from production to waste management. Despite the clear engagement in consumers' awareness activities, through which they are informed about climate crisis (e.g. [KNOCA](#)), food origin (e.g. [Du bist hier der Chef](#)), food safety (e.g. [SAFE](#)), food quality (e.g. [Food Watch](#)), among other aspects, there is a need for stronger engagement for sustainability action in the stages of the FSC closer to consumption, such as processing, distribution and retail.

10 Conclusions

In the 21st century, the sustainability concept has integrated research, political and social domains. Especially in Western European countries, sustainable initiatives from public and private actors are growing and are acknowledged as central to building a climate neutral economy. In this study, initiatives are grouped into categories according to the main stakeholders involved (public administrations, industries, consumers, and financial entities). Next, an in-dept review of the main initiatives facilitated the understanding of their potential contribution to decarbonisation.

Focusing on the FSCs, the findings indicate that most initiatives require the interaction of several actors and categories. For instance, consumer and industry initiatives require financial means, which must be provided either by public or private financial sectors. In addition, the regulatory framework and policy initiatives serve as a “push factor” to make emission reductions along FSCs compulsory. In this regard, the EGD and the subsequent European Climate Law offer an appropriate framework for achieving net zero emissions by 2050. Similarly, the future implementation of the F2F is expected to resolve several issues related to food systems. In line with political and scientific debates, this study acknowledges the importance of bringing together public bodies, companies, NGOs, and civil society to design sustainable solutions.

The limitations of this compilation of stakeholders' initiatives are as follows: Firstly, they are limited to European countries and do not cover emerging and low-income countries, which could be addressed in future research. Secondly, the review covers initiatives until 2021; therefore, a continuous update of the systematic review is beneficial.

The main policy recommendations that could be inferred from the comprehensive revision of the past and ongoing initiatives are threefold:

- First, European stakeholders have been active, especially with regard to reducing food waste in production and consumption systems and promoting awareness regarding food sustainability to a wider outreach. Adapting FSC stages in relation to sustainability management, applying and informing sustainability measures at the firm level, and promoting sustainable public procurement require further actions.

- Second, the initiatives revised indicate that there is already a high engagement at production and consumption stages, paving the road towards decarbonization. Nevertheless, actions to achieve sustainable food processing, packaging, and distribution require additional initiatives, where the potential for reducing emissions is still untapped.
- Third, targets specifically related to broader governmental approaches depend on a comprehensive national framework, able to meet sustainable food production and consumption in accordance with international objectives. In this regard, Europe is still far from the full implementation of a detailed framework and criteria to meet these targets. Although the F2F framework seems to suit this purpose, targets are under evaluation and remain as a set of general suggestions rather than a concrete proposal. Therefore, a timely and clear implementation pathway is desirable to achieve the main goals.

Further research could assess the need for integrated governmental action along the entire FSC and design concrete criteria to meet sustainable food systems. Although it is still too early to establish a link between multi-stakeholder's actions, their associated GHG emissions reduction and sustainability outcomes and the evaluation of causal effect should also be a matter for further research.

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ENOUGH – EUROPEAN FOOD CHAIN SUPPLY TO REDUCE GHG EMISSIONS BY 2050

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