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What are the Barriers and Opportunities for the Harmonisation
of the European Food and Beverage Impact Assessments and
Communication Sector?
A Multi-Scalar-Perspective on Sociotechnical Transitions in the
European Union's Food System.

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List of Abbreviations

BRC	British Retail Consortium
CEO	Chief Executive Officer
CSRD	Corporate Sustainability Reporting Directive
EG	Economic Geography
EC	European Commission
ESFC	European Sustainable Food Coalition
EU	European Union
F&B	Food and Beverage
GCD	Green Claims Directive
GSTA	Global Sustainability Transition Alliance
LCA	Life Cycle Analysis
MLP	Multi-Level-Perspective
MSP	Multi-Scalar-Perspective
NGO	Non-governmental Organisation
NPO	Non-profit Organisation
OECD	Organisation for Economic Co-operation and Development
PEF	Product Environmental Footprint
PEFCR	Product Environmental Footprint Category Rules
SaaS	Software as a Service
SBTi	Science-based-targets initiative
SMEs	Small and medium-sized enterprises
WRAP	Waste & Resources Action Programme (WRAP)
WWF	World Wildlife Fund

Abstract

The current food system faces a dual challenge. While significantly contributing to environmental and socio-economic problems, the food system is also more dependent on, and vulnerable to, the natural environment compared to any other system (Mengual et al., 2024). To address unsustainable production methods and encourage sustainable consumption, a niche innovation has emerged to measure and reduce the socio-environmental impact of food and beverage (F&B) products' whole supply chain (Notarnicola et al., 2017b; Taufique et al., 2022; Ellen MacArthur Foundation, 2021), as well as to increase transparency with consumers regarding the impact of their dietary choices (De Bauw et al., 2021; Eco Food Choice, 2025; Potter et al., 2022; Galli et al., 2020; Tiboni-Oschilewski et al., 2024). Yet there is currently no harmonised F&B impact assessment and communication method across the EU (Cicek, Boone & Broekema, 2024; Ponsioen & van der Werf, 2017), leading to a confusing landscape of providers and hindering the sector's potential in contributing to a sustainable transformation of the food system (Cicek, Boone & Broekema, 2024; Deconinck, Jansen & Barisone, 2023; Iraldo, Griesshammer & Kahlenborn, 2020). While harmonisation has been considered crucial to solving this issue (Deconinck, Jansen & Barisone, 2023), understanding the scope for this from an economic geography perspective remains a key gap in academic analysis. Utilising the Multi-Level(Scalar)-Perspective, this thesis identifies and analyses the existing barriers and opportunities for European F&B impact assessment and communication sectoral harmonisation, and provides recommendations for how to make this goal a reality.

Key words:

Food systems, sociotechnical transitions, sociotechnical transformations, F&B impact assessment and communication, Multi-Level-Perspective, Multi-Scalar-Perspective, Europe, barriers, coalitions, Economic Geography, expert interviews.

Kurzfassung

Unser Ernährungssystem steht aktuell vor einer doppelten Herausforderung. Zum einen trägt es erheblich zu ökologischen und sozioökonomischen Problemen bei, zum anderen ist es mehr als andere Systeme abhängig von der Natur und anfällig für deren Einflüsse (Mengual et al., 2024). Um schädlichen Produktionsmethoden entgegenzutreten und einen nachhaltigen Konsum zu fördern, ist eine innovative Nische entstanden, mit deren Hilfe die sozio-ökologischen Auswirkungen der gesamten Lieferkette von Lebensmitteln gemessen und reduziert werden können (Notarnicola et al., 2017b; Taufique et al., 2022; Ellen MacArthur Foundation, 2021). Weiters können dadurch die Folgen von Ernährungsentscheidungen für Konsumentinnen und Konsumenten transparenter werden (De Bauw et al., 2021; Eco Food Choice, 2025; Potter et al., 2022; Galli et al., 2020; Tiboni-Oschilewski et al., 2024). Jedoch gibt es derzeit keine harmonisierte Methode zur Bewertung und deren Kommunikation in der Lebensmittelbranche (Cicek, Boone & Broekema, 2024; Ponsioen & van der Werf, 2017), was zu einem unübersichtlichen Angebot führt und den Nischensektor dabei behindert, zur Entwicklung eines nachhaltigen Lebensmittelsystems beizutragen (Cicek, Boone & Broekema, 2024; Deconinck, Jansen & Barisone, 2023; Iraldo, Griesshammer & Kahlenborn, 2020). Die Harmonisierung innerhalb des europäischen Nischensektors, der sich mit der Bewertung der sozio-ökologischen Auswirkungen von Lebensmitteln und der Kommunikation dieser Bewertung beschäftigt, wird als entscheidend für die Lösung dieses Problems angesehen (Deconinck, Jansen & Barisone, 2023). Allerdings gibt es in der wissenschaftlichen Analyse wesentliche Lücken, wie dieses Ziel erreichbar ist und was wirtschaftsgeographische Sichtweisen dazu beitragen können. Unter Anwendung der Multi-Level(Skalar)-Perspektive beschreibt und analysiert diese Arbeit die bestehenden Hindernisse und Chancen für die Harmonisierung, um Empfehlungen für die Umsetzung dieses Ziel zu bieten.

Schlagwörter:

Lebensmittelsysteme, soziotechnische Transitionen, soziotechnische Transformationen, Bewertung der sozio-ökologischen Auswirkungen von Lebensmitteln, Kommunikation, Multi-Level-Perspektive, Multi-Skalar-Perspektive, Europa, Hindernisse, Koalitionen, Wirtschaftsgeographie, Experteninterviews.

1. Introduction

Food production and security is integral to human survival and global sustainable development (Notarnicola, et al., 2017a; Wang et al., 2023). Yet, the current food system faces a dual challenge. While significantly contributing to environmental and socio-economic problems, the food system is also more dependent on, and vulnerable to, the natural environment compared to any other system (Mengual et al., 2024). Consequently, climate change is directly impacting food security and quality (Mengual et al., 2024; Sovacool et al., 2021; Notarnicola, et al., 2017b; Tiboni-Oschilewski et al., 2024). To address these challenges, there is a need to transition towards a sustainable transformation of the food system within the EU and beyond (Mengual et al., 2024; European Environment Agency, 2023a). The emergence and diffusion of new production methods and consumption behaviours are necessary for the success of this transformation (Cicek, Boone & Broekema, 2024 European Environment Agency, 2023a).

One innovation emerging in the niche, which is receiving increased attention and has the potential to transition the food system towards sustainable production and consumption, is food and beverage (F&B) impact assessment and communication (Cicek, Boone & Broekema, 2024; Deconinck, Jansen & Barisone, 2023). While traditional certifications and eco-labels have existed for some time within Europe, these usually only consider one aspect of sustainability or one production practice (Potter et al., 2022; Tiboni-Oschilewski et al., 2024). Yet, to curb unsustainable production methods and encourage sustainable consumption behaviours, it is essential to measure and reduce the impact of F&B products' whole supply chain (Notarnicola et al., 2017b; Taufique et al., 2022; Ellen MacArthur Foundation, 2021), as well as be transparent with consumers regarding the impact of their dietary choices (De Bauw et al., 2021; Eco Food Choice, 2025; Potter et al., 2022; Galli et al., 2020; Tiboni-Oschilewski et al., 2024). As such, recent years have seen a surge in public and private schemes which provide an answer to this: comprehensive Life Cycle Analysis (LCA)-based environmental and social impact assessments and subsequent communication (usually via labelling) of F&B products (Deconinck, Jansen & Barisone, 2023; Cicek, Boone & Broekema, 2024). This thesis refers to this group of technology suppliers collectively as the 'F&B impact assessment and communication sector', arguing they present a potential solution to the challenges currently faced by the food system status quo.

At the time of writing, there is no universally accepted or harmonised F&B impact assessment and communication method at the global or European-level (Cicek, Boone & Broekema, 2024; Ponsioen & van der Werf, 2017). This, along with the fast rise in the number of F&B impact assessment and communication suppliers, means that a confusing and competitive landscape of providers, approaches, proposals and methodologies has emerged (Deconinck, Jansen & Barisone, 2023). Such a fragmented landscape can put the reliability and comparability of F&B impact assessments from varying solutions into question, as differing methodologies can lead to differing results (Cicek, Boone & Broekema, 2024; Deconinck, Jansen & Barisone, 2023; Sovacool et al., 2021). This in turn is creating market and consumer confusion, thus hindering the potential of F&B impact assessment and communication solutions in successfully contributing to the sustainable transformation of the food system (Cicek, Boone & Broekema, 2024; Deconinck, Jansen & Barisone, 2023; Iraldo, Griesshammer & Kahlenborn; 2020).

In order to address this issue, it is widely recognised that there is an urgent need to harmonise the F&B impact assessment and communication sector (Deconinck, Jansen & Barisone, 2023; Potter et al., 2022; Cicek, Boone & Broekema, 2024; Ellen MacArthur Foundation, 2022, OECD, 2025; Iraldo, Griesshammer & Kahlenborn; 2020; Boone et al., 2023). Within the research presented here, harmonisation is understood as being the use of a common data set, methodology and label design for F&B impact assessment and communication. Yet, the existing literature shows that understanding the scope for such harmonisation remains a gap in academic analysis (Deconinck, Jansen & Barisone, 2023). This thesis thus responds to Deconinck, Jansen & Barisone's (2023) call for further investigation into the process of F&B impact assessment and communication harmonisation within the EU, by analysing the existing barriers to harmonisation and the emerging moves to counter them. Regarding the latter, the focus lies on the significant number of non-profit organisations (NPOs) and non-governmental organisations (NGOs) which have recently been established across Europe to create cross-sectoral and stakeholder collaboration within the F&B impact assessment and communication sector. Examples include the 'European Sustainable Food Coalition (ESFC)' (ESFC, 2025a), the 'International Alliance for Food Impact Data' (EIT Food, 2024), the 'Life Eco Food Choice Project' (Ademe, 2025) and the UK-based 'British Retail Consortium (BRC) Mondra Coalition' (Mondra, 2025). The role such pre-competitive coalitions can play in overcoming the existing barriers to sectoral harmonisation has not yet been addressed in academic literature and is considered for the first time in this research.

In response to the identified research gap, the following research question was developed to guide this thesis: ‘What are the Barriers and Opportunities for the Harmonisation of the European Food and Beverage Impact Assessments and Communication Sector? A Multi-Scalar-Perspective on Sociotechnical Transitions in the European Union’s Food System’. In order to structure the investigation process the following two sub-questions were also devised: (1) Through the lens of the MSP framework, what are the current EU-wide niche-, regime-, landscape-level and multi-scalar barriers to F&B impact assessment and communication harmonisation within Europe? and (2) To what extent can emerging coalitions be considered opportunities for addressing these barriers and how can they contribute to the harmonisation process?

The research and results were structured around a modified version of the process theory and conceptual model used widely within the sustainability transformations literature - the Multi-Level-Perspective (MLP) (Geels, 2019). Applying an economic geography (EG) lens and based on Coenen, Benneworth & Truffer’s paper (2012: 972), the MLP was adjusted to the ‘Multi-Scalar-Perspective’ (MSP), adding an understanding of scale and place-specific impacts of sustainable transitions to the MLP framework. Through this an understanding of the niche-, regime-, landscape-level *and* multi-scalar barriers (as well as their interactions) currently hindering sectoral harmonisation in the EU could be achieved, thus highlighting potential incumbent actors and lock-in mechanisms at play (Geels, 2019; Coenen, Benneworth & Truffer, 2012). In identifying these, it was possible to consider the effectiveness of emerging opportunities for harmonisation and provide recommendations for the F&B impact assessment and communication sector’s successful disruption of the European food regime through harmonisation. To undertake the research and produce an in-depth understanding of the topic, an intensive research design with a triangulation of qualitative methods was applied (Wilson, 2014; Clifford et al., 2012). Namely a narrative literature review, content analysis and six semi-structured expert interviews. This ensured stronger and more comprehensive data through increased scope, as well as, more nuanced and reliable results by allowing comparison between different data sources (Wilson, 2014; Mertens & Hesse-Biber, 2012; White & Marsh, 2006).

The next chapter explains the background to the research, further detailing the need for a sustainable food system transformation and the potential contribution of a harmonised F&B

impact assessment and communication sector in this transition. Moreover, the existing literature on F&B impact assessment and communication will be explored and the research contribution of this thesis is determined. In Chapter 3, the theoretical approach and conceptual framework is described and justified, while Chapter 4 discusses the methodology, the research methods used and the research limitations. The final results are presented, analysed and discussed in Chapter 5 followed by the key research implications, including a number of recommendations for the sector and its stakeholders. Lastly, the contents of the thesis, as well as ideas for possible future research avenues are summarised and highlighted in the concluding Chapter 6.

2. The Research Background

The need for a food system transition towards sustainability has been extensively researched within the sociotechnical transformation literature. In order to identify prevalent themes and find a research focus through identifying gaps in the knowledge base, a deep-dive into the vast pool of available literature on this topic was conducted (see Chapter 4). This chapter will synthesise the existing literature in order to contextualise the thesis, providing an overview of the current status quo of the food system, its impacts, challenges and the need for transformation. Furthermore, the literature will be drawn upon to explain why F&B impact assessment and communication was chosen as the central theme for this thesis by exploring its potentiality for food system transformation. Finally, the need for harmonisation will be identified as a key challenge for this emerging sector, along with the limited research into the barriers hindering this process, justifying the research focus.

2.1 Why Food System Transformation?

2.1.1 The Environmental and Socio-economic Impacts of the Food System

The food system is described as one of the most important yet intricate sociotechnical systems on earth (Sovacool et al., 2021; FAO; 2018). While meeting one of the most important human needs, the contemporary food system is also a leading driver of environmental issues, such as climate change, land and water consumption, and biodiversity loss (Notarnicola, et al., 2017a). Between 2010 and 2020 in the European Union (EU) alone, the environmental impacts of food consumption increased 20%, reaching 45% of total EU consumption (Mengual et al., 2024). Moreover, human rights and health concerns are frequently associated with the F&B system status quo (*ibid.*). The green revolution and intensification of agricultural activities have been key forces in reducing global food insecurity and hunger since the mid-1950s (Wang et al., 2023; Popp, 2022). Yet, this has led to the creation of a food system which is destroying the very social and natural environment which it relies on (Sovacool et al., 2021; Popp, 2022; Ellen MacArthur Foundation, 2021). As such, a new issue in global food security discourse is becoming increasingly prominent - the need for sustainability (Mengual et al., 2024).

Environmental impacts: greenhouse gas emissions

The F&B industry is associated with around one third of global greenhouse gas emissions (Sovacool et al., 2021; Ellen MacArthur Foundation, 2021; European Commission, 2025a).

The main driver of this is the agricultural life cycle stage, accounting for 80-86% of total industry emissions (Notarnicola et al., 2017b; Bezares, Fretes, & Martinez, 2021). However, discrepancies in the generated emissions in the production of food is not only sectoral, but can also vary significantly between individual products (Clark, 2022). Some foods, notably meat, dairy and eggs are known to have a much higher impact than, for instance, plant-based foods (Clark, 2022; Mengual et al., 2024; Notarnicola et al., 2017b; Potter et al., 2022; Galli et al., 2018). Meat production alone is responsible for 18% of global greenhouse emissions, due to high levels of methane being produced by deforestation, feed production and processing, animal digestion and manure decomposition (Stoll-Kleemann & O’Riordan, 2015). Yet, trends suggest that as economies continue to become wealthier globally, so too is overall food consumption per capita and the shift towards consuming higher-impact foods (Sovacool et al., 2021; Clark, 2022). As such, it is estimated that a global population of over 9 billion by 2050 will not only increase food demand by 60% (Sovacool et al., 2021), but also consume approximately 150 million tonnes more meat compared to 2020 levels (Stoll-Kleemann & O’Riordan, 2015; FAO, 2012). Without intervention, this is estimated to add 1°C to anthropogenic global warming by 2100, surpassing internationally agreed emission targets (Mengual et al., 2024).

Environmental impacts: land and water consumption

The intensification of farming and the growing demand for food in recent decades means that 40% of earth’s habitable land is currently used for the food system (Popp, 2022; Clark, 2022; WWF, 2025). The scale of this land use change, as well as unsustainable land management practices in agriculture, are cited as root causes of land degradation and biodiversity loss (Mengual et al., 2024; Vermeulen, 2022; Ellen MacArthur Foundation, 2021). A substantial cause for this is the global rise in meat consumption, with 1kg of animal protein requiring 6kg of plant protein, meat production requires a significant amount of land for fodder production (Stoll-Kleemann & O’Riordan, 2015). At the EU level, two-thirds of agricultural crop land is used to produce fodder; globally, 80% of soy harvest and 44% of grain harvest is used for industrialised meat production (*ibid.*). This in turn means that 80% of deforestation and 70% of biodiversity loss globally can be linked to the food system (WWF, 2025a). While biodiversity loss is in part caused by deforestation, the introduction of invasive species in the form of crops can lead to further insect decline and the extinction of native species (Popp, 2022; Myers, 2022).

The intensive use of chemical fertilisers and freshwater supplies have been highlighted as additional negative environmental impacts of the current food system. Firstly, the ten-times increase in nitrogen fertiliser use in agriculture since the 1960s, is having a significant impact on toxicity levels across ecological and aquatic systems (Popp, 2022; Notarnicola et al., 2017b). Secondly, intensified agricultural practices have also led to a doubling of global irrigation in the same time period, meaning that food systems now rely on 70% of earth's freshwater supplies (Popp, 2022; Clark, 2022; UN, 2025). In aquatic systems themselves, overfishing and macro-plastic pollution remain a critical concern (Popp, 2022; Mengual et al., 2024).

Socio-economic impacts: employment and human rights

The food system does not only have the greatest direct impact on planetary health and resources compared to any other, it is also one of the largest employers and source of economic activity globally (Wasserman, 2009; Sovacool et al., 2021; Mengual et al., 2024; UN, 2025). This is especially true in low-income economies, where the agriculture sector alone employs more than two-thirds of workers (Mengual et al., 2024; UN, 2025). In the EU, the numbers reach over 17 million across 9 million farms (European Commission, 2025b). And yet, current systems do not financially support all workers along the food supply chain equally - most notably, primary producers are disproportionately treated unfairly and the violation of human rights is a prevailing issue (European Commission, 2025c). While over 70% of child labour is found in the agricultural sector (UN, 2019), poor working conditions, migrant and seasonal workers' exploitation, and low pay is common within the sector (Mengual et al., 2024). Soybean production expansion onto rain-forest land, particularly in South America, to supply global growing meat demand has also led to human rights concerns (Stoll-Kleemann & O'Riordan, 2015). The displacement and loss of income of small farmers and indigenous peoples means that in Brazil alone, the survival of more than 200 tribes is threatened (Stoll-Kleemann & O'Riordan, 2015; WWF, 2025b).

Social impacts: health and wellbeing

With regard to human wellbeing, the food system is linked to many negative health issues due to both under- and over-nutrition (UN, 2025; Ruggeri Laderchi et al., 2024). Despite the intensification of agriculture, recent research on overt and hidden hunger revealed that alarming gaps in global food nutrient intake endure (Wang et al., 2023). Conversely, the continued manufacturing of highly processed foods which encourage overconsumption also

lead to negative public health issues (Sovacool et al., 2021; Rolls, Cunningham & Diktas, 2020). In the EU alone, unhealthy diets are linked with 800,000 deaths annually (Madre Brava, 2024).

Food production methods at the very start of the supply chain are also having adverse effects on human health. For example, high levels of pesticide use leads to chemical run-off and the pollution of water systems in human usage (Sovacool et al., 2021; Mengual et al., 2024). Low animal welfare standards, including extreme antimicrobial use, on the other hand can lead to disease and the potential for antimicrobial resistance which will limit human capacity to combat such diseases (Mengual et al., 2024). And yet, many consumers lack awareness of the impact of their purchases on both planetary and human health (Berners-Lee, 2022; Stoll-Kleemann & O’Riordan, 2015). The development of accounting, outsourcing and greenwashing narratives by product producers, suppliers and retailers, means that consumers are often led to believe that their choices have a positive impact on themselves and the planet, when in fact the opposite might be true (Thunberg, 2022).

In sum, the global food system has wide-reaching negative environmental and socio-economic impacts along the whole food supply chain. The food system status quo is thus destroying the very social and natural environment which it relies on (Sovacool et al., 2021; Popp, 2022; Ellen MacArthur Foundation, 2021). How planetary and human health as well as food security are being affected by this is explored in the next section.

2.1.2 The Impact of Climate Change on the Food System

Food production and security is integral to human survival and global sustainable development (Notarnicola, et al., 2017a; Wang et al., 2023). Yet, the current food system faces a dual challenge. While significantly contributing to the aforementioned environmental and socio-economic problems, the food industry is also more dependent on and vulnerable to the natural environment compared to any other, meaning climate change is directly affecting food security and ingredient-level nutritional values (Mengual et al., 2024; Sovacool et al., 2021; Notarnicola, et al., 2017b; Tiboni-Oschilewski et al., 2024). As such, in its current state, the food system is reported to be destroying more value than it creates (Ruggeri Laderchi et al., 2024).

Climate change limits food system resilience, by reducing ability and capacity (especially in low-income countries) to respond and adapt to ever worsening crises and shocks, such as extreme weather events or global pandemics (Mengual et al., 2024; European Commission, 2025b). For example, extreme weather events relating both to temperature and precipitation, are reducing crop yields (Mirón, Linares & Díaz, 2022). By 2050, global crop production is expected to have reduced by 23% as a result of global warming (Haile et al., 2017). This will also continue to have adverse impacts on food prices, in turn impacting financially vulnerable consumers most (Haile et al., 2017; Menugal et al., 2024). Furthermore, the nutritional value and quality of food products themselves will be increasingly negatively impacted by changes in the global climate (Myers, 2022). With increased levels of carbon in the atmosphere, the process of nutrient adoption during crop growth is disturbed - this in turn exacerbates issues of nutrient deficiencies globally (Mirón, Linares & Díaz, 2022; Myers, 2022). Additionally, average temperature increases could mean that food-borne illnesses are likely to be more successful, placing further risks on human health (Mirón, Linares & Díaz, 2022). With food demand set to increase by 60% by 2050 (Sovacool et al., 2021) and the negative impacts of the food system expected to grow if current trends are maintained (Mengual et al., 2024), so too will the impact on the food system itself, putting both planetary and human health at risk.

Concern regarding the dual challenge which the current food system poses, means that there is wide-spread consensus among many researchers, political and industry leaders, investors, civil society organisations, and consumers that the status quo is unsustainable and the need for a sustainable transformation is critical to ensure future food security and planetary health (Deconinck, Jansen & Barisone, 2023; Ellen MacArthur Foundation, 2021; Potter et al., 2022; Haile et al., 2017; European Environment Agency, 2023a). In 2015 global leaders assigned developing a sustainable food system as a key building block of the United Nations' Sustainable Development Goals (FAO, 2018). Yet, while this is a global issue, achieving systemic change will require interconnected actions at the local, national and regional levels (*ibid.*). As such, at the EU level, the need to transition the F&B industry towards sustainability in order to address current challenges is also acknowledged (Mengual et al., 2024; European Environment Agency, 2023a). The next section considers the difficulty in defining sustainability in the context of food systems, and the necessary changes needed to achieve this goal at the EU level.

2.2 Sustainable Food Systems

Arayess & de Boer (2022) argue that in the interest of developing concrete regulations and guidance documents at the EU level, it is important to clearly define sustainability. Yet, this can be a difficult task, as sustainability is a contested concept with different meanings and realities for different people within different contexts (Galli et al., 2018). The United Nations (UN, 2025; FAO, 2018) outlines three indicators which should be considered simultaneously when aiming for a sustainable food system to ensure there are no unintended impacts across any dimension. These are economic, social and environmental sustainability, which should safeguard food security and nutrition for humanity today as well as for future generations (FAO, 2018). Galli et al. (2018) expand on this established understanding of sustainability, proposing six criteria for assessing the sustainability of food systems specifically, namely: health, ecological, economic, social, ethical and resilience. The inclusion of health as an important aspect of the sustainability of food, is also seen in the European Commission's (EC) goal to 'transition towards more sustainable food systems, [which are] able to preserve resources while guaranteeing access to healthy diets for everyone' (European Commission, 2023). Because sustainability can be understood differently in different contexts, a wider interpretation of sustainability in relation to the food system is necessary to accommodate food's distinctive role in human life and relationship with nature (Galli et al., 2018). When discussing a sustainable food system, this thesis therefore refers to this expanded definition.

Sustainable food system researchers are in consensus that both diets and food production need to transition towards sustainability in order to achieve a system transformation (Wasserman, 2009; Galli et al., 2018; Vermeulen, 2022; European Environment Agency, 2023a). As discussed, consumption patterns drive demand for unsustainable products such as meat (Vermeulen, 2022; Potter et al., 2022; Stoll-Kleemann & O'Riordan, 2015). Therefore, changing consumer behaviour has been identified as a powerful lever in increasing the sustainability of the food system (Notarnicola et al., 2017). At the same time, redesigning policy to encourage more sustainable practices in food production and distribution is important (Galli et al., 2018), as the environmental footprint of the same food product can differ fifty-fold or more depending on the agricultural practices used (Vermeulen, 2022). From an economic sustainability perspective, research suggests that a sustainable transformation of food diets and production would also provide economic benefits of up to

five to ten trillion USD a year for the industry linked to better human and environmental health (Ruggeri Laderchi et al., 2024).

Overall, sustainable food systems have to be considered within the context of the food system itself and its own particularities. Though there may not be consensus on the exact definition, there is much agreement on what is needed in order to achieve the overall goal - the emergence and diffusion of new, sustainable production methods and consumption behaviours (Cicek, Boone & Broekema, 2024; European Environment Agency, 2023a). There have been many innovations in recent years within the food industry to try and achieve this goal (FoodUnfolded, 2025). One innovation which is emerging in the niche and receiving increasing traction is F&B impact assessment and communication (Deconinck, Jansen & Barisone, 2023). The next section will examine this sector and its significance in transitioning the food system towards a sustainable transformation.

2.3 The Transformative Potential of F&B Impact Assessment and Communication

To understand the potential benefits of F&B impact assessment and communication, it is necessary to first define the concept and understand its development. Deconinck, Jansen & Barisone (2023) state that there are four levels of assessment and reporting within the F&B industry, namely product, project, firm, and country. To limit the scope of research, the focus of this thesis will remain solely on the product-level. While traditional certifications and eco-labels have existed for sometime within Europe, these usually consider only one aspect of sustainability or production practice - for example, fair trade, organic farming, rainforest alliance or fair animal welfare (Cicek, Boone & Broekema, 2024; Potter et al., 2022; Tiboni-Oschilewski et al., 2024). Yet, more recently, there has been a trend towards the use of LCA methodologies to first assess and then communicate (usually via labelling) the environmental and socio-economic impact of F&B products (Cicek, Boone & Broekema, 2024).

LCAs account for the whole supply chain of a product and are considered key in the transition towards sustainable production and consumption patterns (Notarnicola et al., 2017a). While LCA methodologies originally only considered environmental impact (for example, carbon emissions), in the interest of food system sustainability, methodologies have also been expanded to include social and economic factors (Chitaka & Goga, 2023). Though

LCAs have been utilised in the F&B industry since the 1970s (*ibid.*) and have been a popular tool within academia (e.g. Notarnicola et al., 2017b), currently there is a surge in public and private schemes which offer comprehensive LCA-based impact assessments for F&B products (Deconinck, Jansen & Barisone, 2023; Cicek, Boone & Broekema, 2024). This is in response to the agreed need for a sustainable transition in food production and consumption (see Section 2.1.2), and broader trends surrounding growing demand for transparency from customers and investors (*ibid.*). The shift from ‘practice-based’ to ‘results-based’ approaches in F&B assessments has also in part been driven by the development of standards, new technologies and platforms for F&B data collection and sharing (Deconinck, Jansen & Barisone, 2023; Boone et al., 2023). Overall, the following discussion of F&B impact assessment and communication aligns with recent developments within the industry. This will exclusively entail the fast-growing sector of firms and organisations which are using LCA-based methodologies to quantify the impact of F&B products on a large scale for F&B producers, brands and retailers to use in sustainability reporting and consumer communication.

F&B impact assessment and communication is a key response to contemporary need for both more sustainable production and consumption patterns (Cicek, Boone & Broekema, 2024). While some research suggests the sector could have a greater impact on sourcing and production choices, the idea of using F&B impact assessments for re-designing food products remains underexplored, and much of the literature focuses primarily on F&B impact communication (Taufique et al., 2022; Ellen MacArthur Foundation, 2021). Notarnicola et al. (2017b) support the former, stating that in order to ensure food security in the future, supply chains will need to be systematically assessed and improved to become more sustainable. Through accurate assessments of their products, F&B producers, suppliers and retailers can map ingredient supply chains and better understand the impact of their products (Galli et al., 2018; Ellen MacArthur Foundation, 2021). Knowing, for example, the carbon footprint of each ingredient or potential hotspots within their supply chain, provides F&B producers, suppliers and retailers with the opportunity to optimise their products to make them more sustainable (Taufique et al., 2022; Sovacool et al., 2021; Deconinck, Jansen & Barisone, 2023; Tiboni-Oschilewski et al., 2024). Such changes could include choosing more sustainable suppliers, altering production processes, redesigning products, or updating product mixes and assortments (Deconinck, Jansen & Barisone, 2023; Taufique et al., 2022; Ellen MacArthur Foundation, 2021; Cicek, Boone & Broekema, 2024). The Ellen MacArthur

Foundation (2021), for example, shows how simply switching to lower impact ingredients or alternatives in a product's composition can significantly improve its overall sustainability rating. Fears around firm reputation and associated brand damage due to unsustainable products could encourage F&B producers, suppliers and retailers to improve their products and assortment accordingly and avoid potential loss of profit (Taufique et al., 2022; Cicek, Boone & Broekema, 2024). With access to sustainability product data, the benchmarking of firms within the F&B industry to hold them accountable to sustainability goals may also become increasingly common (Zeb, Soininen, & Sozer, 2021; Deconinck, Jansen & Barisone, 2023). Assessments, therefore, can be used to compare F&B products within and across categories and ensure that continuous product improvement from a sustainability-perspective is encouraged and recognised (Boone et al., 2023; Eco Food Choice, 2025; Cicek, Boone & Broekema, 2024).

F&B suppliers, brands and retailers might be particularly concerned about reputational loss if considered unsustainable, due to the ever-increasing consumer interest and demand for transparency on what is in our food and how sustainable it is (Wasserman, 2009; Deconinck, Jansen & Barisone, 2023; Sovacool et al., 2021; Cheftel, 2005; Arayess & de Boer, 2022; Potter et al., 2022; Taufique et al., 2022). Though dietary changes are considered crucial to meet sustainability targets (Stoll-Kleemann & O'Riordan, 2015; Zeb, Soininen, & Sozer, 2021; Madre Brava, 2024), consumers are not provided with the information they need in order to make the most sustainable choice and are often guided by estimates or misconceptions when making food choices (Shi et al., 2018; Taufique et al., 2022). Without product-specific knowledge on the sustainability of their purchases, consumers are unable to differentiate between more or less sustainable items, thus indicating a consumer-level need for F&B impact assessment and communication (De Bauw et al., 2021; Eco Food Choice, 2025; Potter et al., 2022; Galli et al., 2020; Tiboni-Oschilewski et al. 2024).

As discussed, 'practice-based' labelling has been commonplace within the F&B industry for a number of decades (Deconinck, Jansen & Barisone, 2023). Labelling within the EU is defined as follows: "any words, particulars, trademarks, brand name, pictorial matter or symbol relating to a foodstuff and placed on any packaging, document, notice, label, ring or collar accompanying or referring to such foodstuff" (Directive 2000/13/EC in Cheftel, 2005: 533). Today, there are more than 200 practice-based environmental labels used within the EU alone and 450 worldwide, with reports suggesting many to be false or deceptive (Arayess &

de Boer, 2022). Thus, a comprehensive assessment and communication of the sustainability of F&B items is favoured in order to avoid greenwashing, limit information gaps and reduce consumer confusion when faced with numerous and perhaps differing labels across products and retailers (Arayess & de Boer, 2022; European Court of Auditors, 2024). Though most F&B impact assessment and communication solutions currently focus primarily on climate impact reporting as this is where most demand lies, some already (or plan to) provide impact categories across various environmental and social factors to respond to holistic understandings of food sustainability (Cicke, Boone & Broekema, 2024).

With better information and more transparency, consumers may be encouraged to select more sustainable products and limit burden shifting from one unsustainable food category to another (Taufique et al., 2022; Notarnicola et al., 2017a). Research has shown that two-thirds of European consumers would embrace an international eco-label label (EIT Food, 2023), while purchasing more sustainable food comes top of the list of consumption shifts citizens are willing to make in their lifestyle choices (KPMG, 2025). With transparent data at hand, consumers could be supported to change their purchasing behaviours through various mechanisms (for example, gamification to reward sustainable changes in shopping habits) and thus transition towards a more sustainable diet (Ruggeri Laderchi et al., 2024). This has the potential to transition the food system towards sustainability, as food production is in part shaped by consumer preferences (Mengual et al., 2024; Iraldo, Griesshammer & Kahlenborn, 2020). Consumer demand for plant-based products, for example, has already led to change within the F&B industry, as vegan product ranges continuously expand in major supermarkets (Sovacool et al., 2021; Webber, 2021).

While consumer demand for F&B impact assessments grows, there is still uncertainty around the extent to which labels will affect every day F&B consumption behaviours, especially while negative externalities are not yet reflected in F&B prices (Tiboni-Oschilewski et al., 2024; Brown et al., 2020; Deconinck, Jansen & Barisone, 2023; Iraldo, Griesshammer & Kahlenborn, 2020, Mengual et al., 2024). In addition to motivation, consumers also require the necessary ability (i.e. ability to interpret a label) and opportunity (i.e. access to sustainable food), in order for F&B impact communication to influence consumer behaviour and disrupt habitual consumption routines (European Environment Agency, 2023a). This is why the *combining* of F&B impact assessment *and* communication will be of critical importance. As argued above, the sector has the potential to transition the food system towards sustainability

without even directly affecting consumer choices. For example, through the modifications which F&B producers, suppliers and retailers themselves can make in their product compositions, supply chains and processes (Taufique et al., 2022). Thus, F&B impact assessment and communication can inform sustainability decision-making at the policy, business and consumer levels alike (European Environment Agency, 2023a; Boone et al., 2023).

Despite the potential that lies in F&B impact assessment and communication solutions, it should be noted that addressing the sustainable implementation of the solution is also of importance. Deconinck, Jansen & Barisone (2023) raise some concerns linked to the global nature of the food system which could mean that the sector, if not sufficiently regulated, could also have negative impacts in two main ways. Firstly, unequally regulated markets in relation to F&B impact assessment and communication could mean that high-impact products are simply redirected to less stringent markets (*ibid.*). Secondly, decisions made by consumers, firms or governments to make their purchases more sustainable could disproportionately affect low- and middle-income countries who are more likely to have high impact production methods (*ibid.*). Thus, in order to achieve its full potential for food system transformation as outlined above, and do so sustainably, the F&B impact assessment and communication sector must also ensure that unsustainable environmental or socio-economic repercussions are limited.

Overall, if managed responsibly, the F&B impact assessment and communication sector has the potential to be a catalyst for the sustainable production and consumption choices needed for F&B system transformation (Deconinck, Jansen & Barisone, 2023; Cicek, Boone & Broekema, 2024). While it will not be the only path to shift the food system towards sustainability, combined with other mitigation measures and policy instruments the F&B impact assessment and communication sector could quickly and effectively transition the system towards sustainability (Taufique et al., 2022; Mengual et al., 2024; Tiboni-Oschilewski et al., 2024). The World Wildlife Fund (WWF) (Meyer et al., 2024), for example, advocates for the significant socio-environmental benefits of adopting a combination of nature-positive production practices, more sustainable diets and measures to reduce food loss and waste. Through this, according to their research, greenhouse gas emissions could be reduced by at least 30%, biodiversity loss by 46%, agricultural land use by 41% and premature deaths by 20% (*ibid.*).

Despite its value, the trend of F&B impact assessment and communication has remained largely under-researched (Deconinck, Jansen & Barisone, 2023). As such, this thesis aims to expand on the literature in this field in order to provide new insights and fill knowledge gaps on this sector and its potential. The next section will consider the development of F&B impact assessment and communication within the EU - the geographical focus of this thesis. The need for investigation into harmonisation processes within the sector will be spotlighted as a gap within the existing literature, thus justifying the research focus of this thesis.

2.4 F&B Impact Assessment and Communication in the European Union

The discourse around F&B impact assessment and communication has taken various forms over the last 25 years within the EU, making the topic itself not necessarily a new one (Arayess & de Boer, 2022). The debate was first initiated due to the development of the solution and subsequent EU legislative framework (Regulation 2002/178/EC) that consumers have the right to the information and facts which can help them to make an ‘informed choice’ around their purchases, meaning there should be ‘no misleading the customer’ (Cheftel, 2005: 531-532). Focus was first laid on nutrition and health, but in 2005 the first guidance on ‘green claims’, in other words sustainability communication, was published at the EC level (Arayess & de Boer, 2022). However, most policies relating to the EU food system are still associated with nutrition and health impact assessment and communication for F&B products, which has proven to be successful with wide implementation (Mengual et al., 2024; Potter et al., 2022). While EU level policies related to wider sustainability goals for the F&B industry still remain more scarce (Mengual et al., 2024), 2013 was a watershed year in investing efforts to address environmental customer communication at the EU level (Arayess & de Boer, 2022). For example, the EC’s Single Market for Green Products initiative, with the introduction of the Product Environmental Footprint (PEF) Guide based on LCA-methodology, was a milestone in the development of standards for environmental reporting within the EU (Ponsioen & van der Werf, 2017; Sala et al., 2021; Deconinck, Jansen & Barisone, 2023). At the same time, the European Food Sustainable Consumption and Production Roundtable developed the ENVIFOOD Protocol as an F&B-specific guidance document in implementing PEF for F&B pilot assessments (Notarnicola et al., 2017a).

In 2019, the EC supported ‘reliable, comparable and verifiable information’ as an important part in empowering consumers to make more sustainable decisions (Arayess & de Boer,

2022: 644). As such, over the last five years, the European policy landscape has been moving towards supporting food system transformation through F&B impact assessment and communication via initiatives such as the Farm to Fork Strategy, Biodiversity Strategy, Corporate Sustainability Reporting Directive (CSRD) (all part of the EU Green Deal) and Green Claims Directive (GCD) (Ellen MacArthur Foundation, 2021; Arayess & de Boer, 2022). The GCD aimed to address the high numbers of environmental labels and subsequent greenwashing in the EU by ensuring that labelling on products is substantiated by evidence and ‘checked by an independent and accredited verifier’ (Directorate-General for Environment, 2025). The CSRD aimed to ensure that companies have to disclose information regarding the impact of their social and environmental activities and products (Directorate-General for Financial Stability, Financial Services and Capital Markets Union, 2025). In anticipation of upcoming regulations stipulating mandatory product-level reporting, there is now increased interest from European F&B industry leaders to start setting targets, commitments and report on their supply chain impact (Deconinck, Jansen & Barisone, 2023; Cicek, Boone & Broekema, 2024; Ellen MacArthur Foundation, 2021; Bezares, Fretes & Martinez, 2021).

Increased need, demand and political pressure for F&B impact assessment and communication solutions within the EU, has led to a proliferation of providers setting out to supply the F&B industry with these services (Deconinck, Jansen & Barisone, 2023). Cicek, Boone & Broekema’s (2024) research found a total of 25 LCA-based schemes operating in the European market alone, subsequently selecting 16 to analyse in more detail as they were identified as having the most potential according to the authors’ criterion (see Figure 1). The authors distinguish between private (for profit) schemes, national (public) schemes, and non-profit schemes and provide an in-depth analysis of each solutions' data sources, methodology, impact categories, scoring system, software and tools, and label design (*ibid.*). The stark increase in suppliers, together with their speed of development and varying approaches in all of these factors, is, however, proving detrimental to the very goal which many F&B impact assessment and communication providers have set out to achieve (Deconinck, Jansen & Barisone, 2023; Cicek, Boone & Broekema, 2024).

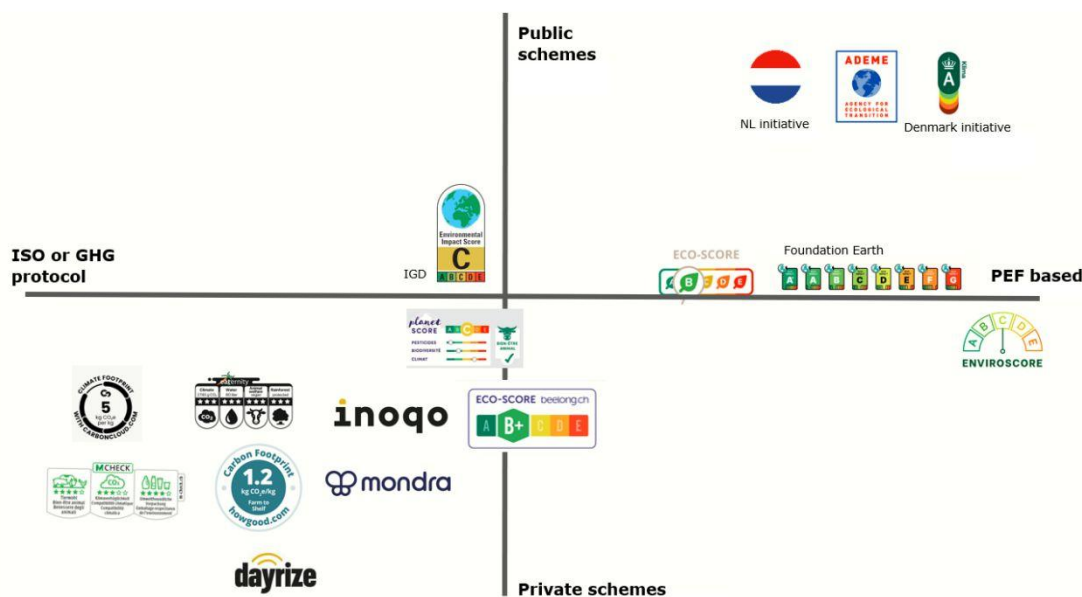


Figure 1: Positioning of each scheme in terms of governance/ownership and use of LCA methodology (Cicek, Boone & Broekema, 2024: 28).

At the time of writing, there is no universally accepted or harmonised F&B impact assessment and communication method at the global or European level (Cicek, Boone & Broekema, 2024; Ponsioen & van der Werf, 2017). This, along with the fast rise in the number of providers, means that a confusing and competitive landscape of organisations, approaches, proposals and methodologies has emerged (Deconinck, Jansen & Barisone, 2023). Such a fragmented landscape can put the reliability and comparability of the product-level assessments themselves into question, especially with regard to methodology as different methods can create different results (Cicek, Boone & Broekema, 2024; Deconinck, Jansen & Barisone, 2023; Sovacool et al., 2021). This in turn curbs the potential of F&B impact assessment and communication solutions in successfully contributing to a sustainable transition of the food system, due to market and consumer confusion (Cicek, Boone & Broekema, 2024; Deconinck, Jansen & Barisone, 2023; Iraldo, Griesshammer & Kahlenborn, 2020).

In order to address this issue, it is widely recognised within the literature that there is an urgent need to harmonise F&B impact assessment and communication approaches (Deconinck, Jansen & Barisone, 2023; Potter et al., 2022; Cicek, Boone & Broekema, 2024; Ellen MacArthur Foundation, 2022, OECD, 2025; Iraldo, Griesshammer & Kahlenborn, 2020; Boone et al., 2023). The topics discussed can be categorised into the harmonisation of

data points, calculation methods, and label design (*ibid.*). On the one hand, data points and methodological harmonisation would allow food companies, supply chain partners, farmers and other industry stakeholders to use F&B impact data and assessments to make informed decisions regarding their products (for example, for optimisation processes) as credibility and comparability between F&B impact assessments could be ensured (Eco Food Choice, 2025; Taufique et al., 2022; Sovacool et al., 2021; Deconinck, Jansen & Barisone, 2023; Cicek, Boone & Broekema, 2024). When discussing data harmonisation in the F&B industry in general Zeb, Soininen & Sozer (2021: 363) argue that ‘the ultimate goal of data harmonisation is to enable the exchange, integration and interoperability of data among the individual information systems for making better decisions’. A harmonised F&B impact assessment approach would be similar in this respect. A consistent labelling format (or alternative method of communication) on the other hand, would increase consumer understanding and trust, by limiting opportunity for greenwashing and thus empowering consumers to make more informed sustainability choices when shopping (Kabaja et al., 2023; Arayess & de Boer, 2022; Potter et al., 2022; Cicek, Boone & Broekema, 2024; Eco Food Choice, 2025; Tiboni-Oschilewski et al., 2024). Though no shared definition of harmonisation was found in the F&B impact assessment and communication literature, in the interest of research specificity a working definition of harmonisation is suggested here. Combining all of the above, this thesis refers to F&B impact assessment and communication harmonisation in the EU as being the use of a common data set, methodology and label design. Through this the full potential of the F&B impact assessment and communication, as described in the previous section, could be achieved.

The barriers which are currently limiting F&B impact assessment and communication harmonisation in Europe are briefly examined by a handful authors such as Cicek, Boone & Broekema (2024) and Deconinck, Jansen & Barisone (2023) (see Section 2.6). Yet, Deconinck, Jansen & Barisone (2023) conclude that there is a need to better understand the opportunity for harmonisation within the F&B impact assessment and communication sector. As harmonisation is consistently cited as a solution to realising the sector’s potential, this thesis intends to respond to Deconinck, Jansen & Barisone’s (2023) call for further research into the process of F&B impact assessment and communication harmonisation within the EU, by analysing the existing barriers to harmonisation and the emerging moves to counter them.

2.5 Coalitions for Harmonisation

Sociotechnical transformations (see Chapter 3) require the involvement of a wide set of actors cooperating to drive transitions (Geels, 2020; Schot & Steinmueller, 2018). Central to such policy changes are coalitions (Swinnen & Resnick, 2023). Coalitions between groups emerge when they mutually agree to cooperate and collaborate on achieving a common goal (McCammon & Moon, 2015, in Shawki & Schnyder, 2023). Swinnen & Resnick (2023) show how coalitions have historically been pivotal in food system transformation as well. This is substantiated by case study analysis contributed by Shawki & Schnyder (2023) and Caleman, Monteiro & Hendrikse (2017). In this context, contemporary debate on F&B impact assessment and communication harmonisation suggests that pre-competitive collaboration among key stakeholders is also crucial in this sector's development and success (Bezares, Fretes & Martinez, 2021; OECD, 2025; Deconinck, Jansen & Barisone, 2023; Cicek, Boone, Broekema, 2024). Linked to this, Galli et al. (2018) argue that collaborating with civil society organisations in future EU F&B sustainable transition policymaking, would ensure that ethical dilemmas are accounted for as they can better represent societal needs. For example, concerns around trade flow reshuffling and negative consequences for food producers in low- and middle-income countries during F&B optimisation processes (Deconinck, Jansen & Barisone, 2023), could also be addressed and regulated in this way. Moreover, coalitions can facilitate the balancing of both private and public interests, which is important in safeguarding the credibility and effectiveness of schemes (Taufique et al., 2022).

In response to this, a number of NPOs and NGOs have recently emerged across Europe to create cross-sectoral and stakeholder collaboration within the F&B impact assessment and communication sector. Examples include the 'European Sustainable Food Coalition' (ESFC, 2025a), the 'International Alliance for Food Impact Data' (EIT Food, 2024), the 'Life Eco Food Choice Project' (Ademe, 2025) and the UK-based 'BRC Mondra Coalition' (Mondra, 2025), all of which have not yet been examined as levers for harmonisation within academic literature. In order to answer Deconinck, Jansen & Barisone's (2023) question around harmonisation within the sector, it will be valuable to consider what role such pre-competitive coalitions can play in this process, in particular in responding and overcoming the existing barriers to harmonisation.

2.6 The Existing Literature and Research Contribution

This section explores the existing literature on the barriers and opportunities for F&B impact assessment and communication harmonisation within the EU and highlights how this thesis will meaningfully contribute to this literature. Whilst food system decarbonisation has been cited as a neglected area of study within sustainability literature as a whole (Sovacool et al., 2021), research on LCA-based European F&B impact assessment and communication as a means to decarbonise and achieve sustainable transformation also remains underexplored (Deconinck, Jansen & Barisone, 2023). Regarding the latter topic, as discussed, a need to better understand the scope for sectoral harmonisation remains a key gap in the currently available literature (*ibid.*). This is shown when examining the small pool of available research which specifically focuses on the barriers and opportunities for F&B impact assessment and communication (also referred to in the literature as F&B environmental footprint, carbon labelling, environmental impact reporting/labels and LCA-based ecolabelling) (Ponsioen & van der Werf, 2017; Iraldo, Griesshammer & Kahlenborn, 2020; Taufique et al., 2022; Cicek, Boone & Broekema, 2024; Deconinck, Jansen & Barisone, 2023; Boone et al., 2023). Whilst on the one hand Ponsioen & van der Werf (2017), Taufique et al. (2022), Boone et al. (2023) and Deconinck, Jansen & Barisone (2023) consider key methodological, data-collection and reliability challenges for the sector. On the other hand, organisational issues and financial and practical implementation barriers are highlighted by Deconinck, Jansen & Barisone (2023), as well as Iraldo, Griesshammer & Kahlenborn (2020) and Boone et al. (2023). Most of the papers reviewed discuss generalised challenges for and often do not relate these to harmonisation per se. However, Cicek, Boone & Broekema (2024) provide the most up to date and specific research for this thesis, highlighting the barriers facing LCA-based F&B impact assessment and communication solutions in their harmonisation goals. These are listed as ‘differing methodologies, high data collection costs, data access, national regulations, industry resistance, and the complexity of creating consumer-friendly labels’ (Cicek, Boone & Broekema, 2024: 5). This list and the author’s subsequent analysis (*ibid.*) provides a useful starting point for research into F&B impact assessment and communication harmonisation.

As this review of the available literature on the research topic shows, studies on F&B impact assessment and communication harmonisation remain relatively limited. Other potential barriers and opportunities can, however, be inferred from the literature discussing challenges

related to F&B impact assessment and communication, for example, sustainable food system development, niche innovations and food sector data management. This includes analyses of EU food policy measures (Mengual et al., 2024; Galli et al., 2018; Galli et al., 2020; Galanakis, Daskalakis & Galanakis, 2025; European Environmental Agency, 2023a; European Environmental Agency, 2023b; Sala et al., 2021), niche-level challenges in sustainable transitions (Geels, 2019; Geels, 2020) and data harmonisation in the food sector in general (Zeb, Soininen & Sozer's, 2021). However, no evidence for EG research (see Chapter 3) on the harmonisation of F&B impact assessment and communication or the use of the MLP or MSP to create deeper understanding of the multi-level and scalar barriers at play were found during the literature review. Moreover, as mentioned in the previous section, the recently emerging coalitions, established to address these barriers, have also not yet been examined within academic literature. Overall, the provided analysis of the barriers and opportunities for F&B impact assessment and communication harmonisation within the EU from an EG lens will meaningfully contribute to the limited literature available with a new perspective and structure, thus addressing a key gap in the literature.

This thesis will also contribute the most contemporary analysis of the European F&B impact assessment and communication sector status quo. As discussed, while this had up until now been provided by Cicek, Boone & Broekema (2024), the authors highlight how the quickly evolving nature of both EU regulations and sectoral developments means the given findings should be revisited in due time. This is an important point to consider when researching at the European-level today, as the available academic literature on the discussed topic was written within a different political context. For example, Sala et al. (2021) predicted an increase in influence of LCA methodologies in support of EU policy over the next years; and Arayess & de Boer (2022) expected to see further policy developments to protect customers from misleading sustainability information. Researched and written during a time when the EU was experiencing a policy shift towards supporting food system transformation (Deconinck, Jansen & Barisone, 2023; Ellen MacArthur Foundation, 2021), these predictions suggest a very positive outlook on the state of the sector. However, far-right electoral gains in the EU's parliamentary elections in June 2024 have kick-started a reversal of position and sustainability policy, as the EC has swapped its agenda from greenness to competitiveness (van Rij et al., 2024; Mathiesen et al., 2025). This can be seen in the example of EC's recent Omnibus Proposal, with which the EC aim to cut red tape and simplify EU rules (European Commission, 2025d), threatening to dismantle the proposed corporate human rights and

environment accountability and obligations legislation such as CSRD (WWF European Policy Office, 2025; Gonzalez-Garcia & Lupin, 2025). Similarly, a more uncertain path lays ahead for the GCD for which support is now waning, potentially resulting in a weakened directive (McGowan, Forbes, 2025). Therefore, this thesis will also provide an updated assessment of the F&B impact assessment and communication sector in the context of this new political situation, considering whether this is one barrier to sectoral harmonisation.

Overall, this research aims to expand the body of work which considers F&B impact assessment and communication as a path towards food system transformation, by using an EG lens and the MSP framework to understand the process of sectoral harmonisation within the EU today. This will address critical gaps in the knowledge base, which are needed to define next steps for the sector in order to achieve its full potential. The following section discusses the theoretical-conceptual framework chosen to provide the foundation for the subsequent presentation and analysis of the barriers and opportunities for European F&B impact assessment and communication harmonisation. The sociotechnical transitions debate is also further contextualised, and the use of an EG lens and the MLP and MSP frameworks are explained and justified in more detail.

3. Conceptual Approach and Theoretical Framework

3.1 Food System Sociotechnical Transitions and Transformations

Transformation, transition, sociotechnical, system - all terms used throughout this research which, like sustainability, have diverse meanings in different contexts. In the interest of avoiding terminological vagueness (Feola, 2015), it is necessary to define the theoretical and conceptual background within which these words sit in this given context. A number of terms have been used to describe the shift needed from the current status quo towards sustainability, but the term ‘transformation’ has become institutionalised within academic discourse (*ibid.*). As such, there is consensus in the literature that a transformation is a process of structural change and can be classified as ‘a change that proceeds via a combination of endogenous and exogenous processes, involving both emergent, inadvertent, unintended consequences and intended, deliberate ones’ (Feola, 2015: 382). Scholars and policymakers are becoming increasingly interested not only in the end result but also in the processes which lead to such sustainability transformations (Olsson, Galaz & Boonstra, 2014; Linnér & Wibeck, 2019). This thesis fits within this trend.

The wider transformation debate offers differing approaches, research styles and discourses. This research can be classified as using a ‘descriptive-analytical’ approach, in that the preconditions and characteristics of an F&B transformation process have been explored to generate knowledge which can be converted into practical solutions (Feola, 2015; Linnér & Wibeck, 2019). In terms of discourse, it is positioned within the distinctive sociotechnical transitions debate (Geels, 2019). In sociotechnical transitions literature, the terms transformation and transition are often used interchangeably (Linnér & Wibeck, 2019; Feola, 2015). While some propose that transformation is a specific type of transition process (De Haan & Rotmans, 2011 in Feola, 2015), Galli et al. (2020: 2) argue that ‘transitions are processes which bring about ‘transformational’ change by empowering ‘change agents’ [to] stimulate the emergence of new paradigms and coalitions’. Therefore, for an effective transformation, a set of change processes are required, rather than one ‘big bang’ change (*ibid.*). This distinction is made in this research as well. As explained in Chapter 2, the success of the F&B impact assessment and communication is seen as having the potential to be one transitional change which could contribute to the collective sustainable transformation of the food system.

‘Sociotechnical’ transitions refer to systemic technological and social changes which aim to address increasing environmental issues, such as climate change and biodiversity loss. Such transformations, therefore, do not solely focus on science and technology as in other disciplines, but involve radical new technologies interspersed with social, behavioural, business models and infrastructural innovation (Geels, 2020; Schot & Steinmueller, 2018). Only considering technological innovations has the potential to create unintentional side or lock-in effects and perpetuate existing systemic challenges (European Environment Agency, 2023a). Thus, integrating wider socio-economic innovations (which are not mutually exclusive and often interact with technological innovations) can restructure food systems more radically (*ibid.*). Due to their extensive reach, sociotechnical transformation processes are pervasive across economy and society, requiring the involvement of a wide set of actors beyond the traditional knowledge transfers between universities and policymakers (Geels, 2020; Schot & Steinmueller, 2018). This includes civil society, NGOs and start-ups cooperating to drive transitions (*ibid.*). In other words, coalitions.

The systems under transition are defined as entities which provide social functions or end-use services and are the backbone of modern societies, which includes among others the (agri-)food system (Geels, 2019; Schot & Steinmueller, 2018). The food system spans many scales and sectors and comprises all social and technical systems which contribute to making, distributing, and using F&Bs, thus: ‘food production, processing, and packaging; alternative forms of food production; food distribution; marketing and value chains; data and analytics; food waste; and food access and affordability’ (Sovacool et al., 2021: 6). Moreover, it also includes the socio-economic and environmental impacts of the food system itself (Mengual et al., 2024), many of which were already discussed in Chapter 2. The multi-scalar nature of the food system (see Figure 2), therefore requires multi-scalar solutions to address its challenges (Sovacool et al., 2021). The F&B impact assessment and communication sector brings together technological and social innovation and aims to transition practices and behaviours across many scales and sectors within the food system towards sustainability, and can thus be positioned within the food sociotechnical system.

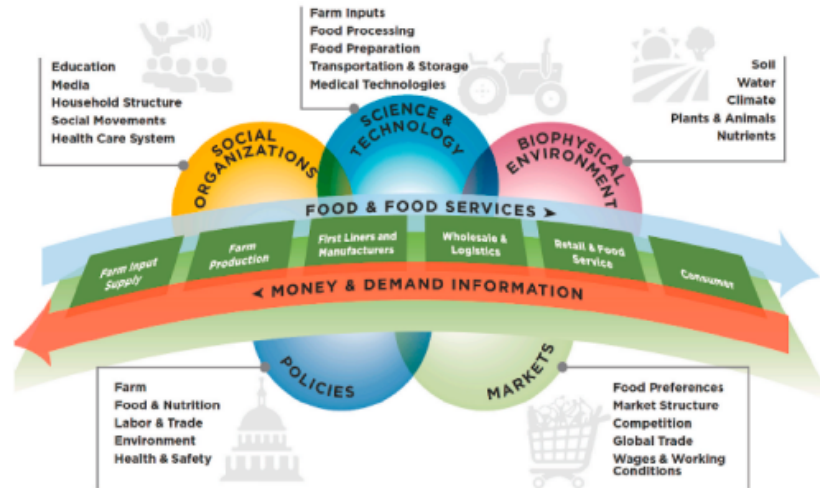


Figure 2: ‘Framing F&B as a sociotechnical system’ (in Sovacool et al., 2021: 5 with permission from the National Academies of Sciences, Engineering, and Medicine, 2019).

Both sociotechnical transformation and transition scholarship alike have been receiving increased recognition over the past decade, linked to heightened interest in addressing climate change, the introduction of the United Nations Sustainable Development Goals, and the growth prospects associated with low-carbon and sustainability transitions (Geels, 2020). Moreover, in response to the challenges posed by the F&B industry’s status quo and a need to understand its complexity, the ‘food system’ has become a key concept within food policy discourses (Galli et al., 2020). This thesis aims to recognise and contribute to these debates by exemplifying how using sociotechnical transitions and systems knowledge can provide deeper insight into how to overcome barriers to F&B impact assessment and communication harmonisation.

3.2 An Economic Geography Study

This thesis was conducted through an EG lens. EG study focuses on understanding the organisation of economic landscapes and their economic activity by analysing economic production, consumption, distribution and exchange processes and their interacting economic agents (Clark et al., 2018; Anderson, 2012). EG tradition is multi-scalar in approach and interested in showing that economic landscapes are heterogeneous, meaning that space is never homogenous and economic processes can have different results in differentiated spaces (Clark et al., 2018; Anderson, 2012). Sociotechnical transitions research is situated within EG, as its analysis of systemic change focuses on the economic processes of production,

distribution and consumption and the involved actors across socio-economic spaces (Schrot & Steinmueller, 2018). The multi-scalar, global and complex nature of the food system (Sovacool et al., 2021; Zeb, Soininen & Sozer, 2021), makes the EG perspective a useful lens through which to better understand its processes, challenges and opportunities. This thesis contributes to EG literature, utilising the field's key foci, approaches and frameworks to create EG-sensitive knowledge on F&B impact assessment and communication harmonisation.

3.3 The Multi-Level-Perspective to the Multi-Scalar-Perspective Framework

The MLP framework is a theoretical approach widely applied in the sustainability transformations debate (Geels, 2019), and was employed to structure the research and results of this thesis. The MLP is a process theory and conceptual model which provides broad analyses into core processes and mechanisms within system transformations and is, therefore, well suited to understanding the dynamics of, and players within, sociotechnical transitions (Geels, 2019; Geels, 2020). The approach shows how transitions transpire as a result of the interplay between processes at three different levels: the niche, regime and landscape (Geels, 2020; Gibbs & Jensen, 2022). The niche is described as a 'safe space' where new entrepreneurial innovations which aim to transform the given system (such as F&B impact assessment and communication) develop (Sovacool & Hess, 2017). The system status quo is determined by the sociotechnical regime which regulates knowledge production, technological pathways and legislation (Galli et al., 2020). Finally, the sociotechnical landscape is an encompassing concept which follows longer-term shifts in culture, societal norms and politics which can put pressure on the existing regime (Geels, 2019; Geels, 2020).

Figure 3 presents the three levels of a sociotechnical system, as well as the process of transitions, namely how a niche innovation can enter and disrupt the given regime across four phases: experimentation, stabilisation, diffusion and disruption and lastly, institutionalisation and anchoring (Geels, 2019). Geels (2020) argues that the general course of a successful transition follows that niche innovations build up momentum, while changes at the landscape level simultaneously create pressure on the system and regime. This destabilisation creates a window of opportunity for diffusion and disruption within the prevailing sociotechnical system (ibid.). Within sociotechnical transitions approaches, technology and other innovations are used as 'analytical entrance points' for studying systemic changes (Geels,

2019: 188). This will also be the case in this research, where the F&B impact assessment and communication technological innovation will serve as the analytical entry point.

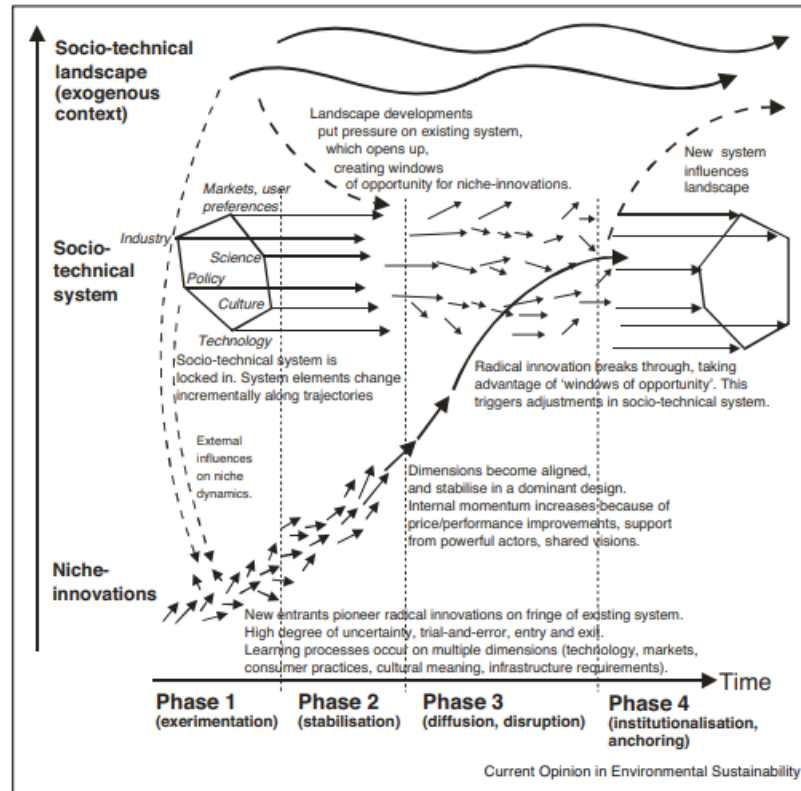


Figure 3: Multi-Level-Perspective on sociotechnical transitions (Geels, 2019: 191).

The MLP was chosen as the appropriate theoretical framework in the context of research into F&B impact assessment and communication harmonisation for a number of reasons. The system-wide view allows researchers to identify and analyse the diverse stakeholder groups, dynamics and complexities involved during a transition process (Whitmarsh, 2012). By understanding any misalignment between stakeholders in the niche and regime, as well as landscape-level dynamics, researchers are able to pinpoint barriers which challenge a successful transition towards sustainability within a given system (Deviney, Classen & Bruce, 2023). Having this system-wide view expands perspectives from observations based on only localised knowledge and experiences, which may not reflect the other parts of the system, being made (*ibid.*). Overall, the MLP lens provides researchers with the ability to identify recommendations to address the given barriers for policy-makers, industry and other stakeholders, supporting system-wide transitions towards sustainability (Whitmarsh, 2012). The aim of this research was to understand the barriers and the corresponding opportunities

for F&B impact assessment and communication harmonisation to determine how the sector can move forward from the current status quo of fragmentation towards diffusion and disruption in the food system. Here, the MLP framework serves as a useful tool to achieve a system-wide overview and to understand the various and varying relationships in and between the niche, regime and landscape levels of the food system which may be hindering the F&B impact assessment and communication sector in achieving its full potential.

Despite its wide implementation in research and policy development, transitions literature and the MLP framework in particular have been criticised by EG scholars. This includes the neglect of multi-scalar perspectives, as well as lack of acknowledgment for the unevenness of transition processes and socio-spatial embedding (Coenen, Benneworth & Truffer, 2012; Carvalho & Lazzerini, 2018; Miörner & Binz, 2021) - all important aspects of EG (Clark et al., 2018; Anderson, 2012). Though the MLP framework utilises the concept of levels in its approach, these are framed as socio-cognitive and are therefore not tied to particular territories or scales (Coenen, Benneworth & Truffer, 2012). This limits the analytical nuance of the framework, as the specific geographical contexts (as well as the potential for negative externalities) of transitions are not considered (Geels, 2019; Gibbs & Jensen, 2022). Though critique for the MLP has in part been acknowledged, and some conceptual elaborations have been made; limitations still remain, especially in relation to geographical systems (Carvalho & Lazzerini, 2018; Geels, 2019). This should not discredit the usefulness of the MLP, but EG scholars have argued that the MLP would benefit from EG's heterogeneous understanding of scale and place-specific impacts of sustainable transitions, modifying the MLP to the 'Multi-Scalar-Perspective' (MSP) (Coenen, Benneworth & Truffer, 2012: 972). Through this, 'level' and 'scale' can be treated as two different dimensions by which to classify transitions (*ibid.*). Due to the multi-scalar nature of the food system (Sovacool et al., 2021) and this research following an EG conceptual approach, it was considered important to use a more geographically-sensitive framework to structure the research and results (Carvalho & Lazzerini, 2018). Therefore, implementing Coenen, Benneworth & Truffer's (2012: 972) suggestion, the MLP was modified to the MSP as the theoretical guide for this thesis, adding another dimension of analysis to the existing framework. This is illustrated in Figure 4.

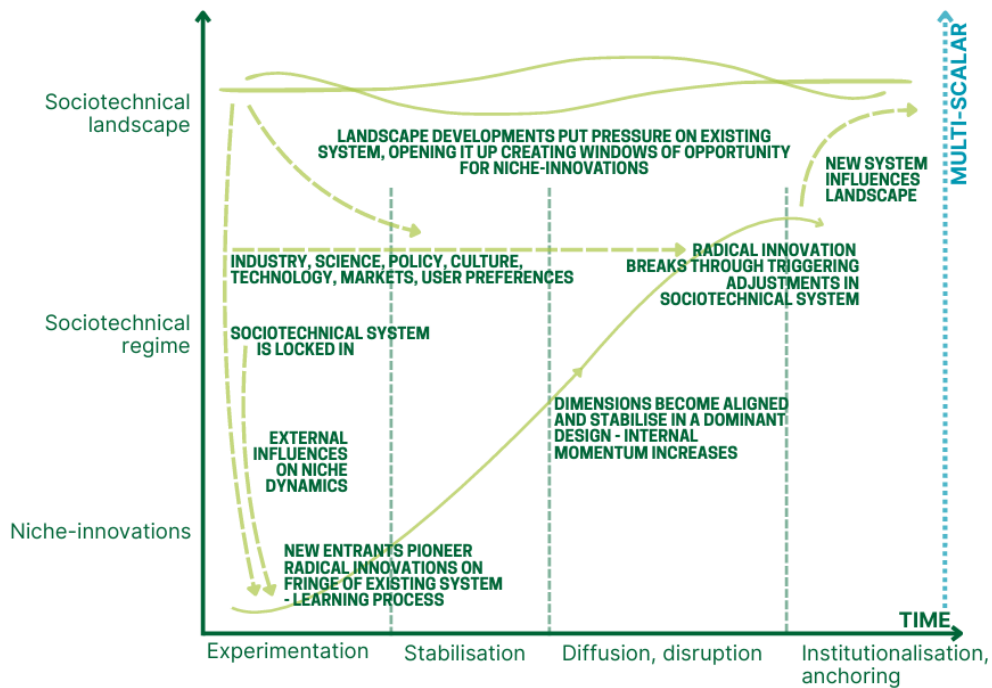


Figure 4: Multi-Scalar-Perspectives on sociotechnical transitions

(Own elaboration based on Coenen, Benneworth & Truffer, 2012: 972, adapted from the original MLP presented by Geels, 2019: 191).

While exploring the MLP's multiphase perspective would be of additional interest in this research, in order to identify the barriers for harmonisation within the F&B impact assessment and communication sector, the analytical focus remains on the MLP's three-levelled interpretation of sociotechnical systems. As discussed, a further analytical element was also added in order to highlight the multi-scalar factors which may challenge F&B impact assessment and communication harmonisation. Thus, following the structure of the MSP, the research and empirical analysis was divided into understanding the various stakeholders and dynamics at play at the niche-, regime-, landscape-levels as well as multi-scalar factors (and their interactions) currently hindering sectoral harmonisation in the EU. This provided valuable insights into the harmonisation process, for example highlighting the potential incumbent actors and lock-in mechanisms which act as barriers to sectoral harmonisation (Geels, 2019; Coenen, Benneworth & Truffer, 2012). By identifying these, it was possible to propose how these barriers can be overcome and recommend the most fruitful opportunities for European F&B impact assessment and communication harmonisation as a means for the sector to successfully enter and disrupt the regime.

Overall, this study aims to contribute to the growing geographical literature conceptually building upon sociotechnical transitions theory (Coenen, Benneworth & Truffer, 2012; Carvalho & Lazzerini, 2018; Miörner & Binz, 2021), by addressing MLP criticism and illustrating the value of adding geographical perspectives via the MSP. Before the research results are presented and explored, the next chapter will describe the methodology and methods used for data collection and evaluation, and provide a deeper discussion of the analytical scale.

4. Methodology

This chapter explores the methodology and methods of data collection and analysis used for the research into F&B impact assessment and harmonisation. This is divided into firstly, the research question; secondly, the methodology; and, thirdly, a detailed description of the methods used. The chapter closes with an examination of the research limitations. All referenced tables can be found in the appendices.

4.1 The Research Question(s)

After the initial literature review was completed and the research focus was specified, the research question and sub-questions were defined based on the identified gap in the literature (see Chapter 2). This research aims to answer the following question: ‘What are the Barriers and Opportunities for the Harmonisation of the European Food and Beverage Impact Assessments and Communication Sector? A Multi-Scalar-Perspective on Sociotechnical Transitions in the European Union’s Food System.’

In order to achieve more structured research and results during the investigation process, the research question was split into the following two sub-questions:

1. Through the lens of the MSP framework, what are the current EU-wide niche-, regime-, landscape-level and multi-scalar barriers to F&B impact assessment and communication harmonisation within Europe?
2. To what extent can emerging coalitions be considered opportunities for addressing these barriers and how can they contribute to the harmonisation process?

4.2 The Research Approach: a Triangulation of Methods

As this thesis aims to identify the ‘what’ and ‘why’ of the single case of F&B impact assessment and communication harmonisation, an intensive research design was chosen to provide the maximum amount of detail and depth in understanding (Clifford et al., 2010: 11-12). Here, methods and analysis should discover and explain the links between events, mechanisms and structures (*ibid.*). Qualitative research is a scientific research method often applied in geography and environmental studies, which collects and analyses non-numeric data with non-statistical approaches (Montello & Sutton, 2012). It is exploratory in nature and data is analysed using interpretive methods to generate new ideas, insights or theories from textual data sources (Taherdoost, 2022). Qualitative methods and analysis are, therefore, often used in intensive research designs (Clifford et al., 2010). The research design used for

this thesis to explore the phenomena of F&B impact assessment and communication harmonisation follows this tradition and does not differ in this regard.

When designing qualitative research, the methods should be identified according to the potential benefits they can bring for the given research project (Taherdoost, 2022). To produce an in-depth understanding of the F&B impact assessment and communication harmonisation for this thesis, a triangulation of qualitative methods was applied. Triangulation indicates the use of more than one method when conducting research (Wilson, 2014). This ensures stronger and more comprehensive data through increased scope as well as a more nuanced and credible understanding of the given research, by allowing comparison between different data sources (Wilson, 2014; Mertens & Hesse-Biber, 2012; White & Marsh, 2006). For this research, these methods were a narrative literature review, content analysis and semi-structured expert interviews. While a literature review creates a foundation of knowledge upon which to build research (Snyder, 2019; Rumrill, Fitzgerald & Merchant, 2010), qualitative content analysis systematically examines the contents of the data found to situate the given topic and discover themes (Taherdoost, 2022; White & March, 2006). Yet the F&B impact assessment and communication sector's recently fast-moving development (Cicek, Boone & Broekema, 2024), meant it was necessary to further validate these findings with the collection and analysis of primary data. This was done by comparing the secondary data already collected and themes found with the most up-to-date knowledge on the sector's harmonisation gathered via the conducted expert interviews. Therefore, the expert interviews served as 'crystallisation points' for the preceding research, by providing insider knowledge, key insights and specifically tailored primary data to strengthen the reliability and validity of the research findings thus far (Bogner, Littig & Menz, 2009: 2; Montello & Sutton, 2012). The advantages and use of these textual data collection approaches are further explained below accordingly.

4.3 The Methods

4.3.1 Literature Review

A comprehensive literature review creates a solid foundation for advancing knowledge, by identifying prevalent themes and gaps in the existing literature on a given subject (Snyder, 2019; Rumrill, Fitzgerald & Merchant, 2010). Narrative literature reviews in particular are noted as useful for topics which have been researched across different fields to show how a

topic has developed over time (Snyder, 2019; Bourhis, 2017). After an initial scoping literature review was conducted to determine key themes in the sustainable food systems literature, F&B impact assessment and communication was selected as the key focus for this thesis. As discussed in the research background, the discourse around European F&B impact assessment and communication (also referred to as carbon labelling, environmental impact labels, LCA-based ecolabelling) has taken various forms over the past 25 years (Arayess & de Boer, 2022). Therefore, a narrative approach to the literature review was therefore considered best in order to broaden the scope of literature considered and contextualise the sector and its challenges. The EU was chosen as the scale of analysis due to the research location being within the EU; most European F&B impact assessment and communication providers operating at the EU level; and the trend towards EU wide environmental reporting and communication standards for the F&B industry (see Chapter 2). The literature review was carried out between March and May 2025 via a keyword search on the academic database Google Scholar (2025). The keyword search history of the scoping and narrative literature reviews can be found in Table A1 (see Appendix A). As reviewing every single available article is not possible (Snyder, 2016), journal articles and book chapters were found and selected based on:

1. language (English),
2. timeframe (within last 25 years),
3. the titles in accordance with the keywords,
4. the content of the abstract in accordance with the keywords.

Through this, papers which explore the topic but name F&B impact assessment and communication differently (for example F&B environmental footprint, carbon labelling, environmental impact reporting/labels and LCA-based ecolabelling) were also included in the literature review.

Further literature was also found via the reference lists of the selected articles using the snowball sampling method (Montello & Sutton, 2012). These were chosen if they had not been found in the keyword search, but were also considered relevant to the topic according to their language, timeframe, titles and abstracts. Overall, but not exclusively, articles written about food system transformation within Europe were also prioritised according to the chosen scale of research. Each relevant journal article and book chapter was read, and the review continued until key ideas and knowledge gaps became clear. The literature review totalled 50 academic sources, while a number of websites from international NGOs, news outlets, and

official intergovernmental and supranational organisations were also referenced in order to afford more depth and up-to-date data in the review. Overall, this produced a comprehensive narrative literature review which explains the background, relevance and contribution of this thesis.

4.3.2 Content Analysis

After the literature review established key ideas and knowledge gaps in the secondary literature, a content analysis of the available resources on the topic was undertaken. Qualitative content analysis systematically examines the contents of data to situate them and determine themes (Taherdoost, 2022; White & March, 2006). For this research, data were gathered in order to situate them within the MSP framework and find key themes which could answer the research question. These were specified as the barriers to F&B impact assessments and communication sectoral harmonisation in the EU. After reading and obtaining relevant data from the literature already reviewed in the first stage of the research, further journals, newspaper articles, websites and official reports were collected via another online keyword search (see Table A1, Appendix A). The gathered data were first coded in accordance with the structure of the MSP framework, dividing the data into 4 categories: the niche, the sociotechnical regime, the landscape level, and the multi-scalar. In a second step, the data was reviewed and refined further to devise sub-categories, which were understood as the individual barriers at each level and scale of the MSP. This is visualised in Table A2 (see Appendix A) where the corresponding sources are also listed. In sum, the following subcategories were generated:

- (Niche) Conceptual - assessment
- (Niche) Data availability
- (Niche) Conceptual - communication
- (Niche) Resources
- (Sociotechnical regime) F&B businesses - retailers and manufacturers
- (Sociotechnical regime) Primary producers
- (Sociotechnical regime) European Union
- (Landscape) Consumers
- (Landscape) Political shift
- (Multi-scalar) Food system
- (Multi-scalar) Data collection
- (Multi-scalar) Supranational governance

Through coding the available literature on the topic, the first research conclusions could be made. Yet, as discussed in Section 4.2, these needed to be checked against primary data to ensure that the findings were still relevant.

4.3.3 Interviews

In the final stage of the research, six semi-structured expert interviews were conducted online. Semi-structured interviews are one of the most widely used methods across the social sciences (Pottinger et al., 2022). While an interview guide containing a set of interview questions ensures consistency across the interviews, semi-structured interviews also leave room for flexibility to accommodate the varying interview partners (Roulston, 2010). As such, the order in which questions are asked is left open, and the asking of follow-up questions to gain further insights on the details provided by the interviewee is also encouraged (*ibid.*). Details regarding the full interview process for this thesis, as well as the interview partners, are provided in this section.

The overall aim of the interviews was to increase the scope of data for content analysis, compare the first findings with primary and up-to-date material, and to fill in any knowledge gaps. As discussed, the conducted expert interviews served as ‘crystallisation points’ for the preceding research, providing insider knowledge, key insights and specifically tailored primary data and thus strengthening the reliability and validity of the research (Bogner, Littig & Menz, 2009: 2; Montello & Sutton, 2012). When defining an expert in a research project, Meuser & Nagel (2009) point out that it is the researcher themselves who decides in reference to their study who they consider an expert within the field. In the context of this thesis, experts were specified as key stakeholders or researchers in the European F&B impact assessment and communication sector. Due to the limited time and financial resources available for this research (see Section 4.4), speaking with a broad range of experts who could provide representative insights for their stakeholder group accordingly to create balanced and comprehensive results was prioritised. A total of six interviews were subsequently conducted. Each of the interviewees is presented in more detail below in order to substantiate their expert status. Because all interview partners were specifically chosen to represent a specific group involved in the F&B impact assessment and communication harmonisation process, it was considered appropriate that their names and job titles be cited in this thesis. For this, each interview partner provided both their verbal and written consent. In line with the participant consent form, their personal data, interview recordings and

transcriptions will however remain confidential. Due to the limited availability of the interview partners, the interviews were conducted for 40-60 minutes between July and September 2025. The data collected and subsequently presented in this thesis are therefore correct to these dates.

Interviews were held with the following six experts (in order of interview dates):

1. Koen Boone - Managing Director Europe at The Sustainability Consortium, Wageningen Economic Research (LinkedIn, 2025a).

Koen Boone is a senior researcher in performance and sustainability assessment for agri-food chains, as well as Theme Ambassador for Sustainable Value Chains, at Wageningen Social & Economic Research (*ibid.*). Moreover, he is a leading figure in the Life Eco Food Choice Project - a scientific consortium of 30 technical experts, funded by the EU, who aim to provide Europe with an operational and collectively supported food environmental labelling by 2027 (Eco Food Choice, 2025). The project is divided into several work packages relating to data, method, testing and harmonisation - Koen Boone leads Work Package 3 on the scoring methodology which aims to create a 'harmonised methodology to aggregate environmental impacts into a single e-score' (*ibid.*). Two papers which Koen Boone co-authored, regarding LCA-based labelling systems in Europe, were reviewed and analysed for the literature review and content analysis of this thesis (Boone et al., 2023; Cicek, Boone & Broekema, 2024). With a deep and specialised knowledge of the F&B impact assessment and communication sector and taking an active role in its harmonisation, Koen Boone was considered an expert for the research purposes of this thesis.

2. Sophie Erhart - Manager of the European Sustainable Food Coalition (ESFC) (LinkedIn, 2025b).

With a background in sustainable resource management and corporate social responsibility, Sophie Erhart now manages the ESFC (Erhart Interview, 2025). As such, Sophie Erhart was also considered a suitable representative to discuss and present the perspective of the coalitions which have emerged across Europe to create cross-sectoral and stakeholder collaboration within the F&B impact assessment and communication sector. The ESFC was established in 2024 with the sole purpose of addressing F&B impact assessment and communication harmonisation barriers (Sustainability Online, 2024). As a pre-competitive collaboration working across the entire F&B value chain, the ESFC aims to develop and align on a unified methodological framework for F&B assessment (ESFC, 2025a). This is to ensure

comparability and accuracy of results across the sector, as well as, effective consumer communication and engagement (*ibid.*). A substantial number of notable organisations across the sector have already contributed to the ESFC's initiatives to date (see Figure 5), thus Sophie Erhart could provide valuable insights into the varying industry stakeholders and harmonisation process.



Figure 5: Organisations that have actively contributed to ESFC's initiatives to date (ESFC, 2025b).

3. Koen Deconinck - Economist and Policy Analyst of Global Agriculture and Food Supply Chains at the Organisation for Economic Co-operation and Development (OECD) (LinkedIn, 2025c).

Koen Deconinck is a key researcher and expert in food supply chains and the F&B impact assessment and communication sector. In 2021, he was the lead author of the OECD report 'Making Better Policies for Food Systems' (OECD, 2021), contributing to the UN Food System Summit (Deconinck Interview, 2025). Since, Koen Deconinck has researched life cycle assessments and most notably, co-authored the paper 'Fast and furious: the rise of environmental impact reporting in food systems' to which this research responds (Deconinck, Jansen & Barisone, 2023). It was, therefore, considered important to gain his perspective on the topic of F&B impact assessment and communication sectoral harmonisation. Regarding the content of the interview, Koen Deconinck would, however, like to disclaim that 'These are personal opinions and do not necessarily reflect the official views of the Organisation for Economic Co-operation and Development or of its member countries' (Deconinck Interview, 2025).

4. Markus Linder - Chief Executive Officer (CEO) and Co-Founder of inoqo, and Co-initiator of the ESFC (LinkedIn, 2025d).

Markus Linder was chosen as a representative of the F&B impact assessment and communication solution providers, thus contributing expert insights into the sector and its challenges from the niche perspective. inoqo is a Software-as-a-Service (SaaS) platform which enables grocery retailers and F&B brands and producers to assess and manage the impact of their thousands of products at scale (inoqo, 2025; Linder Interview, 2025). inoqo is working with notable retailers such as Albert Heijn, dm-drogerie markt and Migros (inoqo, 2025). Markus Linder also co-initiated the ESFC (see above) with the aim of harmonising farm and product-level F&B impact assessment and communication (Linder Interview, 2025). As such, he also holds specialised knowledge in the opportunities for sectoral harmonisation and could contribute meaningfully from both perspectives.

5. Michael Löscher - Climate Strategy Lead at Schwarz Corporate Solutions (LinkedIn, 2025e).

Schwarz Group is a leading global retail group (whose portfolio includes Lidl and Kaufland) based in Germany, with an annual turnover of €133 billion and 550,000 employees (World Economic Forum, 2025). Having been employed by the Schwarz Group for almost seven years, Michael Löscher now works as Climate Strategy Lead (LinkedIn, 2025e). For this, Michael Löscher and his team are responsible for coordinating and orchestrating all the emission reduction efforts which Schwarz Group takes on, including in relation to F&B and Scope 3 (Löscher Interview, 2025). As the literature suggested that grocery retailers are an important player for the F&B impact assessment and communication sector (Taufique et al., 2022; Ellen MacArthur Foundation, 2021), it was considered important to gain a deeper insight from the F&B business perspective. Working exactly on this topic within the industry, Michael Löscher was able to provide his expert view on both the barriers and opportunities for F&B impact assessment and communication harmonisation from the user perspective.

6. Marco Pierazzoli - Enterprise Account Executive at Improvin' (LinkedIn, 2025f).

Marco Pierazzoli is Enterprise Account Executive for the UK, Italy and Benelux (Pierazzoli Interview, 2025) at the farm-level primary data collection solution Improvin' (2025). Improvin' aims to allow their customers to collect primary data directly from farmers regardless of the structure of the supply chain and monetize environmental outcomes (Pierazzoli Interview, 2025). The farm-level data collected by Improvin' can also be used by

F&B impact assessment and communication providers to fill data gaps - yet, methods are also currently not harmonised (*ibid.*). As data availability, data collection and unharmonised data were cited as barriers to European F&B impact assessment and communication harmonisation (see Section 2.4), it was considered beneficial to examine the role of farm-level data collection tools in the harmonisation process. Working in this sector, as well as having a background in F&B impact assessment and communication, Marco Pierazzoli was recognised as an expert in the context of this research.

Once the potential interview partners were found and selected, they were contacted via email to request an interview. After an interview date and time was agreed, the interviewee was sent a Google Meet link from which to access the online interview. A consent form, participant information sheet and interview guide were written and sent to each expert a maximum of two weeks before the interview date. This gave each interviewee time to read the relevant information regarding the research process, sign the consent form, and reflect on the interview questions before the interview. The interview guide consisted of seven open questions, to provide the interviewees with broad topics which they could respond to in their own words (Roulston, 2010). The questions (see Appendix B) were written based on the findings of the secondary data content analysis (see Table A2, Appendix A). In preparation for each interview, more detailed background research on the interviewee and their respective place of work (for example, reviewing journal articles written, company websites or appearances in online articles) was conducted to learn more about the participant (Roulston, 2010). This helped formulate specific questions in addition to the interview guide which would be relevant for the expert and their specialised knowledge.

All interviews were held online, recorded and auto-transcribed using Google Meet and the non-generative artificial intelligence transcription tool Gemini. Only in one case was Microsoft Teams used, as the interviewee was unable to use Google Meet due to their organisation's security restrictions. After each interview, the auto-transcription was checked via the recording and corrected if mistakes were found. Using the transcriptions, a further content analysis was conducted, and the interviews were summarised and coded according to the categories and sub-categories devised in the first content analysis (see Table A2, Appendix A). The interview materials were analysed using the 'research approach', reading each interview as 'a report of experience' (Bryne, 2018: 234) and remaining aware of the context and potential interests of each interviewee and how this may have affected the data

generated (White & Marsh, 2006). After reviewing and comparing the results of both the literature and interview content analyses, the completed data was used to draw key findings and conclusions regarding the barriers and opportunities for the harmonisation of European F&B impact assessment and communication. These are outlined in the next chapter. It should be noted that generative artificial intelligence was not used for the research and writing of the work presented here. The chatbot ChatGPT (OpenAI, 2025) was used solely as a formatting guide for referencing the bibliography and the online translation tool DeepL (2025) was used as an aid in the translation of the thesis abstract into German.

4.4 Research Limitations

The limitations of the research methods are acknowledged in this section. These refer to the reliability and validity of the study, the data collection methods, and the author's own positionality. As the research design and data collection methods and analysis were just described and justified, the aim of this reflection is not to undermine the usefulness of the conducted research. The goal here is simply to promote academic progress and transparency, disclosing how this research topic could be strengthened further in the future (Zhou & Jiang, 2025).

Reliability and validity are important parts of academic research, which ensure research repeatability, quality and truthfulness (Montello & Sutton, 2012). As discussed, the use of expert interviews was chosen as a means to access reliable insider knowledge and strengthen the validity of the secondary literature research findings (Bogner, Littig & Menz, 2009; Montello & Sutton, 2012). Due to finite time and financial resources as well as the limited scope of a Masters thesis, only six expert interviews were subsequently conducted to provide representative views for the various sectoral stakeholder groups. While sufficient findings and conclusions could be drawn from this small sample size and thus no further interviews were conducted, additional research on this topic could broaden the number and types of interviews to gain further insights, perspectives and strengthen the sample representativeness. Although it has been argued that small sample sizes are enough to achieve 'theoretical saturation' (Mason, 2010 in Low, 2019: 133) and the interview data in this research served only to provide 'crystallisation points' (Bogner, Littig & Menz, 2009: 2), it is possible to continue to identify new findings as long as data is collected and analysed (Low, 2019). Notably, in the scope of this research it would have been beneficial to interview EC representatives to better understand this topic from a policy and governance angle. Though

five relevant EC employees were reached out to during the scouting phase of the interviews, limited response meant no meeting could be scheduled. Relevant information could still be gained from other interview partners working in close collaboration with the EC, yet this first hand perspective was missing from the final results. Moreover, further interviews with other F&B impact assessment (and communication) providers, coalitions and academics working on the topic, as well as F&B business representatives and consumers would be advisable for future studies. More time, financial resources and connections to potential interviewees could have assisted in this endeavour, but in the scope of this Masters research project these were not available.

Objectivity is often presented as a fundamental concept in academic writing, meaning it is assumed that research avoids influence of a particular agenda or of personal opinions, values and perspectives (Nunn, Brandt and Deveci, 2018; Arnaudet & Barrett, 1984 in Hyland, 2002). However, this ignores that different disciplines have different views of knowledge, research practices and ways of seeing the world (Hyland, 2002). Furthermore, biases, backgrounds and beliefs shape research processes and a researcher's subjectivity, in turn influencing qualitative research results (Bourke, 2014). As such, reflection and transparency is an important part of the research process, where disclosing positionality and inevitable subjectivity within the given study highlights to the reader any implications that this may have had on the data collection, analysis and findings (Bourke, 2014; Nunn, Brandt and Deveci, 2018).

Regarding the first point of potential research subjectivity, this thesis utilised an EG lens through which to view the topic of F&B impact assessment and communication in order to provide an alternative perspective. Though this was done intentionally, it should be noted that using different tools, perspectives, methodologies or theoretical frameworks within a given research project can lead to differing conclusions or framing of the results (Kitchen & Tate, 2000). As disciplines have different views of knowledge, research practices and ways of seeing the world (Hyland, 2002), repeating this research within another discipline might lead to alternative conclusions. Regarding the second point of potential research subjectivity, the author's location and identity as a central-European based sustainability Masters student and the associated unconscious biases and beliefs may have also indirectly influenced the research process and analysis. The author's professional background - almost four years of employment in sales for the F&B impact assessment and communication solution provider

inoqo (2025) - could have been of significance too. For example, the author's perception of the sector and how the author was perceived during interviews may have been impacted (Bourke, 2014; Montello & Sutton, 2012). Though the thesis was not sponsored by any business or university, unconscious biases and beliefs based on this background will have been at play in the research process and delivering of results. In addition, regarding the experts who were interviewed, three were personal connections from the author's network. This can also be disadvantageous for the research outcomes. For example, when assumed shared knowledge is not discussed or when boundaries are already in place for explorable topics (Roulston, 2010). At the same time, certain spaces such as the EC were less accessible to the author, thus again impacting the data available for research analysis. This reflection shows that future research regarding F&B impact assessment and communication harmonisation should not only consider expanding the number and type of experts interviewed, but also expanding the number and background of the researchers themselves. For example, researchers from different European regions and countries might highlight different barriers and opportunities for harmonisation, not found in this English-language based, single researcher study. This would ensure more objective results and research depth.

The next chapter presents the research findings, analysis and discussion. This is followed by the concluding chapter, where further insights into future research opportunities are detailed.

5. Results and Discussion

This chapter presents, analyses and discusses the results of the research conducted for this thesis on the barriers and opportunities for F&B impact assessment and communication in Europe. This is divided into two sections according to the sub-research questions presented in Chapter 4. Within this, the results are structured correspondingly to the categories and subcategories devised during the first content analysis research phase (see Table A2, Appendix A). In the discussion of each subcategory, first, the named barrier is explained according to the evidence found in the secondary literature analysed. Second, the content of the conducted interviews are explored to compare the expert's insider and up-to-date knowledge with that in the secondary literature. The barriers identified in the secondary literature content analysis, the key findings of the expert interviews, along with the number of interviewees who mentioned or discussed the topic, are presented in a table at the start of each section. Here, 6/6 means six of the six interviewees stated the given point, 5/6 means five of the six interviewees stated the given point and so on. Bold text is used to spotlight the key results which were not found in the secondary literature and are (to best of the author's knowledge) new findings, thus in turn highlighting the contribution of the research. These are explained and discussed accordingly in each dedicated section.

The research results are also visualised in Figure 6 and Figure 7 below. These show how the addition of the expert interviews modify the research results. This is expanded upon in Section 5.4. As it has been argued that harmonisation is considered the key to the sector's success, 'harmonisation' symbolises the 'institutionalisation' phase and is thus positioned as the sectoral goal at the top right hand corner (Geels, 2019: 191). The barriers which the F&B impact assessment and communication sector face in reaching this are placed on the MSP diagram according to their corresponding subcategory. The positioning of each barrier within the MSP framework will be explained, as well as its relational gravity as a barrier to the harmonisation of F&B impact assessment and communication. Before the niche, regime, landscape and multi-scalar barriers are explored, the interview results are introduced by highlighting an additional barrier, briefly discussed in Chapter 2 and confirmed by the conducted expert interview. Namely, the challenge of defining harmonisation in the context of F&B impact assessment and communication.

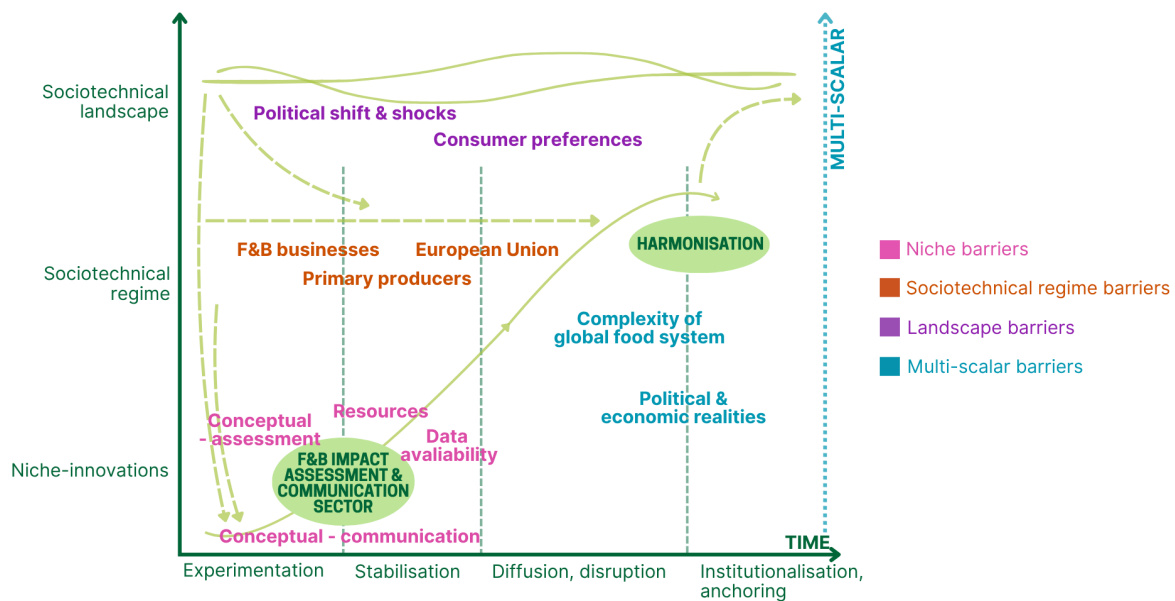


Figure 6: A MSP on the barriers for the harmonisation of the F&B impact assessment and communication sector in the EU's food system - according to the secondary literature content analysis research results.

(Author's own illustration adapted from Geels, 2019: 191).

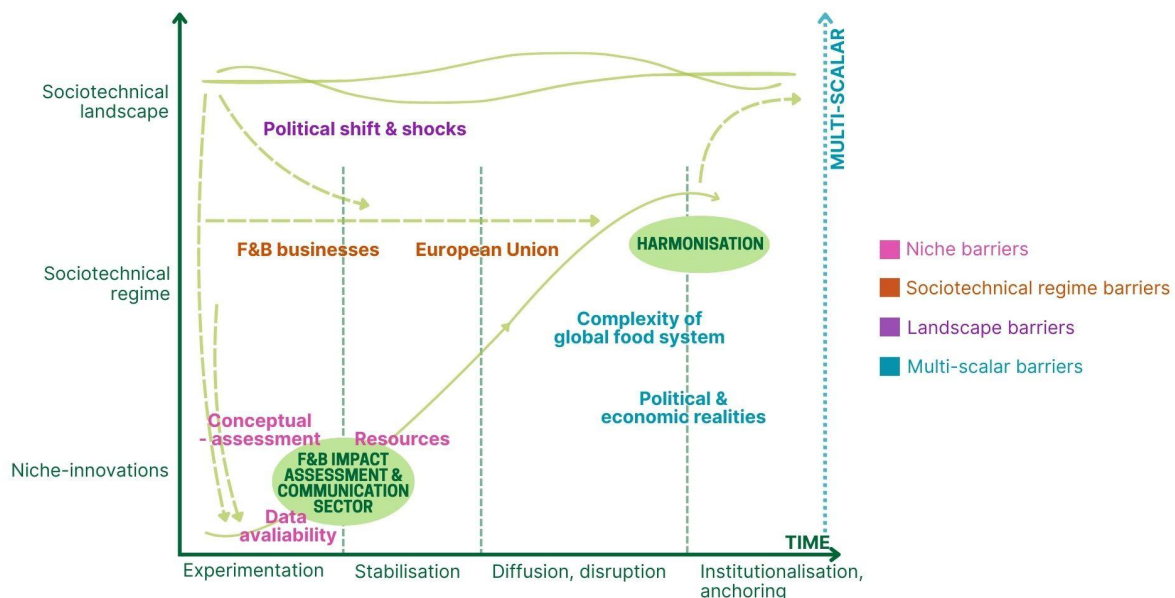


Figure 7: A MSP on the barriers for the harmonisation of the F&B impact assessment (and communication) sector in the EU's food system - according to the combined primary and secondary research results.

(Author's own illustration adapted from Geels, 2019: 191).

5.1 Defining Harmonisation

Table 1

Research results - harmonisation as defined in the secondary and primary data

Defining Harmonisation (Secondary Literature)	Key Findings (Expert Interviews)	Stated by (Nº of Interviewees)
No unified definition of harmonisation	Support need for sectoral harmonisation	6/6
	Support need for full harmonisation	2/6
	Support need for partial harmonisation	2/6

Note. Author's own research results.

The literature reviewed showed a wide recognition of the urgent need to harmonise F&B impact assessment and communication approaches, including data points, calculation methods, and label design (Deconinck, Jansen & Barisone, 2023; Potter et al., 2022; Cicek, Boone & Broekema, 2024; Ellen MacArthur Foundation, 2022, OECD, 2025; Iraldo, Griesshammer & Kahlenborn; 2020; Boone et al., 2023). The interview data supported this finding, with all interview partners aligning on the need for harmonisation (6/6). For example, Pierazzoli (Interview, 2025) stated: “[Harmonisation] is a prerequisite. I mean, it's not that it will help. Without it we won't go anywhere”. This supports the view that harmonisation is instrumental for the further development of the F&B impact assessment and communication sector.

Nonetheless, similarly to the secondary literature where no shared definition of harmonisation in the context of F&B impact assessment and communication could be found (see Chapter 2), expert opinion diverged on the meaning of harmonisation and what it should look like in practice. The level of F&B impact assessment and communication harmonisation deemed necessary, for example, differed from full harmonisation of data, methods and labels (2/6) to an acknowledgement that full harmonisation can also have disadvantages and that some aspects (for example, methodology) are not suitable for global harmonisation (see Section 5.2.4) (2/6). For instance, Deconinck (Interview, 2025) stated: “Harmonisation is the kind of thing that sounds obviously like a great idea, but you have to be really specific about what you want to get harmonised because some things shouldn't be harmonised”. Yet, if the term harmonisation itself remains unharmonious and undefined across stakeholders, the question whether reaching the goal is achievable must be asked. While it is still possible to analyse and discuss the key barriers to harmonisation in relation to the working definition proposed in Chapter 2 for this thesis (the common use of one data set, methodology and label design across the EU), this finding highlights the importance of alignment when embarking on a

harmonisation process. If all involved stakeholders have differing ideas of harmonisation, this could become an additional barrier to achieving it (whatever this may be). This should be kept in mind throughout this chapter.

5.2 The Barriers to Harmonisation

This section addresses sub-question one of this research: Through the lens of the MSP framework, what are the current EU-wide niche-, regime-, landscape-level and multi-scalar barriers to F&B impact assessment and communication harmonisation within Europe?

5.2.1 The Niche Barriers

Table 2

Research results - the niche-level barriers and key expert interviews findings

Niche Barriers (Secondary Literature)	Key Findings (Expert Interviews)	Stated by (№ of Interviewees)
Conceptual - assessment methodology	Complexity & number of topics needing agreement	1/6
	Alignment with other data providers (eg. farm level assessments) needed	2/6
	Methodology needs to be feasibly implementable for all involved stakeholders	1/6
	Technology providers should lead methodological development	3/6
	Academia and/or government should lead methodological development	3/6
Data availability	Data harmonisation is a necessary part of sectoral harmonisation	6/6
	Choosing high data requirements would be challenging for producers & suppliers	1/6
	Data collection can be burdensome and expensive for farmers	2/6
	Lack of transparency between producers & suppliers - due to lack of data or trust	4/6
	Skepticism for data sharing between F&B impact assessment & communication providers	1/6
Conceptual - communication	Sectoral focus should not be on communication, but on F&B product impact assessment first	2/6
Resources	High costs in time, effort & money limiting harmonisation progress	4/6

Note. Author's own research results.

Conceptual - assessment methodology

When discussing the sector-level difficulties faced by the F&B impact assessment and communication schemes, coming to an agreement on one harmonised methodology was a common problem thematised within the secondary literature (Deconick, Jansen & Barisone, 2023; Cicke, Boone & Broekema, 2024; Boone et al., 2023; Taufique et al., 2022; Ponsioen & van der Werf, 2017; Arayess, S. and de Boer, A., 2022). As highlighted in Chapter 2,

different F&B impact assessment providers have different methodologies, which is curbing their potential progress (Deconinck, Jansen & Barisone, 2023; Cicke, Boone & Broekema, 2024). Yet, choosing and following a joint methodology appears to be a barrier to the goal of harmonisation itself. While providers have attempted to make up for the lack of standards in place, they have in turn been confronted by their own conceptual challenges regarding differing methodological choices (Ponsioen & van der Werf, 2017; Deconinck, Jansen & Barisone, 2023; Cicke, Boone & Broekema, 2024).

The contents of the expert interviews confirm and expand upon this finding. Erhart (Interview, 2025) highlighted how complex F&B impact assessment methodologies are; thus agreeing on just one approach would mean agreeing on a multitude of contentious topics from terminologies to system boundary and functional unit measurements. Moreover, this would also need to be aligned with farm-level assessment providers (such as Improvin'), as their systems will require interoperability (2/6). While the kinds of choices made will have a significant impact on the assessments made, Deconinck (Interview, 2025) pointed out that the solution found also has to work for every stakeholder involved (see Section 5.2.4). But this in turn begs the question of who decides what works for everyone - while a lack of hierarchy, precedence and governance left the sector room for creativity and innovation, the absence of these structures also led to the current fragmentation (*ibid.*). Half of the experts interviewed were of the opinion that it should be the technology providers themselves who should lead the methodological development (3/6). However, opinion diverged on this, with the other half being of the view that the methodology should be a non-profit entity managed by academia and / or government (EC) to ensure that it remains outside of the business domain and not subject to market forces such as competition (3/6). This suggests that, overall, while complexity in agreeing on a joint methodology endures, this challenge is aggravated in the lack of clarity on who should lead methodological development. Thus, conceptual and practical issues within the F&B impact assessment and communication sector remain.

Data availability

According to Taufique et al. (2022) the validity and effectiveness of F&B impact assessment and communication is dependent on the availability and accuracy of data with which assessments are carried out. Despite this, the literature review showed that the data being used by F&B impact assessment solutions is currently disjunctured, with many providers using a mix of primary and secondary data often sourced from diverse agriculture inventory

databases (which also vary in methodology) (Ponsioen & van der Werf, 2017; Notarnicola et al., 2017; Cicke, Boone & Broekema, 2024). Furthermore, while in some cases primary data may be available, producers and suppliers can be reluctant, or do not have the right skills, to share it efficiently (Cicke, Boone & Broekema, 2024). If the availability of accurate and harmonised data is required for valid assessments, then not having access to such data is another barrier to harmonisation.

The expert interviewees aligned on the view that data harmonisation is a necessary part of F&B impact assessment and communication harmonisation, while also elaborating on why this continues to be a barrier for the sector (6/6). The issue of conceptual disagreements was highlighted here. Linder (Interview, 2025), for example, argued that choosing the minimum data requirements feasible for the chosen methodology was of critical concern, as scaling F&B impact assessment technologies with high data requirements from producers and suppliers will be much more difficult. This is because data collection can be burdensome for farmers, especially for those who need assistance with collecting and providing data which can create a high financial load (2/6). Global variability in having the means and technology to share data are also evident (2/6), as discussed in Section 5.2.4.

Beyond the methodological and practical challenges, a significant number of interviewees also shared the opinion that transparency with primary producers and suppliers is an added barrier to accessible and accurate data for F&B impact assessment and communication harmonisation (4/6). Corresponding to the secondary literature, Löscher (Interview, 2025) and Erhart (Interview, 2025) believed that farmers often either do not have the data to share, or if they do, are reluctant to share their primary data with the entire F&B value chain. Pierazzoli (Interview, 2025) added more insight here, sharing that in the experience of farm-level impact assessors, farmers are only willing to share information if it is clear what is going to happen with it and how it will benefit them. As such, expert opinion suggested that transparency in the sector needs to be improved and incentivisation and data security systems for farmers need to be put in place to get access to the data needed for F&B impact assessments (4/6). In the meantime, to compensate for the lack of available data the F&B impact assessment provider, inoqo has created what it believes to be the largest and most consistent database (193,000+ ingredient/country specific emission factors) based on statistical data, yet remains unsure about making this available to others in the sector (Linder Interview, 2025). Without a willingness to share data within and beyond the F&B impact

assessment and communication sector, however, data availability and accessibility will limit harmonisation processes.

Conceptual - communication

Consumer communication via impact labelling has added another layer of complexity for the F&B impact assessment sector (Cicke, Boone & Broekema, 2024) with many authors prescribing importance to food impact labelling in aiding food system transformation (Taufique et al., 2022; Notarnicola et al., 2017a; Mengual et al., 2024; Iraldo, Griesshammer & Kahlenborn, 2020). A harmonised label would need to balance accessibility and credibility for consumers and avoid creating additional confusion while shopping (De Bauw et al., 2021; European Environment Agency, 2023a).

Some experts, however, suggested the idea that while some solution providers are currently offering both F&B impact assessment and communication services simultaneously, sectoral focus and harmonisation efforts should first and foremost be centred on impact assessments alone (2/6). Boone (Interview, 2025), for instance, argued that harmonising impact assessments and communication are two separate issues, as consumer communication remains a “*nice to have*” asset for F&B businesses, while assessments are increasingly necessary for reporting on sustainability commitments made by businesses. Löscher (Interview, 2025) confirmed this from the grocery retailer perspective, revealing that they are a long way off from communicating impact data with consumers via labelling and first would want to work on making their offering more sustainable. He added that while sustainability departments at grocery retailers have historically sat in the communications department, recent societal shifts (see Section 5.2.3) mean that are now more often categorised as risk management (*ibid.*). As such F&B impact assessment is being prioritised over communication. This was also evident from the rest of the conducted interviews, where discussion primarily focused on assessment rather than communication, which was touched on by only a couple of interviewees in more detail. This may suggest that F&B impact communication is a topic which is popular at the research and conceptual level, but labelling implementation and thus harmonisation currently holds less relevance in real-world scenarios. Therefore, while harmonisation on consumer communication remains a barrier to overall sectoral harmonisation, it is arguably of less consequence, as impact assessment data and methodologies will need to be aligned first. As such unless otherwise noted, the rest of

the results presented in this chapter discuss primarily F&B impact assessment and keep communication in brackets to indicate this as a second step.

Resources

The idea that large amounts of financial resources have been spent and are a strain on the harmonisation of the F&B impact assessment (and communication) sector was only suggested by Cicek, Boone & Broekema (2024). Yet, this was a topic which many interviewees discussed (4/6), supporting the argument that this too is a barrier for sectoral harmonisation. High costs in terms of time, effort and money limiting the sector and its harmonisation were reiterated as limiting factors for the sector by Boone (Interview, 2025) in the online interview, but other experts shared similar views (4/6). Deconinck (Interview, 2025) and Erhart (Interview, 2025) pointed out that the complexity in harmonisation, for example understanding complicated and ever-changing regulations, as well as the significant financial and time resources needed for the process. From the technology provider perspective, Linder (Interview, 2025) highlighted how much solutions such as inoqo have already invested in their own work and that it is, therefore, not an easy decision to share this with others in the sector through harmonisation. Moreover, despite considering F&B impact assessment (and communication) providers to be the biggest drivers in the harmonisation process, most being start-ups with few resources available to invest in standardisation, hinders them in this regard (*ibid.*).

Despite little mention of this in the literature review on F&B impact assessment (and communication) this point is also supported by general sustainable transitions literature. Geels (2019: 190), for example, argues that green niche innovations face economic challenges and suffer from the ‘liability of newness’ which can reduce their access to financial resources as they have not yet achieved social acceptance. This is known as a lock-in mechanism which results in innovation being often incremental and path dependent (Geels, 2020). Thus, limited financial resources within the F&B impact assessment (and communication) sector may have a two-fold impact on harmonisation efforts. While technology solutions themselves on the one hand might be hesitant to harmonise due to the large amount of resources they have invested into their own individual projects (Linder Interview, 2025). Due to the lock-in mechanisms at play they also do not have surplus resources available to embark on the complex process of harmonisation alone (4/6). This

suggests that higher levels of strategic agency to support harmonisation processes may lie with regime actors (Miörner & Binz, 2021).

5.2.2 The Sociotechnical Regime Barriers

Table 3

Research results - the sociotechnical regime-level barriers and key expert interviews findings

Sociotechnical Regime Barriers (Secondary Literature)	Key Findings (Expert Interviews)	Stated by (Nº of Interviewees)
F&B businesses	Play a key role in harmonisation	6/6
	Currently not doing enough to fulfil this role	6/6
	Slow action as first working to better understand the topic	1/6
	Slow action as waiting for other actors to move first (eg. national / supranational governments)	4/6
	Slow action as waiting for a winning solution provider within the niche	1/6
	Reluctance to financially commit to sustainability	2/6
	Different actor views within this stakeholder group eg. sustainability vs. C-level employees	1/6
Primary producers	Interest groups could potentially resist F&B impact assessment & communication harmonisation	1/6
European Union (EU)	EU plays a key role in harmonisation and should be highly involved in the decision-making	3/6
	Some progress has been made by the EU towards harmonisation	3/6
	Complexity of EU protocols & standards limits harmonisation	1/6
	The new EU parliament (2024) is hindering harmonisation by deprioritising sustainability	6/6

Note. Author's own research results.

As sociotechnical transitions are carried out by multiple social groups and not in the niche alone, it is necessary to also examine the engagement of actors at the different levels and spatial scales of the MSP (Geels, 2019; Coenen, Benneworth & Truffer, 2012). Although regime actors can on the one hand be supporters of transitions, they can also act as barriers to sociotechnical transitions (Miörner & Binz, 2021). In this case, they are described as incumbent actors who reproduce, maintain and improve the existing regime against the interest of niche innovation in question (Geels, 2020). Examples include firms, policy-makers and regulators, users and special-interest groups (Geels, 2019). Therefore, key stakeholders of the European food system are examined in this section to explore their role in the harmonisation of the F&B impact assessment (and communication) sector. Specifically, whether they can be considered incumbent actors or supporters of the harmonisation process and their potentially varying levels of agency according to the secondary literature and expert interviews.

F&B businesses

The F&B industry is highly diverse and fragmented, with 95% of businesses being SMEs (Sovacool et al, 2021). Despite this, it is only a small number of large multinationals which hold a disproportionate influence on the industry, with 50 manufacturers responsible for 50% of global food sales (Mengual et al., 2024). Grocery retailers in particular are considered highly influential ‘middle-of-the-chain’ actors, given their significant role in shaping what and how food is produced and consumed (Madre Brava, 2024: 6). As discussed in Chapter 2, the secondary literature therefore considers the potential impact of F&B businesses (such as grocery retailers) on food system transformation extensive and unique (Ellen MacArthur Foundation, 2021; Mengual et al., 2024; Bezares, Fretes & Martinez, 2021).

Research has shown that there is increasing interest across the industry regarding sustainability and for F&B impact assessment *and* communication (Arayess & de Boer, 2022). For example, early commitment to impact assessment and reporting was shown by large grocery retailers including Tesco, Casino and E.Leclerc (Taufique et al., 2022). Over the last couple of years, others such as Colruyt Group (2025) and Albert Heijn (ESM, 2024) have continued the trend. However, overall a striking implementation gap remains between the sustainability commitments of F&B businesses and tangible action (Ellen MacArthur Foundation, 2021). While Tesco on the one hand had announced that it would label all 70,000 of its products it soon abandoned the product, citing high costs as the reason (Taufique et al., 2022). Albert Heijn on the other hand, are sharing the climate impact of 1,100 of their private-label products (ESM, 2024). However, this will be only a fraction of their total assortment, as grocery retailers typically have tens of thousands of products (Cicek, Boone and Broekema, 2024). The secondary literature suggested that limited motivation to spend large amounts of capital on sustainability investments is in fact a trend in the F&B industry and could explain this implementation gap. Compared to other industries, overall F&B businesses spend significantly less on all types of innovation and tend to be risk averse and cautious (European Environment Agency, 2023a). Sovacool et al. (2021) highlight that when firms do innovate this is focused on new product development. For example, by 2021 the industry had invested more on developing and selling energy drinks, compared to R&D for energy and sustainability (*ibid.*). Overall, this suggests that niche innovations, especially in the sustainability sector, face high financial entry barriers to the F&B industry (European Environment Agency, 2023a). Yet, if F&B businesses are not willing to invest to cover the

financial burden which F&B impact assessment (and communication) harmonisation demands, they could be considered incumbent actors in the harmonisation process.

All the interviewees agreed that while F&B business (and grocery retailers specifically) are important stakeholders in the F&B impact assessment (and communication) harmonisation process and could have a big impact by funding and pushing the topic forwards, not enough is being done by businesses to fulfill this potential (6/6). Expanding on this, the experts painted a more complicated picture compared to the secondary literature, suggesting there was more behind F&B businesses simply being reluctant to invest in new technologies. Key themes were that F&B businesses are waiting until they have a better understanding of the topic or until other actors move first (5/6). Löscher (Interview, 2025) believed that retailers are not yet a driving force for harmonisation as they are too busy with internal discussions on the topic, resulting in harmonisation with other businesses on the topic still being out of reach. Löscher (Interview, 2025) stated: *“I think the retailers play a key role [...] but it’s a little bit of a longer journey still”*, suggesting that the topic may in fact be out of reach for some time. Boone (Interview, 2025) and Erhart (Interview, 2025) on the other hand understood from their discussions with F&B businesses, that many are waiting for national or supranational governmental decision-making on the topic which is also slowing down the process (see below). For example, Boone (Interview, 2025) cited the French case: *“Recently a very broad group of French retailers asked the French government in an official letter to set one methodology and one tool so they know what they should use”*. Pierazzoli (Interview, 2025) expanded on this, stating that if businesses are not obliged by law to move on this topic, the likelihood that it will happen is very slim. As well as waiting for government action, Linder (Interview, 2025) argued that many F&B businesses are also waiting for developments within the niche to become clearer. But waiting for a winning F&B impact assessment (and communication) solution in the sector or for government guidelines is simply preventing F&B businesses from taking action on harmonisation themselves (*ibid.*).

Notwithstanding, Erhart (Interview, 2025) highlighted how agency and engagement between company teams varies extensively, meaning actors within businesses can be distinguished from one another and F&B businesses should not always be viewed collectively. For example, whereas sustainability teams at grocery retailers are keen to engage on this topic, company CEOs who hold more power in the business, are often more concerned about short-term economic sustainability and thus view harmonisation with less urgency (*ibid.*). In

general, business strategies tend to be interested in the next 12-18 months rather than the next ten years (Pierazzoli Interview, 2025). This supports the findings of the secondary literature, suggesting that reluctance to financially commit to F&B impact assessment (and communication) harmonisation by those with more agency in F&B businesses is creating a barrier for sectoral harmonisation. Moreover, the expert interviews indicated that slow activity from the side of F&B businesses also can be linked to a general perception that others such as the technology providers themselves or governments should be responsible for harmonising the F&B impact assessment (and communication) sector. This responsibility shifting means that existing structures against which the niche struggles continue to be reproduced and maintained (Geels, 2020), suggesting that F&B businesses (overall) are incumbent actors in this transition process.

Primary producers

Some secondary literature suggested that primary producer interest groups can be powerful protesters against change which can slow down or halt progress in sustainability transitions (Stoll-Kleemann & O’Riordan, 2015; Ruggeri Laderchi et al., 2024). In contrast, it was noted by Mengual et al. (2024) that small-scale farmers are often subject to market pressures and therefore do not have the required agency to drive change in the food system (see Section 5.2.4). The reluctance of primary producers to share farm-level information with F&B impact assessment (and communication) solutions due to limited agency and lack of transparency in the sector was already noted in Section 5.2.1. Yet, insight offered by Deconinck (Interview, 2025) provided supporting evidence for the potential of primary producer interest groups in also becoming incumbent actors to F&B impact assessment (and communication) harmonisation. Citing the example of the meat sector, Deconinck (Interview, 2025) explained how their preference for weight-based allocation rules for the EU’s PEF guidance led to the collapse of the EU’s pilot phase (Technical Secretariat for the Red Meat Pilot, 2019; Spurek 2020; Wilfart et al., 2021). This highlighted the potential power of primary producer interest groups in campaigning against transformative change in the food system and the resistance which F&B impact assessment (and communication) solutions might come across as they attempt to transition into the sociotechnical regime. However, despite this stakeholder groups’ reluctance for data sharing (see Section 5.2.1), there is no real evidence of primary producers actively halting F&B impact assessment (and communication) harmonisation in a similar way. Therefore while the need for increased transparency and assistance for data collection

remains a barrier (see Section 5.2.1), overall, primary producers arguably cannot be viewed as an incumbent actor group directly hindering the harmonisation process.

European Union

Governmental policies are hugely important in creating and maintaining food systems (Vermeulen, 2022; Eshel, 2022). As this paper is analysing European F&B impact assessment (and communication) providers only, the governmental policies and mechanisms considered remain at the European scale. Consisting of 27 countries, the largest governing body in Europe is the EU - a unique economic and political entity as well as the world's biggest single-market (Publication Office of the European Union, 2024). Among the EU's key responsibilities are the development and creation of innovation policies promoting new solutions in areas including climate and environmental protection (European Commission Directorate-General for Communication, 2017). The European Environment Agency (2023a) states that European public policies and institutions play a critical role in backing innovation for sustainability transitions, especially through stimulating niche innovation. Because of the suggested barriers in the niche and the inactivity of F&B businesses, it could be argued that Europe's government institutions need to take charge to support F&B impact assessment (and communication) solutions to break through to the regime.

A number of EU policies, initiatives and directives connected to the F&B impact assessment (and communication) sector were already highlighted in Chapter 2, including the Farm to Fork Strategy, Biodiversity Strategy, CSRD, GCD and PEF Guide. Discussing the impact of these policies, the secondary literature suggests that while in general the EU has promoted policies which work towards food sustainability, there are many inconsistencies, incoherencies and policy gaps, making the EU food and agriculture-related policy complex and fragmented (Galli et al., 2018; Galli et al, 2020; European Environment Agency, 2023b; Mengual et al., 2024). While seemingly supportive of food system transformation, the complex policy landscape combined with measures doing little to support niche actors and innovations in the F&B industry, have limited the transitional potential of policies thus far (Mengual et al., 2024; European Environment Agency, 2023a). With regards to PEF and PEFCR, researchers have also found that these standards have disadvantages and are not the answer to F&B impact assessment (and communication) harmonisation (European Environment Agency, 2023a; Cicke, Boone & Broekema, 2024; Boone et al., 2023). For instance, the methodological approaches of the PEFCR are inconsistent meaning product

categories cannot be compared once assessed (Boone et al., 2023). Overall, according to the secondary literature, though the EU has appeared to support food system transformation and F&B impact assessment (and communication) in theory, the practical implementation of their policies appears complex, as well as limited in their support of niche innovations.

Over the past year, the EU's policy landscape has also undergone significant changes due to the appointment of a new EU parliament (European Parliament, 2025), which has shifted the agenda and vision of the EU as a whole to the far-right of the political spectrum (see Section 5.2.3) (van Rij et al., 2024; Mathiesen et al., 2025). This change is seen in the EC's 'Vision for Agriculture', setting out its vision for Europe's food system for 2040 and beyond (European Commission, 2025c). While the word 'sustainable' itself still appears frequently throughout the text (*ibid.*), environmental campaigners have warned that critical recommendations have been omitted (Niranjan, The Guardian 2025). Moreover, the environmental aims which have been included remain ambivalent, without specific outcome-based indications (van Zanten, Duncan & van Meijl, 2025). In relation to F&B impact assessment (and communication), this is exemplified in the Vision's contradicting and ambiguous goals. While the EC is aiming to future-proof the agri-food sector by for example helping customers make informed food choices based on trustworthy information. At the same time, they would also like to reduce red tape by limiting the bureaucratic burdens of sustainability reporting, streamlining EU sustainability standards and phasing in a new voluntary benchmarking system for on-farm sustainability assessments (European Commission, 2025c). Yet, rolling back on *mandatory* sustainability reporting may make transparency with customers more difficult. Scientific opinion agrees that the EU's new vision lacks a holistic food system approach and the focus on competitiveness and simplification (sustainability being listed after these commitments) points towards a process of deregulation, undermining socio-environmental protections and therefore, a sustainable food system transformation (van Zanten, Duncan & van Meijl, 2025; Gonzalez-Garcia & Lupin, 2025). This is already seen in the reduction of CSRD objectives as part of the EU's recent Omnibus Proposal for example (WWF European Policy Office, 2025).

While there was not yet any secondary data available on how the EU parliament's change in agenda and priority has affected the F&B impact assessment (and communication) sector specifically, the conducted expert interviews provided up-to-date insights. Before delving into these findings, it should be noted that only half of the interviewees agreed that the EU plays a

very important role in the harmonisation of the F&B impact assessment (and communication) sector and that they must be highly involved in any future harmonisation solution (3/6). In this vein, there was also some recognition for what the EU has already achieved regarding this topic. For example, Boone (Interview, 2025) revealed that the EC is currently updating the database which supports PEF with much more detailed data. Related to this, Deconinck (Interview, 2025) pointed out the EU's development of a new umbrella approach for PEFCR which will make product comparison across categories easier (ESFC, Newsletter, July 2025c). In addition, Linder (Interview, 2025) suggested that the EU's commitment to the Empowering Consumers Directive (see European Commission, 2024) might lead to more consolidation in consumer labelling and thus F&B impact assessment methodologies. Erhart (Interview, 2025), however, echoed the secondary literature stating that the complex landscape of EU protocols and standards suggests that the EU itself has not been harmonised on the topic of F&B impact assessment (and communication) over the last years, creating a further barrier to the sector's harmonisation.

Despite the number of positive developments mentioned, overall all interviewees agreed that the election of a new EU parliament in 2024 has drastically impacted the F&B impact assessment (and communication) sector's hopes for harmonisation (6/6). The expert interviews suggested there is fear among sectoral stakeholders that the EU will further reduce its involvement in food system transformation, meaning it will no longer actively push for F&B impact assessment (and communication) harmonisation and thus other routes to harmonisation need to be explored (6/6). This concern is summarised by the following two interview quotes. Firstly: *"I don't expect that the European Commission will make massive [...] progress into any of these directions because their number one priority is really increasing competitiveness and any additional regulation with regard to environmental impact of products is seen as an additional barrier for businesses to succeed."* (Linder Interview, 2025). Secondly: *"A few years ago I had a bit of hope that something like that [a mandatory solution] would be possible, and they also had a food labelling framework on the table. I think that's completely off the table, and currently we're moving the other way [...] and also in many national governments you see the same movement, with the relaxing of national demands. There's more focus on competition and competitiveness. It has a clear influence [on the harmonisation process]."* (Boone Interview, 2025). These quotes show how instrumental the EU could be in the harmonisation process, but by prioritising economic

competitiveness, the EU is becoming more of a barrier than enabler of harmonisation. This reflects the findings of the secondary literature research.

In the context of limited resources in the niche (see Section 5.2.1) and other regime players such as F&B businesses suffering under an implementation gap, without support from the EU a lock-in mechanism arguably ensues and the F&B impact assessment (and communication) sector is stopped from moving forwards (Geels, 2020). Geels (2019) argued that to encourage a sustainability transformation, policymakers do not have to passively wait for the suitable conditions to emerge, but can take an active role in nurturing these conditions. As this research proposes that the EU is doing the opposite and is rather favouring the interests of incumbent stakeholders within F&B businesses (Geels, 2020), it indicates that the EU itself is also an incumbent actor in F&B impact assessment (and communication) harmonisation.

5.2.3 The Landscape Barriers

Table 4

Research results - the landscape-level barriers and key expert interviews findings

Landscape Barriers (Secondary Literature)	Key Findings (Expert Interviews)	Stated by (№ of Interviewees)
Consumer preferences	Consumer attitudes could have a significant impact on harmonisation	1/6
	Preferences & lack of interest in the topic currently limiting consumer engagement with harmonisation	2/6
	Questioning whether consumers should bare any responsibility for sectoral harmonisation	2/6
Political shifts and shocks	Sustainability is off the political agenda - food system transformation is being deprioritised	5/6
	Russian threat in Europe means short-term food security prioritised over long-term food security	1/6
	F&B sustainability managers can no longer use EU regulation to push for harmonisation	1/6
	F&B SMEs no longer have to report on sustainability activities - large company reports thus based on inaccurate data	1/6
	Political changes need not affect harmonisation progress as much as believed by some	3/6
	Reframing need for harmonisation towards resilience (rather than sustainability) key for remaining relevant	3/6

Note. Author's own research results.

Consumer preferences

The sociotechnical landscape refers to elements considered outside of the system in question, but which still have an influence on the system's status quo (Linnér & Wibeck, 2019). This

includes slow-changing developments in societal norms, macro-economic trends and geo-politics, as well as external shocks such as war or financial crises (Geels, 2019). As consumer practices reflect societal norms (Melnik, Carrillat & Melnik, 2021), consumers have the potential to exert considerable influence on shaping sociotechnical transitions when acting collectively on a topic (Mengual et al., 2024; European Environment Agency, 2023a). Therefore, over the last couple of decades, the role of consumers as food system change agents has received increasing interest in transformation literature (Galli et al., 2020). In the context of the F&B impact assessment (and communication) sector, however, Notarnicola et al. (2017a) point out that the average customer lacks specific food sustainability and LCA knowledge to have an interest for, or influence on, the sector. The experts interviewed were asked about this, in order to better understand the extent to which consumers could be involved in this particular food system transition.

While Linder (Interview, 2025) argued that consumer attitudes could have a significant influence on the sociotechnical regime and niche by demonstrating support for sustainability labelling, other experts were more in line with the view of Notarnicola et al. (2017a) (4/6). Deconinck (Interview, 2025) noted that customers should ideally be involved in the harmonisation process, but that current consumer preferences and the complexity of the topic are barriers to consumers pushing for food system transformation in Europe. Similarly Pierazzoli (Interview, 2025) argued that many consumers do not have the time, means or knowledge to reflect on the sustainability of their food. Löscher (Interview, 2025) built on this distinguishing between different types of consumers: those shopping, for example, at a discounter store (such as Schwarz Group's supermarkets Lidl and Kaufland) who will be prioritising price over sustainability more than those shopping, for example, at an organic food store (*ibid.*). Consumers could, however, have an impact on the harmonisation process via indirect channels such as civil society organisations or environmental NGOs which hold the technical knowledge needed for conversations around F&B impact assessment (and communication) (Deconinck Interview, 2025). Yet notably, it was also questioned whether pushing for F&B impact assessment (and communication) should even be the responsibility of the consumer, but rather the role of sociotechnical regime actors who hold the most agency in making the food system more sustainable in general (2/6).

Overall, the data collected suggests that though consumers have the potential to have large scale impact on food system transformations, they are not currently agents of change in the

case of F&B impact assessment (and communication) harmonisation. To enable consumers to play a role in the process, there would need to be a shift in wide-scale consumer preferences and the macro-economics influencing consumers' buying behaviours. This in turn could put pressure on the food industry to prioritise this topic. Yet, as highlighted in Section 5.2.1, it is also important to consider whether consumers need to play an active and direct role in the harmonisation process at all, as other stakeholders especially in the sociotechnical regime may have more agency here. If consumer preferences were a strong lever in the F&B impact assessment (and communication) harmonisation process, lack of engagement on this topic could be considered a significant barrier. However, as academic and expert opinion veers towards the opposite view, consumer preference not actively supporting F&B impact assessment (and communication) cannot be considered as a considerable barrier relative to the other barriers discussed in this thesis.

Political shifts and shocks

Gibbs and Jensen (2022) argue that changes in politics can close any windows of opportunity for niche innovations to enter the regime, as sectors can be delegitimised according to the agenda of the given political movement. As discussed in Section 5.2.2, EU parliamentary elections occurring just over a year ago means no secondary literature on its influence on F&B impact assessment (and communication) sectoral harmonisation could be found for this research. The significance of far-right electoral gains (van Rij et al., 2024) on the EU itself could only be inferred by examining EC documents such as the new 'Vision for Agriculture' (European Commission, 2025c). Though as suggested by Gibbs and Jensen (2022), a change in politics has the potential to not only produce policy revision but can also have a wider-reaching impact on society through modifying narratives and subsequent delegitimation of previously accepted ideas. External shocks such as war can have a similar effect on societal concerns and priorities (Geels, 2019). The data from the conducted expert interviews filled in gaps regarding the extent to which the recent political shifts and shocks in Europe have impacted the potential for F&B impact assessment (and communication) harmonisation.

Among the interviewees there was considerable agreement that as sustainability is off the political agenda within Europe, this has in turn led to a deprioritisation of food system transformation from F&B businesses, too (5/6). According to the experts, this is because business commitment to sustainability reporting and improvement has been primarily driven

by pressure to comply with EU directives such as the first CSRD proposal (5/6). As Erhart (Interview, 2025) stated: *“Pushbacks on CSRD and GCD have made the topic less of a priority, as many companies are driven by what they need right now and less about what they need in the future”*. Löscher (Interview, 2025) supported this statement by noting that in the past the sustainability department at Schwarz Gruppe, for example, had used EU regulation to persuade top-level managers about the need for change. This driver has now been withdrawn, making the job of the sustainability department harder in this regard (*ibid.*). Moreover, Erhart (Interview, 2025) highlighted that even though, according to the current CSRD simplification proposal, large multi-nationals will still need to report on their sustainability activities, their F&B suppliers will no longer have to collect or report on theirs. This will mean that assessments and reports from large companies who are still required to comply with CSRD will continue to be based on inaccurate data as most suppliers will not voluntarily invest in collecting their impact data (*ibid.*). Contextualising the switch in agenda, Boone (Interview, 2025) argued that the war in Ukraine and the Russian threat in Europe has influenced not only government behaviour but also businesses, as short-term food security has been prioritised over sustainability. This suggests that the reason why F&B businesses are not providing the necessary investment which F&B impact assessment (and communication) providers need in order to harmonise is in part driven by landscape-level political shifts and shocks. Barriers to sectoral harmonisation thus arguably exist at every level of the food system.

Some interviewees, however, stated that changes in the European political landscape have not impacted overall attitudes to F&B impact assessment (and communication) as much as might be expected (3/6). The current reframing of sustainability narratives towards ideas of resilience in the F&B industry was cited as one way to keep momentum for business action up (3/6). Löscher (Interview, 2025), for example, said *“Because of the political situation we are in, everyone says sustainability is not important anymore and it was a ‘mega trend’ [...] but now the storytelling has just changed”*. Löscher (Interview, 2025) expanded on this, by explaining how in grocery retailer governance structures sustainability teams were historically considered part of the communications department, but now are located in risk management. Therefore, through a changing discourse, pressure to decarbonise F&B companies (via for instance, F&B impact assessment and communication) is now rooted in future-proofing this very climate-dependent sector (2/6). Deconinck (Interview, 2025) believes this is leading to a rise in ‘green hushing’, where companies quietly continue to

move forward with environmental work out of necessity and independent of political changes. This suggests that though political shifts and shocks at the landscape-level may have delegitimised F&B impact assessment (and communication) harmonisation in its original discourse form, a change in agenda does not yet need to be a barrier to its success. Thus, in order to stay relevant the sector may just need to change its storytelling (3/6). In turn, this does not mean that harmonisation and the success of the sector in contributing to a sustainability food system transformation is now out of reach.

5.2.4 The Multi-Scalar Barriers

Table 5

Research results - the multi-scalar barriers and key expert interviews findings

Multi-Scalar Barriers (Secondary Literature)	Key Findings (Expert Interviews)	Stated by (№ of Interviewees)
Physical complexity of the global food system	Complexity & scale of food system is barrier to harmonisation	4/6
	Geographical differences in land, farming & processes methods make harmonised assessment methodologies difficult	3/6
	Harmonised methods globally could decrease the accuracy of F&B impact assessments due to physical differences	2/6
	Interconnectedness & interdependency of the sector with other industries	1/6
Differing political and economic realities within Europe and beyond	Every country & retailer across Europe is at a different point with regard to this topic	3/6
	Data availability differs between regions, countries & businesses depending on economic realities	4/6
	A harmonised system based on high levels of data maturity would be inaccessible to many stakeholders	2/6

Note. Author's own research results.

In the MLP framework (as discussed in Chapter 3) only three analytical levels are used to understand sociotechnical transitions (Geels, 2019). These are the levels which have already been addressed thus far: niche, sociotechnical regime and landscape. While some authors have referred to 'local-global' processes when comparing the niche and landscape levels, these remain socio-cognitively bounded in meaning (Coenen, Benneworth, Truffer, 2012). 'Global' from this view relates to broader 'imagined' communities which are coordinated remotely by 'local' groups who have initiated a transition by shifting their socio-cognitive perspectives (*ibid.*). This omits the notion that actors and processes across different geographical territories and scales are often interdependent, meaning a transition cannot transpire independently of other geographical realities (Carvalho & Lazzerini, 2018).

Moreover, EG writers note that by not acknowledging geography in the MLP, the ‘global’ is subsequently made everywhere, suggesting that any one sustainability transition can also happen anywhere (Carvalho & Lazzerini, 2018; Coenen, Benneworth, Truffer, 2012; Miöner & Binz, 2021). In order to create a full picture of the barriers which limit the sectors’ harmonisation, this section will acknowledge the multi-scalar networks, institutional structures and geographies of the global food system within which the F&B impact assessment (and communication) sector sits (*ibid.*).

In Chapter 4, the process of defining the barriers facing the F&B impact assessment (and communication) sector before conducting the expert interviews was described. After reading and analysing the secondary literature, for the multi-scalar factors these were found to be: the globalised F&B industry, global data collection issues, and EU-wide country differences in legislation and capacity. While these are all still relevant points and all will be discussed in this section, after reviewing the content of the expert interviews, the framing of the barriers were adjusted for more clarity and to avoid crossover. The following two barriers will now be discussed: the physical complexity of the global food system, and the political and economic differences within Europe and beyond.

Physical complexity of the global food system

The F&B impact assessment (and communication) sector is part of the global food system, which spans many scales, sectors and comprises all social and technical systems which contribute to making, distributing and using F&Bs (Sovacool et al., 2021). This system is so complex and globalised that it has a ‘geographical spread’ unlike any other and only continues to grow (Zeb, Soininen & Sozer, 2021; Mengual et al., 2024; Sovacool et al., 2021: 3). Over the past 25 years, the volume of international trade for agricultural goods for example, has grown by a factor of nine (Popp, 2022). Adding to this, the food system does not exist in isolation and is inherently interconnected with other systems such as energy, finance, health, transport and technology (Sovacool et al., 2021). It should therefore transpire that the global, multi-scalar nature and physical characteristics of the food system are taken into account in F&B impact assessment (and communication) methodologies. Yet, LCA models in the past have typically been mostly non-spatial and temporal which has greatly limited the accuracy of assessments (Notarnicola et al., 2017a). When discussing F&B impact assessment (and communication) harmonisation and its barriers, therefore, this omission and the multi-scalar nature of the food system must also be examined.

The results of the conducted expert interviews suggest that one of the main challenges of the harmonisation of the F&B impact assessment (and communication) sector is the complexity and scale of the food system itself (4/6). This is largely due to geographical differences in land, farming methods and processes globally which make it an extremely difficult industry to measure in terms of sustainability (3/6). For example, different geographies have different characteristics which can result in considerable variability in data for the same crop (Pierazzoli Interview, 2025; Notarnicola et al, 2017a). These physical differences have exacerbated methodological discussions, as some argue that applying the same harmonised methodology to assess products produced across different geographies can cause problems in the accuracy of the assessments (Deconinck Interview, 2025). This could be remedied through a country-specific assessment methodology which takes local factors into account, for instance the varying needs of the same crop in different continents (2/6). Yet, having varying approaches across countries and continents could be considered a trade-off to harmonisation itself and is therefore still a contested issue (2/6). Deconinck (Interview, 2025) also highlighted the significance of the interconnectedness of the food system with other sociotechnical systems for F&B impact assessment (and communication) harmonisation. To ensure comparable results across F&B products, the same impact assessment methodology or allocation rules will also need to be used in interdependent industries such as the chemical fertiliser sector (*ibid.*). This supports the secondary literature (e.g. Sovacool et al., 2021) and validates a further challenge for F&B impact assessment (and communication) harmonisation.

Therefore, the physical complexity of the global food system brings with it a number of challenges to consider for those leading the harmonisation process. As nature cannot be considered an human actor, it arguably cannot be considered an incumbent actor in the same way stakeholders such as F&B businesses or the European Union are. However, the added complexity of the system at hand makes conversations concerning harmonisation more difficult and may be the source of methodological disagreements in the niche.

Differing political and economic realities within Europe and beyond

F&B impact assessment (and communication) writers have argued that one obstacle to harmonisation within the sector remains the varying national standards, policies and political visions across Europe (Cicke, Boone & Broekema, 2024). For example, while in 2020 France

announced that F&B environmental labelling would become mandatory within five years (Tiboni-Oschilewski et al., 2024), political and economic capacity for such action varies significantly across Europe (Cicke, Boone & Broekema, 2024; Galanakis, Daskalakis & Galanakis, 2025). Economic capacity can be linked to the dualistic structure of the F&B industry in Europe (and beyond) (Sovacool et al, 2021; European Environment Agency, 2023a). Though large multinationals hold significant influence, small and medium-sized enterprises (SMEs) account for 99.1% of all F&B companies in Europe, which are considerably less economically secure compared to their multi-national counterparts (*ibid.*). This suggests that political will and economic ability to invest in F&B impact assessment (and communication) cannot be generalised across Europe, but is spatially dependent and can vary from business to business.

The results collected from the expert interviews support this view (3/6). While from the NGO perspective, Erhart (Interview, 2025) stated it seems every country in Europe is at a different point with regards to the topic, Löscher (Interview, 2025) affirmed this from the retailer perspective too. Schwarz Gruppe operates in over 30 countries worldwide and have noticed a significant difference between the business locations which would be ready for harmonisation and those which are not (*ibid.*). Löscher (Interview, 2025), remained positive that harmonisation will be possible globally eventually, but that it will take some time until this occurs everywhere.

The interviews showed that varying economic realities across geographies and F&B industry stakeholders also challenges F&B impact assessment (and communication) harmonisation, as it affects data availability between regions, countries and businesses (4/6). Boone (Interview, 2025) argued that though better F&B impact assessment (and communication) methodologies are built on more detailed information, not all regions in the EU and beyond have the capability to collect and share such data. Thus: *“Harmonisation should be built on the weakest link”* (Boone Interview, 2025). Other experts agreed, explaining that as data collection and availability varies significantly from country to country (even within the EU alone), it makes harmonisation noticeably more arduous and raises questions around equal access to the solution (2/6). Deconinck (Interview, 2025), for example: *“If you will insist on the same level of maturity of data, then clearly you will be disadvantaging the areas that are probably already economically disadvantaged anyway, that wouldn't have the same level of human capital, technological capital, and data availability”*. Deconinck (Interview, 2025)

expanded with an European example - while there are 9 million farms across the EU, one third are smallholdings in Romania (Eurostat, 2022). The scale of farming and digitalisation on such farms in Romania is thus completely different compared to high-tech agricultural enterprises in, for example, the Netherlands where carbon footprint calculations are the norm (Deconinck Interview, 2025). As explained in Section 5.2.1, data collection can come at a high cost for farmers (2/6). And yet, most food world-wide is produced by smallholder farms who cannot afford to collect all the required data for accurate F&B impact assessment (and communication) (Linder Interview, 2025). Because of these differences in capacity, it was reasoned that the chosen harmonisation solution needs to work for all involved stakeholders, ensuring that smaller and less financially secure producers can also meet the criteria (Deconinck Interview, 2025). Specifically, it should arguably be built with those with the least data and economic agency in mind, so that all the required supply-chain actors can partake in F&B impact assessment (and communication) (Boone Interview, 2025).

Differing physical, political and economic realities within the globalised food system therefore suggests that a harmonised F&B impact assessment (and communication) solution cannot only consider what is possible methodologically, but also what is feasible to implement across Europe and beyond. Though better methodologies are built on more detailed information, insisting on a high level of data maturity would only make harmonisation inaccessible to the most economically disadvantaged actors within the food system (2/6). Thus, taking a multi-scalar perspective suggests that a harmonised approach today is possible, but that it must be built based on the stakeholder with the smallest political and financial capacity to ensure accessibility, equality and subsequent effectiveness of the F&B impact assessment (and communication) sector. This does not mean that a harmonised solution cannot be improved upon in the future. The interview data indicates that large multinational F&B businesses are willing to work with their suppliers in the future to consistently improve data availability over time (Löscher Interview, 2025). Yet, both financial assistance and technical support for primary producers, suppliers and SMEs across the whole globalised food system will be necessary to achieve this.

5.3 The Opportunities for Harmonisation

This section responds to the second research sub-question: To what extent can emerging coalitions be considered opportunities for addressing these barriers and how can they

contribute to the harmonisation process? As discussed in Section 2.5, coalitions have historically been pivotal in food system transformation (Swinnen & Resnick, 2023). Transitions literature has been an advocate for coalitions to support the emergence of innovations, as these can pool together different resources, knowledge, skills and political connections (European Environment Agency, 2023a). Moreover, in the case of competing ideas they can facilitate shared vision building and thus create directionality for the given innovation (*ibid.*). As such, it has been suggested that coalitions could aid the process of F&B impact assessment (and communication) harmonisation too (Bezares, Fretes & Martinez, 2021; OECD, 2025; Deconinck, Jansen & Barisone, 2023; Cicek, Boone, Broekema, 2024). In the case of the F&B impact assessment (and communication) sector, emerging coalitions include the ‘International Alliance for Food Impact Data’ (EIT Food, 2024), the ‘Life Eco Food Choice Project’ (Ademe, 2025), the ‘European Sustainable Food Coalition’ (ESFC, 2025a) and the UK-based ‘BRC Mondra Coalition’ (Mondra, 2025).

Table 6

Research results - the opportunities for harmonisation and key expert interviews findings

Opportunities for Harmonisation	Key Findings (Expert Interviews)	Stated by (Nº of Interviewees)
Coalitions for harmonisation	Collaboration between actors is necessary for harmonisation in the current political climate	6/6
	Importance to include all relevant stakeholders	2/6
	A bottom-up solution could bring advantages eg. functionality for solution users	3/6
	Coalitions also have costs eg. time & money	1/6
	Coalition should be led by technology providers	1/6
	Coalition should be led by F&B businesses	1/6
	Coalition should be led by academia	1/6
	Fragmentation among the coalitions now occurring & potentially hindering progress	2/6
	A coalition of coalitions could build a harmonised framework globally	4/6

Note. Author’s own research results.

All six experts interviewed agreed with the findings from the secondary literature analysis. Namely, that collaboration between actors across the F&B industry and the F&B impact assessment (and communication) providers themselves is a necessary step for the harmonisation process (6/6). Alternative routes to harmonisation were also acknowledged, for instance either being EU-led or via one solution player emerging as the strongest in the market (3/6). Yet, given the current niche barriers (see Section 5.2.1) and political shifts (see Section 5.2.3) these are considered unrealistic for the time being, making cooperation at present even more important than ever before (3/6). The benefits of a bottom-up initiative

were highlighted suggesting that, despite it perhaps being the only realistic way forward for the industry, it could also be to the F&B industry's advantage. For example, a cross-industry coalition could ensure a F&B impact assessment (and communication) solution which actually works for the whole F&B industry, unlike top-down guidelines which have often omitted functionality in the past (PEF was cited as one example) (3/6). Moreover, as suggested in the literature, Boone (Interview, 2025) pointed out that combining each stakeholder's strengths and resources is a promising way to create a shared solution. The resulting harmonised outcome could then be presented as a ready-made protocol to the EC, if / when the political landscape shifts back towards a sustainability-supporting agenda in the future (3/6). Deconinck (Interview, 2025) claimed that such a process would fit into the policy-making trend of the EU: *"What often happens is that if you're in the public sector and you're going to try and make a regulation or a standard is that you're not going to reinvent the wheel. You're ideally going to look around and take something that is there already"*. Linder (Interview, 2025) went so far as to say that this is already on the table with regards to F&B impact assessment (and communication): *"The commission is telling us [the ESFC] [...] that if we are able to bring the industry together and if we're able to demonstrate from north to south and east to west that it works and that we can generate impact, they would be more than happy to basically build on that for future regulation, once the environment is a bit more favourable [...], but I don't envision that to happen in the current term of the commission"*. If this is the case, it suggests that coalitions could significantly contribute to harmonisation processes, by aligning the sector on a joint solution which could be implemented in the future.

However, in spite of the potential effectiveness of emerging coalitions in harmonising the F&B impact assessment (and communication) sector, they also face a number of challenges which may limit their agency in the harmonisation process. Firstly, similarly to niche dynamics, opinions diverged regarding who exactly should lead such a bottom-up coalition - from the technology providers, to F&B businesses, to academia (3/6). Secondly, while the importance of every stakeholder being involved is considered critical for a successful coalition, despite a lot of interest and positive momentum, this has not yet materialised in existing coalitions (2/6). Thirdly, Boone (Interview, 2025) highlighted that although more cooperation is always needed, it also comes at a cost, including time and money. Finally, while many coalitions have been established in order to combat fragmentation in the F&B impact assessment (and communication) sector, ironically, fragmentation in this effort has

now also started to occur (2/6). This leads to *“The risk is that you end up with three or four initiatives all trying to harmonise things differently”* (Deconinck Interview, 2025). For example, Linder (Interview, 2025) argued that the ESFC was initiated as there had been disagreement in the methodology supported by another coalition working on similar objectives. Having varying coalitions creating varying approaches, however, will again not lead to a harmonised outcome and will fall prey to repeating the very issue which was set out to be resolved (2/6). In order to address this, it is therefore important that the coalitions themselves also converge on their work to avoid duplication and ensure that a common vision is being pursued (2/6). In other words a coalition of coalitions.

According to the experts interviewed, a number of coalitions and key stakeholders are in exchange regarding the very idea of a coalition of coalitions (4/6). The currently coined ‘Global Sustainability Transition Alliance’ (GSTA), among others includes the ESFC, BRC Mondra Coalition, Wageningen University & Research, Waste & Resources Action Programme (WRAP) and Science-based-targets initiative (SBTi) (Linder Interview, 2025). The aim of the global coalition is to align all the member’s efforts in order to build a harmonised framework for F&B impact assessment (and communication) which could be applicable across Europe and beyond (2/6). By drawing everyone’s resources together, holding all stakeholders to account and creating a solution which keeps the globalised food system in mind, a global coalition has the potential to counter niche- and regime-level as well as multi-scalar barriers. While each organisation may lack the individual agency to drive harmonisation, together they could make the opportunities needed to create a joint solution ready for international employment once a window of opportunity opens up (for example, a political shift towards supporting F&B impact assessment and communication in Europe). Nonetheless, the GSTA currently only remains in the planning stages, thus this conclusion remains merely theoretical and ongoing assessment will be necessary. Moreover, though fragmentation will be addressed, the challenges surrounding who leads the coalition of coalitions, the financial and time costs and how to ensure all F&B impact assessment (and communication) stakeholders are involved remain open.

5.4 The Key Research Results and Implications

So far, this chapter has presented the results of the conducted research into the barriers facing the F&B impact assessment (and communication) sector in reaching a harmonised solution, as well as the opportunities available to still achieve this goal. These were discussed in turn.

This section will synthesise the key findings to answer the research question, highlight unexpected results and provide recommendations for the sector's stakeholders moving forward.

The research question will be discussed in order, thus the barriers to F&B impact assessment (and communication) harmonisation in the EU will be addressed first. During the initial stage of the research process, the preliminary results allowed for the identification of eleven potential barriers to the harmonisation of the F&B impact assessment (and communication) sector for the four points of analysis (see Figure 6). Further investigation via the expert interviews, however, suggested some barriers are of more consequence than others, with some being outruled as current barriers altogether. This left a total of eight identified barriers (see Figure 7). In the niche, conceptual issues, data availability and a lack of resources were found to be curbing the potential of harmonisation from within the sector. Notably, the primary research suggested that consumer communication is considered a second step for the sector and thus harmonisation on this topic is not yet necessary (2/6). This was unexpected, considering the secondary literature often framing F&B impact assessment and communication as a consumer-focused solution (for example: De Bauw et al., 2021; Eco Food Choice, 2025; Potter et al., 2022; Tiboni-Oschilewski et al. 2024). Removing F&B impact communication would for the time being, would also remove one barrier and ease the process towards F&B impact assessment harmonisation and re-frame the solution more towards farmers, producers and suppliers. Thus overall, the difficulty in choosing a harmonised methodology while a magnitude of different approaches exist, along with the limited data available to solution providers, are barriers which are more significantly limiting the sector in the niche. Yet, perhaps most significantly, F&B impact assessment (and communication) is suffering under the same lock-in mechanism which many niche innovations face - a lack of surplus resources (Geels, 2019: 190). This means that they do not have the financial agency to invest in the costly process of harmonisation alone.

Beyond internal sectoral barriers, new innovations typically also contend against incumbent actors in the sociotechnical regime, who reproduce and maintain existing structures and prevent transformational change (European Environment Agency, 2023a; Geels, 2020). The research showed that the F&B impact assessment (and communication) sector does not differ from any other niche innovation in this way. While F&B businesses have the potential to be a driving force in the harmonisation process and have shown increasing interest for F&B

impact assessment (and communication), the literature (Ellen MacArthur Foundation, 2021) and interviews conducted (6/6) suggest that the implementation gap remains substantial. On the one hand, this is linked to an overall lack of willingness to invest in technology solutions from the sustainability sector (European Environment Agency, 2023a; Sovacool et al., 2021). On the other hand, the research suggested that many F&B businesses are responsibility shifting, either waiting for national or international governmental direction or for a clear winner in the F&B impact assessment (and communication) sector to emerge (5/6). By maintaining current practices and not investing in F&B impact assessment (and communication) solutions, F&B businesses can be considered incumbent actors in the harmonisation process.

This can also be said for the EU which is currently not providing significant enough orientation for F&B businesses with regards to F&B impact assessment (and communication). This has been linked to their own complex landscape of protocols and standards (Galli et al., 2018; Galli et al., 2020; European Environment Agency, 2023b; Mengual et al., 2024). While the PEF and PEFCR methodologies, for example, have been found to be limited in applicability (European Environment Agency, 2023a; Cicke, Boone & Broekema, 2024; Boone et al., 2023), there is also rising concern that the newly (2024) elected right-wing EU parliament is deprioritising sustainability in general (van Rij et al., 2024; Mathiesen et al., 2025). In the context of F&B impact assessment and communication, this is culminating in a roll back of mandatory sustainability reporting for businesses determining industry-level priorities (WWF European Policy Office, 2025). This research showed that this is no different for the F&B industry, in turn impacting the F&B impact assessment (and communication) sector. The expert interviews showed that there is cross-sectoral agreement that the 2024 election significantly impacted the sector's hopes for harmonisation, as the EU is shifting its priorities from sustainability to competitiveness (6/6). To encourage sustainability transformation, policymakers can actively nurture niche innovations and create the suitable conditions for their development (Geels, 2019). Yet, moving in the opposite direction positions the EU as an incumbent actor in the F&B impact assessment (and communication) harmonisation process. No evidence could be found, however, to suggest that primary producers are currently acting as a significant barrier to harmonisation. Although increased transparency and support for data collection could aid the accuracy of F&B impact assessment (and communication) results (4/6).

At the landscape level, the research found that consumer preferences are not a strong lever in F&B impact assessment (and communication) harmonisation processes (4/6). Contrastingly, political shifts to the far-right across Europe and political shocks, such as the Russian invasion of Ukraine, have been the root cause of sustainability being replaced by security discourses on European political and business agendas (5/6). While this can be considered a significant barrier to harmonisation for the F&B impact assessment (and communication) sector, interview evidence also suggested that the impact is not as great as first feared (3/6). While the political shift is directly influencing the output of the EU, for example, it was also argued that simply reframing the F&B impact assessment (and communication) sector's narrative from sustainability towards resilience could safeguard their relevance and drive within the current political and economic environment (3/6). This suggests that despite landscape shifts towards the right, politically-speaking, the goal for F&B impact assessment (and communication) harmonisation need not be out of reach just yet. This was an unexpected finding in the context of the concern voiced by environmental campaigners surrounding the EU's new vision for Europe's food system, which were less optimistic regarding the future of sustainability transitions (Niranjan, Guardian 2025; van Zanten, Duncan & van Meijl, 2025). In light of this, landscape barriers are proving, in comparison to niche- and sociotechnical regime-level barriers, to be of less significance.

As discussed, this thesis conceptually built on the MLP to create the MSP framework and analyse the multi-scalar barriers affecting F&B impact assessment (and communication). This provided deeper insights into spatial perspectives, including the geographically varying realities, networks and structures which are impacting the sector (Coenen, Benneworth & Truffer, 2012; Carvalho & Lazzerini, 2018; Miörner & Binz, 2021). The multi-scalar barriers discussed were the physical complexity of the global food system, and the political and economic differences within Europe and beyond. It was found that the physical complexity of the global food system cannot be considered an active barrier in hindering harmonisation per se. Yet, the nature of the food system as a whole does make the task of methodological harmonisation for the F&B impact assessment (and communication) sector more difficult in comparison to other less changeable systems (4/6), and thus may be the source of disagreements within the niche. Differing political and economic realities within Europe and beyond are also a consequential barrier for sectoral harmonisation. Varying economic realities across geographies and F&B industry stakeholders, as well as interest in the topic, affects data availability, capacity and motivation for F&B impact assessment (and communication)

harmonisation (Cicke, Boone & Broekema, 2024; Galanakis, Daskalakis & Galanakis, 2025). For this reason, a number of experts interviewed suggested that in order to remain inclusive and have the wide-scale needed to drive food system transformation, a harmonised F&B impact assessment (and communication) solution will need to be based on the capacities of the stakeholders with the least technological and financial capabilities (2/6). Thus, differing physical, political and economic realities within the globalised food system suggests that in harmonising F&B impact assessment (and communication) solutions, it should not only be considered what is possible methodologically, but also what is feasible to implement across Europe and beyond. As this may not be the outcome which many solution providers have been working towards and rather a limitation of harmonisation in itself, this can be considered a barrier to the goal which solution providers set out to achieve.

Though there are a significant number of barriers facing the F&B impact assessment (and communication) sector in harmonising, there are also upcoming opportunities which could aid harmonisation. The results regarding this address the latter part of the research question with the aim of better understanding the potentiality of overcoming the barriers discussed in place. In the context of F&B impact assessment (and communication) these opportunities come in the form of collaborative action between industry stakeholders via bottom-up-led coalitions and initiatives. As discussed in Section 5.3, examples include the ‘International Alliance for Food Impact Data’ (EIT Food, 2024), the ‘Life Eco Food Choice Project’ (Ademe, 2025), the ‘European Sustainable Food Coalition’ (ESFC, 2025a) and the UK-based ‘BRC Mondra Coalition’ (Mondra, 2025). Such coalitions were expressed as a necessary step to achieve sectoral harmonisation in the current political environment in both the secondary (Bezares, Fretes & Martinez, 2021; OECD, 2025; Deconinck, Jansen & Barisone, 2023; Cicek, Boone, Broekema, 2024) and primary (6/6) data sources. Yet, opinion diverges on who exactly should lead this process (3/6) - exemplified by the sheer number of emerging coalitions working on this topic. While transitions writers have been proponents of coalitions in supporting sustainability transformations (European Environment Agency, 2023a) and F&B impact assessment (and communication) literature shared the view that coalition building could create opportunities for sectoral progress (Bezares, Fretes & Martinez, 2021; OECD, 2025; Deconinck, Jansen & Barisone, 2023; Cicek, Boone, Broekema, 2024), the idea that too many coalitions working on the same topic can also be unproductive was not considered. This concern was only voiced in the conducted expert interviews, where it was suggested that the rise in coalitions aiming to address F&B impact assessment (and

communication) fragmentation are at risk of falling into the same issue (2/6). Though academic literature has not yet addressed this, the phenomena has been seemingly recognised within the F&B impact assessment (and communication) sector, as a number of leading coalitions and organisations are already discussing the establishment of a coalition of coalitions (4/6). While the so-called GSTA is reputed to be the solution to the barriers hindering sectoral harmonisation (Linder Interview, 2025), many questions remain unanswered and the coalition of coalitions currently remains in the planning stages. Therefore, the GSTA's potential impact in harmonising the F&B impact assessment (and communication) sector cannot yet be determined.

Finally, arguably the most significant finding of the conducted research was highlighted at the start of this chapter. That is that a joint definition of harmonisation for the F&B impact assessment (and communication) sector does not yet exist within the secondary literature or among key stakeholders (6/6). A working definition was used for this thesis for research clarity and focus, yet the same cannot be said for the F&B impact assessment (and communication) sector. Thus, the sector is aspiring to a vision of European harmonisation that itself remains unharmonious and undefined, making progress towards this goal even harder, even with a coalition of coalitions.

The findings presented here contribute to the limited available research on the harmonisation of the LCA-based European F&B impact assessment (and communication) solutions. Understanding the scope for harmonisation was a key gap among the literature (Deconinck, Jansen & Barisone, 2023). While Cicek, Boone & Broekema (2024) in part discuss this topic in their paper, the authors highlighted the need for future research due to the fast-changing nature of both EU regulations and sectoral developments. By drawing from the small pool of data focusing on the sector's challenges and expanding on this via expert interviews and the utilisation of a new research perspective (EG) in this area, previous findings could be confirmed and new conclusions regarding the barriers and opportunities for F&B impact assessment (and communication) in the EU today could be derived. This includes the impact of the new EU parliament and general European political landscape and on the sector, the role of F&B businesses and the complexity of the global food system. Though further research might still add to the findings here, on the one hand this thesis addresses Deconinck, Jansen & Barisone's (2023) concern and successfully advances the research on F&B impact assessment (and communication) harmonisation. On the other hand, it also contributes to

scholarly literature through extending transitions theory, adding to the increasing use of geographically-sensitive process theories in sustainability transformations debate with a new case study (Raven, Schot & Berkhout, 2012). By implementing Coenen, Benneworth & Truffer's (2012) idea to adapt the MLP to the MSP, the framework used for this research also incorporated a multi-scalar analysis of the barriers to F&B impact assessment (and communication) harmonisation. Thus, overall, this thesis provides both practical and theoretical contributions to the existing academic literature.

Regarding the practical contributions, recommendations for the F&B impact assessment (and communication) sector's harmonisation can also be drawn corresponding to the presented findings. As a first step, alignment on a joint vision and definition of harmonisation in order to ensure that all stakeholders involved in harmonising the F&B impact assessment (and communication) sector are working towards the same goal. Secondly, while working on harmonisation, it will be important to ensure that the sector remains relevant to the current political and economic agenda, even if this requires a narrative reframing as discussed in Section 5.2.3. This way, the F&B impact assessment (and communication) sector has a chance to contribute to a sustainable food system transition, rather than be delegitimised by the dominant agenda. In today's context, this could be shifting the focus from sustainability to resilience (3/6). Thirdly, increased transparency and support for primary producers, suppliers and SMEs globally to enable data collection and sharing with F&B impact assessment (and communication) providers will be necessary to ensure access to the required data for accurate and granular assessments. Finally, the F&B impact assessment (and communication) technology providers themselves will depend on further investment and support to create a harmonised solution. Though this would ideally come from F&B businesses and government actors, as these remain incumbent actors in the harmonisation process, alternative sources of investment will need to be found. The GSTA could have the potential to create a cross-sectoral cooperation to bring all the involved stakeholders' resources together and ensure equal agency in the harmonisation process, but their goals in this regard are not yet public. The GSTA should overall attempt to mitigate, rather than add to, current fragmentation of the coalition for F&B impact assessment (and communication) harmonisation space. Such an overarching sectoral coalition could create opportunities to overcome the current barriers of harmonisation.

While conclusions and recommendations were drawn from this research, interpretive limitations can also still be recognised. Four points in relation to this are discussed here. As already highlighted in Chapter 4, the point of this practice is not to undermine the usefulness of the research, but rather to promote academic progress, transparency and disclose where more research could strengthen the validity of the findings (Zhou & Jiang, 2025). Firstly, like most intensive research designs, the findings presented here cannot be considered representative or generalisable for other innovations or food system transitions (Clifford et al., 2010). The results are in reference to the specific case of F&B impact assessment (and communication) harmonisation only and thus could not be used to analyse other case studies. Secondly, despite considering multi-scalar factors in the research and results, this thesis focuses on the EU-context only. The findings are therefore context-bound, meaning researchers conducting a similar study on a different continent could also find different results. Thirdly, the nature of research in general is such that it is possible to have a multitude of differing answers to the same question depending on many factors such as the chosen theory, methodology or practice (Kitchen & Tate, 2000). Linked to this, as also mentioned in Chapter 4, biases, backgrounds and beliefs can also shape research processes and interpretations (Bourke, 2014). Thus, another researcher may have approached this research or interpreted the results differently by using an alternative theory, analytical lens, methodology or due to their specific background and belief system (Kitchen & Tate, 2000; Bourke, 2014). Other interpretations of Coenen, Benneworth & Truffer's (2012) MSP proposal, for example, may have led to differing results or understandings of the case at hand. The author read Coenen, Benneworth & Truffer's (2012: 972) argument that a MSP allows 'level' and 'scale' to be thought as two dimensions along which transitions can be classified' in such a way that in this research 'scale' was simply added as additional analytical dimension to the MLP. Yet, upon further reflection, it would have also been possible to treat 'scale' not as a separate entity entirely but to fully integrate it into the MLP. For example, by using a multi-scalar perspective to study each 'level' in turn. These interpretative limitations, however, also leave room for further research into the barriers and opportunities for F&B impact assessment (and communication) harmonisation in the EU and beyond. The next chapter concludes this thesis by summarising the research objectives and findings but also by addressing potential avenues for future research.

6. Conclusion

This thesis investigated the F&B impact assessment (and communication) sector in the EU, focusing on the barriers and opportunities for sectoral harmonisation. The aim of this was to better understand what challenges this sector faces in its attempt to support a sustainable transformation of the European food system as well as possible routes towards progress in this pursuit. The analysis was undertaken via a EG lens and situated within the sociotechnical transitions literature. As a first step, how the food system significantly contributes to environmental and socio-economic problems, while also being more dependent on, and vulnerable to, the natural environment compared to any other was demonstrated (Mengual et al., 2024). Then, the potential of F&B impact assessment (and communication) solutions in addressing this problem through measuring, reducing and reporting on the impact of food products was explored. Through this, a lack of harmonisation in the upcoming sector was, however, highlighted as a key challenge hindering the rise of F&B impact assessment (and communication) as well as a key research gap (Cicek, Boone & Broekema, 2024; Deconinck, Jansen & Barisone, 2023; Sovacool et al., 2021). This thesis addresses this knowledge gap, while also assessing the role of emerging coalitions in countering the existing barriers to F&B impact assessment (and communication) harmonisation.

The widely applied process theory and conceptual model, the MLP framework, was utilised and adapted to structure the research and results of this thesis (Geels, 2020). To identify the barriers for harmonisation within the F&B impact assessment (and communication) sector, the analytical application of the MLP was focused on the three-levelled interpretation of sociotechnical systems: the niche-, regime-, landscape-levels (Geels, 2019). Yet, to create a more geographically-sensitive framework, the conceptual model was adapted to also consider multi-scalar barriers, transforming the MLP to the MSP (Coenen, Benneworth & Truffer, 2012). This ensured deeper analytical nuance, for example, the acknowledgment for the unevenness of transition processes and socio-spatial embedding - both important aspects of EG (Coenen, Benneworth & Truffer, 2012; Carvalho & Lazzerini, 2018; Mörner & Binz, 2021).

To conduct the research and provide maximum detail and depth an intensive research design consisting of a triangulation of qualitative methods was chosen (Clifford et al., 2010). Secondary and primary data were collected through a narrative literature review, content

analysis and six semi-structured expert interviews. The expert interviews served as ‘crystallisation points’ to compare against the secondary literature, providing insider knowledge, key insights and specifically tailored primary data to strengthen the reliability and validity of the research (Bogner, Littig & Menz, 2009: 2; Montello & Sutton, 2012). This was important in the context of the rapidly-changing F&B impact assessment (and communication) sector and EU policy (Cicek, Boone & Broekema, 2024).

Overall, the research presented in this thesis shows that the F&B impact assessment (and communication) sector faces eight main barriers on its road to harmonisation (see Figure 7). These are in part linked to multi-scalar challenges, including the nature of the complex, versatile and changeable food system distributed across differing political and economic realities which the sector attempts to measure. But lock-in mechanisms and incumbent actors are also at play at the niche-, sociotechnical regime- and landscape- levels. While the sector is hindered by its inability to self-fund harmonisation from within the niche and still tackles many conceptual and practical issues, the EU in its current state does not support a comprehensive and mandatory F&B impact assessment (and communication) solution to enable a sustainable food system transformation. Linked to this and to the general political and economic shift towards the right in Europe, the research suggested that F&B businesses are also not ready to implement a solution which is not mandatory or fits into short term business plans. It was important to identify these barriers in order to devise concrete next steps for the sector to achieve its harmonisation goals.

Though influential actors in the sociotechnical regime may be impeding harmonisation to an extent, this does not mean that the F&B impact assessment (and communication) sector cannot ensure that there is a harmonised solution ready when the right time comes. By working collaboratively to find a shared vision and solution, the sector can already set to work to guarantee harmonisation *de facto*. As the socio-environmental and economic impacts of climate change are only set to get worse within the coming years, in turn impacting the stability of the food system (Mengual et al., 2024), it is important to endeavour to harmonise F&B impact assessment (and communication) as soon as possible. This would mean that if the political landscape in Europe again shifts back towards an agenda inclusive of sustainable transformation and search for a harmonised F&B impact assessment (and communication) solution, the sector will have one at hand ready for immediate implementation. As a second step, though it may not be considered a current priority, the sector should also address the

harmonisation of F&B impact assessment *communication* methods. This way, not only will F&B businesses be able to reduce their impact, but transparency with consumers will empower behavioural change (Deconinck, Jansen & Barisone, 2023; Taufique et al., 2022; Ellen MacArthur Foundation, 2021; Cicek, Boone & Broekema, 2024; Notarnicola et al., 2017a). With this, F&B impact assessment and communication could have the opportunity to reach the institutionalisation stage (see Figure 4) within the food system, in turn contributing to a systematic transition towards sustainable transformation.

Future studies into F&B impact assessment (and communication) harmonisation in Europe will be necessary to keep the research on this fast-moving sector up to date and highlight any changes or developments (Cicek, Boone & Broekema, 2024). This will include analysis of the GSTA and its impact on sectoral harmonisation. As mentioned in Chapter 4, as long as data is collected and analysed it is possible to continue finding new research results (Low, 2019). As such, it would be beneficial if further research, which has the necessary scope and resources, also increased the amount of data collected and analysed, for example conducting more expert interviews. Interviews with EC employees, more F&B impact assessment (and communication) providers, academics, coalitions as well as F&B business representatives, consumers and primary producers and suppliers would be advisable to broaden knowledge and perspectives on the topic. In addition to this, as research outcomes can also be influenced by a researcher's biases, background and beliefs (Bourke, 2014), having a wider range of researchers from varying fields and backgrounds could work towards ensuring higher levels of objectivity. Moreover, future research could also compare the conclusions drawn in this thesis with research using different theories or methodologies to further test the validity of the results. This could include, for example, using a different interpretation of the MSP as suggested in Section 5.4. Finally, different aspects of F&B impact assessment (and communication) could also be studied in the future to further understand the potential role of the sector in a global food system transition towards sustainability. For instance, more research is needed to grasp the potential negative socio-economic impacts of the F&B impact assessment and communication sector, highlighted by Deconinck, Jansen & Barisone (2023). This includes a potential disproportionate impact on low- and middle-income countries who are more likely to have high impact production methods, if consumers, firms or governments in Europe choose to make their food system more environmentally sustainable (*ibid.*). More research on this topic before F&B impact assessment and communication reaches the diffusion and disruption phase could limit any unintended consequences created by the sector.

In conclusion, this thesis should be used as a foundation to drive further research into F&B impact assessment and communication harmonisation in Europe and beyond, with the aim to support the sector in sustainably transitioning the global food system towards a sustainable transformation.

Appendix A - Tables

Table A1

Keyword search for the literature review and content analysis

Literature Review Keywords	Sustainability transformations Sociotechnical transitions Food and beverage industry Food systems Food production impacts Environmental Socio-economic Health Ultra processed foods Global diet gap Food prices High impact food products Meat and dairy Climate change Food security Sustainable food systems Sustainable food consumption European Union European Commission Greenwashing Food innovation Trends Labelling Consumer food demands Transparency Consumer food consumption behaviours Food and beverage impact assessment and communication Life cycle analysis Food data Sustainability impact Harmonisation Coalitions in system transitions Pre-competitive collaborations <i>And a combination thereof</i>
Content Analysis Keywords	Food and beverage impact assessment and communication Providers Labelling Harmonisation Barriers Opportunities Multi-level perspective Niche innovation

	Sociotechnical regime Sociotechnical landscape European Commission European elections 2024 Food policy landscape Sustainable food policies EU Climate Law Product Environmental Footprint Guide Green New Deal Farm to Fork Strategy Green claims Green Claims Directive Corporate Sustainability Reporting Directive SMEs Food system scale Coalitions for food and beverage impact assessment and communication European Sustainable Food Coalition International Alliance for Food Impact Data BRC Mondra Coalition <i>And a combination thereof</i>
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Note. Author's own illustration, 2025.

Table A2

The barriers to European F&B impact assessments and communication sectoral harmonisation - coded according to the analysed secondary literature

Level	Barrier	Elaboration	Source
Niche (Tech providers)	Conceptual - assessment	Methodological difficulties, differences and disagreements	Deconick, Jansen & Barisone, 2023
			Cicke, Boone & Broekema, 2024
			Boone et al., 2023
			Taufique et al., 2022
			Ponsioen & van der Werf, 2017
Socio-technical regime	Data availability	Lack of good quality (primary) data for assessments	Arayess & de Boer, 2022
			Cicke, Boone & Broekema, 2024
			Clark et al., 2022
			Notarnicola et al., 2017a
			Zeb, Soininen & Sozer, 2021
Landscape	Conceptual - communication	Differing views on labelling approach	Taufique et al., 2022
			Cicke, Boone & Broekema, 2024
			European Environment Agency, 2023a
Multi-scalar	Resources	High cost of solutions and harmonisation	Cicke, Boone & Broekema, 2024
Socio-technical regime	F&B businesses (retailers and manufacturers)	High level of influence, but overall implementation gap	Mengual et al., 2024
			Arayess & de Boer, 2022
			Ellen MacArthur Foundation, 2021
			Bezares, Fretes & Martinez, 2021
			Taufique et al., 2022
			Stoll-Kleemann & O'Riordan, 2015
			Madre Brava, 2024
			Cicke, Boone & Broekema, 2024
			European Environment Agency, 2023a
			Sovacool et al., 2021
Socio-technical regime	Primary producers	Some oppose reforms, some have limited agency; all subject to market pressures	Iraldo, Griesshammer & Kahlenborn, 2020
			Stoll-Kleemann & O'Riordan, 2015
			Mengual et al., 2024
			Ruggeri Laderchi et al., 2024
	European Union (EU)	Have supported food system transformation, but complex and fragmented policy landscape	Galli et al., 2020
			Galli et al., 2018
			European Environment Agency, 2023a
			Boone et al., 2023
			Mengual et al., 2024
			Galanakis, Daskalakis & Galanakis, 2025
Landscape	Consumers	Agents of change, but limited role in harmonisation	Arayess & de Boer, 2022
			Galli et al., 2020
			European Environment Agency, 2023a
			Notarnicola et al., 2017a
	Political shift	New European Commission moving sustainability away from the political agenda	Mengual et al., 2024
			van Rij et al., 2024
			Mathiesen et al., 2025
			European Commission, 2025c
			WWF European Policy Office, 2025
Multi-scalar	Food system	Heterogeneous, huge scale, globalised, fragmented and interconnected nature	Gonzalez-Garcia & Lupin, 2025
			McGowan, Forbes, 2025
			Zeb, Soininen & Sozer, 2021
			Sovacool et al., 2021
			European Environment Agency, 2023a
			Mengual et al., 2024
			Notarnicola et al., 2017a
			Popp, 2022
Multi-scalar	Data collection	Farm and processing data is spatially specific	Iraldo, Griesshammer & Kahlenborn, 2020
			Cicke, Boone & Broekema, 2024
			OECD, 2021
	Supranational governance	Differences between EU countries	Notarnicola et al., 2017a
			Cicke, Boone & Broekema, 2024
			Deconick, Jansen & Barisone, 2023
			Galanakis, Daskalakis & Galanakis, 2025
			Tiboni-Oschilewski et al., 2024

Note. Author's own illustration, 2025

Appendix B - Interview Guide

The Research Question:

What are the Barriers and Opportunities for the Harmonisation of the European Food and Beverage Impact Assessments and Communication Sector? A Multi-Scalar-Perspective on Sociotechnical Transitions in the European Union's Food System.

The Interview Questions:

1. To what extent do you think the F&B impact assessment and communication **sector requires harmonisation, and what would you consider a priority** in this process (if any)?
2. What do you think are the **main challenges** for F&B impact assessment and communication **solution providers in their harmonisation**?
3. Apart from the F&B impact assessment and communication providers themselves, do you think there are **other key stakeholders which play a role in the harmonisation of the sector**? Why and how do their roles differ (if at all)?
4. Among the key actors (the F&B impact assessment and communication providers, as well as, other key stakeholders mentioned), **to what extent do you think there are varying levels of agency in the harmonisation process**?
5. To what extent do you think the new **European Parliament (2024-2029) and current legislative simplification process** is effecting F&B impact assessment and communication harmonisation?
6. What **role do you think economic geography factors* play** in the process of F&B impact assessment and communication harmonisation within the EU?
**For example, but not exclusively, regional differences within the EU and the scale of the global food system.*
7. A number of coalitions have emerged over the last couple of years to address the barriers to F&B impact assessment and communication harmonisation. To what extent do you think such **coalitions can be successful in harmonising the sector, or are there any alternative routes to achieving harmonisation**?

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