

Advancing sustainability in economic sectors

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Abstract

The necessity of a sustainability transition i.e. large scale transformation to solve grand societal challenges at all levels is not debated. How to go about achieving these necessary transitions is the question. The role and contribution of economic sectors to sustainability is an important aspect to consider for management and policy-making. This thesis is comprised of two different but interconnected streams of research explored in five papers on how economic sectors contribute to sustainability both in terms of their impacts (positive and negative) and in terms of their management of impacts.

Paper I sought to contribute to the conceptual understanding of the synergies and trade-offs between a sector and its performance across the 169 targets of the Sustainable Development Goals (SDGs). The study examined the tourism sector's contribution to the SDGs with a specific focus on revealing synergies and trade-offs. Synergies, i.e. co-benefits of tourism positively contributing to the fulfilment of one or more SDG targets were found in 32 instances. Trade-offs, i.e. drawbacks of tourism activities negatively affecting the fulfilment of one or more SDG targets were found in 11 instances. Findings were classified through a ranking system for easily accessible and comprehensive results targeted to policy-makers and managers.

Paper II reviewed and applied a previously developed, national-level environmental sustainability indicator set to the Icelandic tourism sector in order to determine whether sectoral environmental impacts can be discerned on the national level. Capturing these impacts is important in terms of the environmental performance of the nation as a whole. Data gaps were found in most thematic categories applied to the tourism sector indicating the need for increased efforts in the collection of pertinent environmental data for Iceland's sustainability performance assessment. The tourism sector's impact was discernible albeit underestimated due to the lack of data

Paper III explored the perspectives of high level managers of medium and large tourism companies and relevant organizations in Iceland in relation to the tourism sector's management of environmental issues. The study attempted to determine the factors influencing organizational change in the tourism sector in Iceland in response to environmental issues. The study found that the policy and regulatory framework in the tourism sector had been slow to develop in an

exceedingly fast-growing sector. Complicated institutional frameworks and increased societal pressure to address key environmental issues created difficulties not easily overcome by the sector alone.

Paper IV explored the perspectives of high level management among medium and large companies and relevant organizations in the fisheries sector of Iceland and Norway to determine the factors (drivers and barriers) that enable blue growth, i.e. economic growth through sustainable use of aquatic resources. The study found that strict fisheries management regimes constituted a necessary requirement for sustainable growth stimulating value-added activities. However, both industries were still mired in debates on equitable social outcomes which the concept of blue growth has not adequately addressed. Governance of shared aquatic resources also emerged as an important aspect of blue growth in a rapidly changing world.

Paper V explored stakeholders' views on policy tools for achieving sustainability transition in European food systems. The study's aim was to explore and analyse stakeholders' proposed solutions for creating sustainable agri-food systems. The proposed solutions were then categorized by the use of an adapted policy tools' typology into five categories: direct activity regulations, market-based, knowledge-related, governance and strategic policy tools. The findings were, then, used to derive policy recommendations targeted to three stakeholder groups: government, food value chain actors (ranging from primary producers to retailers), and civil society.

This thesis contributed to research on sectoral approaches to sustainability with the aim of informing policy and management for achieving sustainability transitions. Future research could provide a more in-depth investigation of the interactions among sustainability policies across different sectors and systems.

Ágrip

Nauðsyn umbreytinga í átt að sjálfbærni eru óumdeild, en þá er átt við umbreytingar af þeirri stærðargráðu sem leysir úr viðamiklum samfélagslegum áskorunum. Spurningin er aftur á móti, hvernig er gerlegt að ná fram nauðsynlegum breytingum. Við stjórnun og stefnumörkun er mikilvægt að huga að hlutverki og framlagi atvinnugreina til sjálfbærni. Ritgerð þessi samanstendur af tveimur mismunandi, en samtengdum, rannsóknaráherslum. Í fimm fræðigreinum er fjallað um það hvernig atvinnugreinar stuðla að sjálfbærni bæði hvað varðar áhrif þeirra (jákvæð og neikvæð) og stjórnun þeirra á áhrifum.

Niðurstöður í grein I stuðla að þekkingu á samlegðaráhrifum og fórnarkostnaði á milli atvinnugreinar og frammistöðu hennar hvað varðar 169 undirmarkmið heimsmarkmiða Sameinuðu þjóðanna um sjálfbæra þróun. Í rannsókninni var kannað framlag ferðaþjónustunnar til heimsmarkmiðana með sérstakri áherslu á að leiða í ljós samlegðaráhrif og fórnarkostnað. Samlegðaráhrif, þ.e.a.s. gagnkvæmur ávinningur af ferðaþjónustu sem stuðlar jákvætt að því að uppfylla eitt eða fleiri undirmarkmið heimsmarkmiðanna fannst í 32 tilvikum. Fórnarkostnaður, þ.e.a.s. neikvæð áhrif tengd ferðaþjónustustarfsemi sem dregur úr því að eitt eða fleiri undirmarkmið heimsmarkmiðanna náist, fannst í 11 tilvikum. Notað var matskerfi til að flokka niðurstöðurnar þannig að þær væru aðgengilegar fyrir stefnumótendur og stjórnendur.

Í grein II voru vísar fyrir umhverfislega sjálfbærni á landsvísu skoðaðir og aðlagðir fyrir ferðaþjónustuna til að ákvarða hvort greina mætti umhverfisáhrif atvinnugreinarinnar á landsvísu. Mikilvægt er að ná utan um áhrif einstakra atvinnugreina þegar árangur þjóða í tengslum við umhverfislega sjálfbærni er mældur. Í flestum þemaflokkum sem tengjast ferðaþjónustunni skorti gögn, en þessi vöntun á gögnum dregur fram mikilvægi aukinnar gagnaöflunar um umhverfislega stöðu mála þegar meta á umhverfislega sjálfbærni Íslands. Áhrif ferðaþjónustunnar á umhverfislega sjálfbærni Íslands voru greinanleg, en þó vanmetin, vegna skorts á viðeigandi gögnum.

Í grein III er greint frá sjónarmiðum stjórnenda meðalstórra og stórra ferðaþjónustufyrirtækja, og tengdra atvinnugreinasamtaka, á Íslandi varðandi stjórnun umhverfismála hjá ferðaþjónstunni. Í rannsókninni var reynt að ákvarða þætti sem hafa áhrif á skipulagslegar breytingar hjá fyrirtækum í

ferðaþjónustunni í tengslum við umhverfismál. Rannsóknin leiddi í ljós að stefna og regluverk í ferðaþjónustunni hefur þróast hægt og ekki í takt við hraðan vöxt í atvinnugreinarinni. Flókin stofnanaumgjörð og aukinn aukinn samfélagslegur þrýstingur til að takast á við umhverfismál skapaði erfiðleika sem atvinnugreinin ein og sér getur ekki yfirstigið.

Í grein IV var kannað sjónarmið stjórnenda meðalstórra, og stórra fyrirtækja og tengdra atvinnugreinasamtaka, í sjávarútvegi á Íslandi og í Noregi til að ákvarða þætti (drifkrafta og hindranir) sem stuðlað geta að 'bláum vexti', þ.e.a.s. hagvexti sem byggist á sjálfbærri nýtingu sjávarafurða. Rannsóknin leiddi í ljós að ströng fiskveiðistjórnunarumgjörð sé nauðsynleg undirstaða sjálfbærs vaxtar sem örvað getur virðisaukandi starfsemi. Aftur á móti var sjávarútvegurinn á Íslandi og í Noregi að kljást við samfélagslegan ágreining um sanngjarna skiptingu arðs af auðlindinni, sem hugtakið 'blár vöxtur' tekur ekki á með fullnægjandi hætti. Stjórnun sameiginlegra sjávarafurða kom einnig fram sem mikilvægur þáttur í tengslum við 'bláan vöxt' í síbreytilegum heimi.

Í grein V voru könnuð sjónarmið hagsmunaaðila til stefnumótunaraðferða sem stuðla að umbreytingu í átt að sjálfbærni í Evrópskum matvælakerfum. Markmið rannsóknarinnar var að kanna og greina áformaðar lausnir hagsmunaaðila til að skapa/þróa sjálfbær matvælakerfi. Lausnirnar sem fram komu voru flokkaðar samkvæmt fimm stefnumótunaraðferðum. Þær eru beinar reglugerðir, markaðstengdar aðferðir, þekkingartengdar aðferðir, stjórnþæki og stefnumarkandi aðferðir. Niðurstöðurnar voru síðan nýttar til að útfæra tillögur fyrir þrjá hópa hagsmunaaðila, þ.e. stjórnvöld, hagsmunaaðila innan aðfangakeðja matvæla (frá frumframleiðendum til smásala) og félagasamtaka.

Með rannsókn á áherslum og aðgerðum atvinnugreina varðandi sjálfbærni dregur ritgerðin fram þekkingu sem nýtist við mótun stefnu til að ná fram umbreytingum í átt að sjálfbærni. Frekari rannsóknir gætu kafað dýpra í samspil mismunandi þátta stefnunnar og ólíkra atvinnugreina.

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List of Papers

This thesis is based on five papers, three published and two that are currently under review, which will be referred to in the text as follows:

Paper I: Chapter 3

Cook, D., Saviolidis, N. M., Davíðsdóttir, B., Jóhannsdóttir, L., & Ólafsson, S. (2019). Synergies and trade-offs in the Sustainable Development Goals—The implications of the Icelandic tourism sector. *Sustainability*, *11*, 4223. doi:10.3390/su11154223

(Author contribution: Investigation, Methodology, Project administration, Writing—original draft)

Paper II: Chapter 4

Saviolidis, N. M., Cook, D., Davíðsdóttir, B., Jóhannsdóttir, L., & Ólafsson, S. Challenges of national measurement of environmental sustainability in tourism. (Under review)

(Author contribution: Investigation, Methodology, Project administration, Writing—original draft, Writing – review & editing)

Paper III: Chapter 5

Saviolidis, N. M., Davíðsdóttir, B., Ólafsson, S. Exploring drivers and barriers of environmental management in the tourism industry: the case of Iceland's tourism. (Under review).

(Author contribution: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Supervision, Writing - original draft, Writing - review & editing)

Paper IV: Chapter 6

Saviolidis, N. M., Davíðsdóttir, B., Ilmola, L., Stepanova, A., Valman, M., & Rovenskaya, E. (2020). Realising blue growth in the fishing industry in Iceland and Norway: Industry perceptions on drivers and barriers to blue growth investments and policy implications. *Marine Policy*, *117*. <https://doi.org/10.1016/j.marpol.2020.103967>

(Author contribution: Formal analysis, Methodology, Data curation, Writing - original draft, Writing - review & editing)

Paper V: Chapter 7

Saviolidis, N. M., Olafsdottir, G., Nicolau, M., Samoggia, A., Huber, E., Brimont, L., Gorton, M., von Berlepsch, D., Sigurdardottir, H., Del Prete, M., Fedato, C., Aubert, P.-M., Bogason, S.G. (2020). Stakeholder perceptions of policy tools in support of sustainable food consumption in Europe: policy implications. *Sustainability*, *12*, 7161. doi: doi:10.3390/su12177161

(Author contribution: Conceptualization, Methodology, Formal analysis, Investigation, Data curation, Writing—original draft preparation, Writing—review & editing)

1 Introduction

1.1 Research focus and structure

This doctoral thesis explores the contribution and role of economic sectors in the advancement of sustainability focusing in particular on two sectors, fisheries and tourism, and on the European food system as whole. The research has an interdisciplinary focus and addresses interconnected objectives in five academic papers: 1) exploring the synergies and trade-offs of Iceland's tourism sector with the Sustainable Development Goals (SDGs) and the implications for Iceland's sustainability performance; 2) applying a national-level environmental indicator set to an economic sector to determine whether sectoral impacts can be detected at the national level; 3) exploring the factors influencing the tourism sector's environmental management in Iceland 4) exploring the factors that enable blue growth, i.e. economic growth through sustainable use of aquatic resources in Iceland and Norway and 5) exploring stakeholders' proposed solutions for a sustainable food system in Europe and deriving recommendations.

Historically, marine and energy resources have formed the backbone of economic growth in Iceland (CBI, 2018). Fisheries is a traditional and long-standing sector in Iceland and has long been one of the country's major economic pillars (CBI, 2018). After the financial crisis, tourism became the main driver of economic growth in Iceland contributing directly and indirectly approximately 40-50% of economic growth since 2011 (Landsbankinn, 2017). Until recently (pre-Covid) tourism had even outpaced other sectors in terms of foreign exchange earnings (ITB, 2018). It was, therefore, interesting to explore sustainability issues in a traditional and established sector (fisheries) and a sector that was growing fast and navigating various policy and management issues (tourism). Finally, the focus on food systems provided a more overarching view of how food policy can be affected by developments in the fisheries and tourism sectors and vice versa.

The thesis begins with Paper I exploring the synergies and trade-offs of a fast-growing economic sector – Iceland's tourism sector – with the 17 Sustainable Development Goals. In particular, the paper explores the impacts of Iceland's tourism sector on performance across the SDGs and associated targets. Based on the perspectives of a broad range of tourism stakeholders elicited in focus group discussions, the study systematically catalogued the interconnections among the Icelandic tourism's impacts (positive and negative) with the Goals and associated targets adapting Nilsson et al.'s methodology.

Numerical summaries based on a traffic light system (adapted from Cook et al., 2017) provided an overview of the synergies and trade-offs whereas the discussions enriched the quantitative assessments and revealed disagreements among different stakeholders. The primary purpose was not to reach a consensus on the topics discussed but to gather and catalogue the full range of perspectives as they related to the SDGs. This assessment resulted in the identification of 32 synergies and 11 trade-offs with the SDGs 169 targets with the rest of targets placed in the neither nor category. Synergies were identified with SDG 8 (on decent work and economic growth), SDG 9 (on industry, innovation and infrastructure), SDG 11 (on sustainable cities and communities), SDG 12 (on responsible production and consumption), and SDG 17 (on partnerships for the Goals). Nearly half of the trade-offs identified through the stakeholder focus groups were associated with SDGs in the environmental category; SDG 14 (on life below water), SDG 15 (on life on land) and SDG 6 (on clean water and sanitation). These findings prompted further exploration of environmental issues in relation to the tourism sector.

In Paper II the focus was exclusively on environmental sustainability by applying a previously developed national level indicator set (Cook et al., 2017) to Iceland's tourism sector with the following aims: a) to evaluate whether the indicator set could capture the tourism sector's main environmental impacts, and by extension national environmental sustainability impacts of a rapidly growing sector, and b) to highlight data gaps for future research. The study found that that the indicator set under evaluation was only partially able to capture impacts from the tourism sector. In some cases, it was due to lack of data. The lack of data was mainly due to two reasons: a) the fragmented and complex composition of the tourism sector makes different demands on data collection than more uniform sectors, and b) existing data was not being collected by the relevant institutions. The indicator set had some shortcomings as well in terms of capturing tourism impacts e.g. the lack of indicators taking into account international impacts (e.g. greenhouse gas emissions from aviation) and the lack of indicators for specific tourism impacts (e.g. impacts on sensitive areas). These shortcomings could be addressed by supplementary, satellite indicators to better capture specific sectoral impacts. As detailed in Olafsson, Cook, Davíðsdóttir and Johannsdóttir (2014), a national-level indicator set is more appropriate for environmental assessment because it takes into account the national context and its specific attributes. This is especially pertinent for countries like Iceland with small highly specialized economies (Jóhannesson, Davíðsdóttir & Heinonen, 2018) where one sector can have outsized effects on national sustainability performance.

Having explored environmental issues in connection to Iceland's tourism sector in Papers I and II, Paper III sought to explore the Icelandic tourism

sector's management of these issues. The study relied primarily on in depth interviews with company managers from the tourism sector and relevant tourism organizations in Iceland. It sought to determine how environmental issues were affecting tourism companies' organisational environment, their motivations for engaging in environmental management and the factors that would facilitate better management for the sector as a whole. The importance of natural landscapes and their conservation cannot be overstated in the context of Iceland's tourism sector which is largely nature-based. Awareness of nature conservation as an issue of strategic importance for the sector is high but at the same time there is widespread recognition that nature conservation measures have not hitherto adequately addressed impacts (EFLA, TRC & RTS, 2019). Paper III also found an increased focus on greenhouse gas emissions by the sector's representatives and especially from transportation. As discussed also in Papers I and II, greenhouse gas emissions from Iceland's tourism are mostly related to transportation (in part due to Iceland's green energy profile). As such, focus has been placed on more sustainable travel (including actions to decarbonize the fleet) in the government's climate action plan (Government of Iceland, 2020), but this has yet to be translated to more specific decarbonisation roadmaps for major economic sectors in Iceland including tourism and fisheries. For both sectors, mitigating greenhouse gas emissions from aviation is a difficult challenge.

In Paper IV the focus of the thesis shifts towards sustainable growth in fisheries and expands the research to include Norway's fisheries sector. The potential for fisheries sectors' growth with limited resources was explored through interviews with high level managers in fisheries companies and related organizations in Iceland and Norway. The aim was to explore the sectors' perspectives in these two countries on blue growth i.e. sustainable utilization of marine resources (Eikeset et al., 2018), identify the drivers and barriers for blue growth and explore the policy implications. Participants in both countries argued that a strict management regime was of utmost importance for conserving limited ecological resources and viewed the role of their Fisheries Management Systems as integral to the success of their respective sectors. Some of the issues discussed in paper IV related to fuller utilization of marine resources such that the sector may derive more value from its products even as it benefits the environment by reducing waste. Icelandic participants pointed out that major structural changes in the sector led to more consolidation which increased the fuel efficiency of vessels thus reducing emissions from the harvesting stage. However, fleet electrification especially of trawlers still faced technological barriers according to the participants. The tourism sector was discussed as an opportunity to increase added value for seafood in Iceland e.g. through fisheries "experiences" for tourists and seafood products developed and

marketed to tourists. The growth in tourism provided the fishing industry with the opportunity to make use of airline cargo capacity to transport fresh fish to new markets which has been selling at a higher premium than other fish products (Sutherland & Stacey, 2017). This underscores cross-sectoral effects and highlights the multiple impacts from the current pandemic.

Finally, Paper V explored the perspectives of stakeholders in four European countries and at the EU level, with the aim of identifying and classifying commonly agreed-upon solutions for supporting sustainable food consumption in the European food system. The paper explored solutions at the food system level rather than the sectoral level by eliciting perspectives from a wider range of stakeholders i.e. beyond sectoral actors such as Food Value Chain (FVC) companies and associated organizations. As discussed in Paper V food is a cross-cutting issue that affects all sustainability dimensions (EEA, 2017) and is integral to the achievement of all the SDGs (Stockholm Resilience Centre, 2016). The concept of a food system has permeated both academic research and high-level policy agendas (e.g. EEA, 2017; Willet et al., 2019). Paper V utilised The Food and Agriculture Organization (FAO)'s definition of a food system: "the entire range of actors and their interlinked value-adding activities involved in the production, aggregation, processing, distribution, consumption and disposal of food products that originate from agriculture, forestry or fisheries, and parts of the broader economic, societal and natural environments in which they are embedded" (p. 1). The recommendations derived from the proposed solutions were targeted at three different stakeholder groups which emerged as important for achieving change from the interviews: government, FVC actors and civil society. The overarching focus of Paper V brought to light some cross sectoral effects in terms of food policy considerations relevant also to the fisheries and tourism sectors in Iceland (cf. Valsdóttir & Þorkelsson, 2014). Food policy formulation would have to be integrated with policies across sectors and engage in multi-actor consultation to achieve sustainability aims.

The remainder of this chapter provides the motivation (sections 1.2 and 1.3) and general background (sections 1.4 – 1.6) for the research conducted for this thesis.

1.2 Sustainability challenges

We live an era of unprecedented changes in the global environment (Rockström, et al, 2009). Resource depletion, environmental degradation (Foley, et al., 2005), decreased biodiversity along with mass extinction of species (Barnosky, et al., 2011) and climate change (IPCC, 2014; WMO, 2020) are all environmental issues that interact with the increasing number of people living on the planet using its limited resources (UN-DESA, 2015). This thesis

addresses pertinent sustainability issues through the lens of economic sectors and how they contribute to sustainability both in terms of their impacts (positive and negative) and in terms of their management of negative impacts. In what follows, the general motivation and context for the papers which comprise this dissertation are presented (Sections 1.2 and 1.3). This is followed by two sections on the main theoretical influences underlying the papers (Sections 1.4 and 1.5). The introduction ends with a section on measurement of sustainability effects for economic sectors (1.6).

Sustainability has gained central prominence in both global and local debates in the last few decades. This intensified focus is no surprise as global environmental challenges are mounting and, in the words of the Organization for Economic Cooperation and Development (OECD) “have already begun to undermine the foundation for growth and development” (OECD, 2015, p.2). The world economy is also expected to almost quadruple in the next decades further increasing the pressure for both natural resources and energy production (OECD, 2012). With the replacement of the Millennium Development Goals (MDGs) with the Sustainable Development Goals (SDGs) sustainability has been placed at the core of the international community’s long-term goals (UN, 2015a). The SDGs are relevant to all economic sectors integrating all the dimensions of sustainability through ecological, economic, social and governance goals (17) with associated targets (169) and indicators (247) for monitoring and assessment (UN, 2015b).

The European Environmental Agency’s (EEA) 2015 report on the State and Outlook of the Environment (SOER) in Europe pointed to several major global megatrends that will be critical for the wellbeing of people and the natural environment in the future (EEA, 2015). Growth in economic activity, resource extraction and environmental impact are still very much interlinked posing challenges in a world that will likely see its population reach 9.7 billion people by 2050 (UN-DESA, 2015). Alongside these is the rise of the middle class globally with accompanying increase in consumption further straining natural resources. All these developments are often referred to as “the Great Acceleration” i.e. simultaneous trends in the socio-economic and biophysical spheres indicating that the human imprint on biophysical systems has accelerated in the last 70 years (Steffen, Broadgate, Deutsch, Gaffney & Ludwig, 2015).

The 2015 SOER report delineated three major global environmental issues that will become pertinent in the coming years: a) growing pressures on ecosystems (many already stretched to their limits) b) increasingly severe consequences of climate change, and c) environmental pollution. Pressures on ecosystems include the increased loss of biodiversity in both land and water and

the continuing degradation of ecosystems through resource extraction which is set to grow with the increase of population and consumption. Impacts from climate change were projected to be severe depending on societal adaptation and resilience. We are already experiencing some of the impacts of climate change e.g. ocean acidification, more extreme weather, droughts and floods and rising sea levels (IPCC, 2016). Last but not least, various forms of pollution threaten ecosystems worldwide in increasingly dangerous mixtures (EEA, 2015).

The 2015 SOER report also emphasized the complex and systemic nature of the environmental challenges under assessment and in particular, three systemic characteristics that need to be recognized and taken into account. Specifically, environmental challenges today a) directly or indirectly affect exposure to environmental factors, b) are intrinsically linked to consumption and resource use patterns and c) their evolution depends on regional and global megatrends (EEA, 2015). As such the SOER (2015) stated that to remain within planetary limits a transition to a green economy is necessary and that it can only be achieved by addressing systemic challenges and integrating policies for a long-term transition (EEA, 2015).

The EEA's most recent SOER report (2019a) reiterated the systemic nature of these challenges stating that "Europe stands at a critical juncture" (EEA, 2019a, p.9) and noting that despite some progress made, environmental impact was still high and the outlook for meeting environmental targets was "discouraging" (EEA, 2019a, p. 11). The SOER emphasized the role of three key systems, the energy, mobility and food systems, in need of substantial transformation in order to achieve the 2050 vision of "living well within the limits of our planet" (EEA, 2019a, p. 23). It is important to recognize that the EEA's 2050 vision derives from a long history of conceptualizations of sustainable development which we turn to next.

1.3 Weak versus strong sustainability

In the last few decades the concept of sustainable development has been gaining increased attention by international organizations, nations, and companies (Giddins, Hopwood & O'Brien, 2005) culminating in the Sustainable Development Goals. The SDGs are effectively the international community's commitment to the core principles of sustainable development. The most widely cited definition of sustainable development is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987). Sustainable development has often been conceptualized as including three intertwined dimensions, the economic, social and environmental dimensions. The aim of sustainable development has often

been stated to be the need to balance the demands of these three dimensions without compromising the future of generations to come on the planet (Dyllick & Hockerts, 2002).

However, underlying this aim is the assumption that the substitutability of natural capital is both possible and desirable. Essentially what this means is that natural resources can be depleted as long as there is enough man-made capital to replace them. Because this conceptualization of sustainability places natural capital at the same level as human capital is it often referred to as “weak sustainability” (Neumayer, 2013). The field of ecological economics (e.g. Costanza et al., 2015; Gowdy & Erickson, 2005) and especially the works of Herman Daly (e.g. 1991; 1996) have mounted a significant critique against this conceptualization of sustainability. The crux of this argument lies in the recognition that the natural world is “finite, non-growing, and materially closed” (Daly, 1996, p. 65). Environmental sustainability cannot only be clearly distinguished from the social and economic dimensions but is, moreover, a necessary precondition for sustainable development (Goodland & Daly, 1996). This perspective has been referred to as “strong sustainability” for placing emphasis on the existence of biophysical limits in the Earth system which our economic activities must not exceed (Neumayer, 2013).

Many recent studies build upon the recognition that there are biophysical limits and that surpassing them risks undermining the functioning of our life-support systems with serious consequences for current and future generations (Barnosky et al., 2012; Rockström et al., 2009; Steffen et al., 2011). Rockström et al.’s (2009) landmark study on the “safe operating space” for humanity within planetary boundaries highlights the existence of thresholds beyond which we can expect planetary-scale systems to destabilize. Similarly, the existence of “tipping points” in the climate system (Lenton, et al., 2019) have the possibility of pushing “the Earth System irreversibly onto a ‘Hothouse Earth’ pathway” (Steffen et al., 2018, p.8254). The Intergovernmental Panel for Climate Change (IPCC) in its Fifth Assessment Report (AR5) also warned of “severe, pervasive and irreversible impacts for people and ecosystems” if climate change continues unabated (IPCC, 2014, p. 1). An argument that encompasses all these developments is that we have now possibly entered the Anthropocene Era – a new geological epoch in which human activities are the main drivers of change in large scale biophysical and planetary-level processes (Waters et al., 2016).

Due to the mounting evidence of widespread global environmental change with potentially dangerous and irreversible impacts, the accepted definition of sustainable development may have to be redefined to recognize that the three sustainability dimensions are parts of nested systems. As such “development that meets the needs of the present while safeguarding Earth’s life-support

system, on which the welfare of current and future generations depends” (Griggs et al., 2013, p.306) may be a more appropriate conceptualization of sustainable development which takes into account all the newest scientific knowledge that has been amassed in the last few decades. However, it should also be recognized that strong sustainability is a much more demanding process than weak sustainability because ultimately it requires that societies shift their patterns of production and consumption to ensure that human economic activities are accommodated within biophysical limits (Roome, 2012). As Roome (2012) put it “strong sustainability is a more complex and exacting process, less amenable to the control of a single company and its managers. It represents a form of social and organizational learning, based on innovation and change that involves many actors, multi-actor, collaborative processes” (p. 621).

It is important to acknowledge that there are critical perspectives of the Planetary Boundaries framework in terms of the framework itself and in terms of its implementation and political impact (see Biermann & Kim, 2020 for a review). The framework has been challenged for example for failing to consider the socio-economic implications of planetary boundaries (Biermann & Kim, 2020). Environmental boundaries have been complimented by social boundaries by Raworth (2012) in order to ensure that basic human needs are also met, often referred to as “a safe and just operating space” for humanity. This is arguably an attempt at an operationalisation of the strong sustainability perspective (O’Neill, Fanning, Lamb & Steinberger, 2018). Recent implementations of the framework (e.g. Hickel, 2019; O’Neill et al 2018) have yielded some stark conclusions in terms of whether and how humanity can stay within a “safe and just operating space”. In implementing the framework i.e. quantifying resource use and linking it to basic human needs, O’Neill et al (2018) concluded that no country was able to meet people’s basic needs at a globally sustainable level of resource use. Thus, they recommended that for the SDGs to deliver universal human development without undermining the Earth’s ability to sustain this development, the SDGs would have to shift their focus away “away from growth towards an economic model where the goal is sustainable and equitable human well-being” (O’Neill et al., 2018, p. 93).

Similarly, Hickel (2019) argued that the SDGs are “internally contradictory” (p.31) because “achieving the aggregate rate of growth required by Goal 8 will violate the sustainability goals” (p.32) and recommend that rich nations abandon growth as a policy objective so as to create ecological space for poorer nations to achieve economic development conducive to meeting their citizens’ basic needs. Thus, recognising that there are implications from this conceptualisation of sustainable development and especially so in terms of differing responsibilities of nations in achieving global sustainability aims is crucial. In international law this is codified in the principle of common but

differentiated responsibilities whereby accounting for differing states of development as well as historic contribution to environmental issues is necessary in negotiations on burden-sharing (Stalley, 2018). Rockström et al (2021) have recently responded to some of the criticism by calling for an integration of social scientific insights in order to explore response strategies that:

“match the diversity and evolving nature of societies, cultures, economies, and technologies, and fulfill minimum criteria for ethics, transparency, trust, collaboration, recognition, and inclusive governance; the trade-offs and synergies between different goals and targets; and which actors and levers are most effective in enabling a transformation which shares the remaining Earth's resources in a just way, to ensure the continued functioning of Earth system processes for human development.” (p. 6). Although two of the papers (I and V) here address sustainability in all its dimensions, it is a central assumption of this thesis that strong sustainability is required to adequately address these interconnected challenges. This perspective is also reflected in the hierarchical characterization of the SDGs by the Stockholm Resilience Centre, where Goals pertaining to the protection of the biosphere (SDGs 6, 13, 14 and 15) form the basis of the SDGs hierarchy upon which the other Goals' realisation depends (see figure 1.2) (Stockholm Resilience Centre, 2016). This was partly the reason also for the more specific focus on environmental issues in papers I, III and IV.

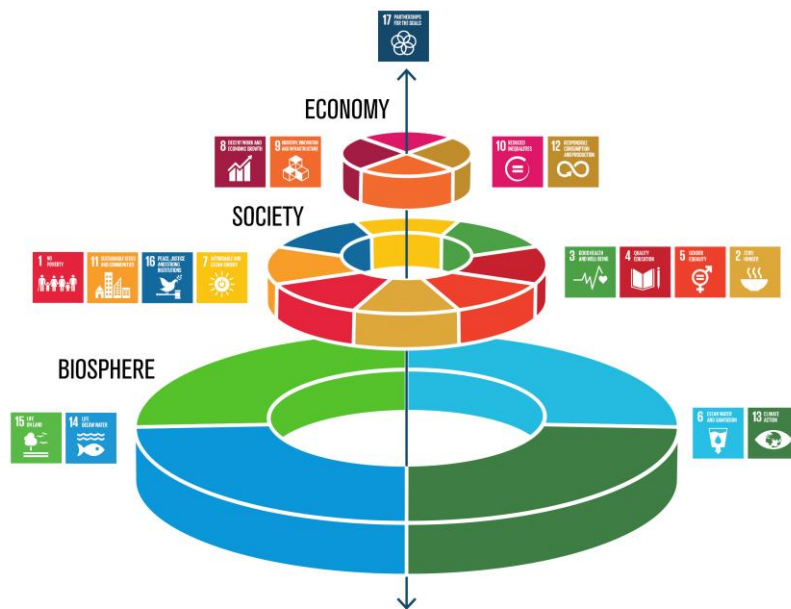


Figure 1. SDG's hierarchy based on a strong sustainability perspective (source: Stockholm Resilience Centre, 2016)

Although, when adequately scrutinized, all the SDGs are relevant to all sectors at least at the global level, some are more obviously relevant to certain sectors than others. In the case of the fisheries sector, SDG 14 (Life below water) has most commonly been directly associated with fisheries (cf. FAO, 2018b) as it calls for the conservation and sustainable use of the oceans, seas and marine resources. For tourism, SDGs 8 (on sustainable economic growth and employment: 8.9), 12 (on sustainable consumption and production: 12.b) and 14 (on sustainable use of oceans: 14.7) all directly implicate tourism in their formulations (UNWTO, n.d.; UNWTO, 2017). Finally, food, of which seafood is an integral part, is increasingly being conceived of, and referred to, as a system, and has been convincingly tied to all the SDGs as a cross-cutting issue (Stockholm Resilience Centre, 2016; UNEP, 2016).

The preceding sections briefly discussed the research structure and focus (Section 1.1) and the general motivation and context (Sections 1.2 - 1.3) for the dissertation as a whole. In what follows, the main theoretical influences that informed the papers will be briefly discussed (Sections 1.4 and 1.5). The introduction then ends with a short section on sustainability measurement (Section 1.6).

1.4 Institutional theory and organizational responses to sustainability challenges

Modern societies rely on organizations for many of the most important functions of society whether they be in the public sphere as in the case of health and education¹ or in the private sphere such as in the production and distribution of good and services (Scott & Davis, 2007). Economic sectors are made up of several organizations which are actors pursuing collective goals with independent rights and powers (Scott & Davis, 2007). Institutional theory is a very useful lens for understanding the factors behind the adoption of sustainability practices at the organizational level. Sustainability from this perspective is a discourse that attempts to change the way we think about business; its ultimate purpose and relationship to society. Ultimately sustainability attempts to bring about radical organizational change to shift the traditional purpose of business (Greenwood, Higgins & Jenkins, 2015).

Traditionally, economic fitness and efficiency have been thought to be the ultimate success factors for businesses but institutional theory argues that organizations mainly succeed by accomplishing a cultural and societal fit (Meyer and Rowan, 1977). The traditional market logics such as the pursuit of

¹ This is of course context-dependent but in Scandinavian welfare states and in much of Europe health and education are largely state-run.

profit and growth are not the sole determinants of success nor do these alone drive organizational actions (Lounsbury, Fairlough & Lee, 2012). From the institutional theory perspective, organizations are open systems whose survival depends on the relationship to their environment broadly speaking (Scott, 2014). Thus, economic efficiency takes second place to the need to conform to societal expectations and seem legitimate in the external environment (Scott, 2014). In other words, “organizations are not free-floating islands of rationality or units of political expediency; instead, they are seriously constrained by social expectations and the properties of legitimacy.” (Greenwood et al., 2015, p. 325).

In addition, the institutional theory lens posits that engagement with environmental and social issues by organizations is the result of circumstances that “enable, push or inhibit” these organizations and are not rooted in the actions and decisions of individual managers (Greenwood et al., 2015, p. 2). Managerial decision-making processes are not entirely inconsequential but they occupy a lesser role than they are afforded to by other strands of literature in management and business studies (e.g. Van der Byl, Slawinski & Hahn, 2020). Institutional theory takes a higher level perspective examining the wider environment in which organizations are embedded and posits that managerial decisions and strategy are constrained by various elements in the broader organisational environment (Hoffman, 1999; Scott, 2014). Societal expectations and the pursuit of social legitimacy are important influencing factors for organizational behaviour (Scott, 2014).

Institutional theory attempts to understand how and why organizations which operate in the same sphere (e.g. education) share more similarities than they do differences. The theory posits that this is because there are institutional controls in place which act as guidelines for organizational behaviour (Scott, 2014). Institutional control can be practiced through coercive instruments e.g. regulations and regulatory institutions; these are an explicit and significant source of control often expressed through incentives and punishments. Then there are normative controls which are informal rules and guidelines often implicit that nevertheless act as powerful guidelines to organizational behaviour. Finally, there are cognitive controls, deeply ingrained beliefs about the way things are done such as taken-for-granted activities and routines (Scott, 2014). These institutional pressures tend to lead organizations towards conformity and “isomorphism” (similarity) (DiMaggio & Powell, 1983).

The important element in this theory for the purposes of this project was the conceptualization of organizations as open systems which are affected by the external environment as they attempt to gain social legitimacy. When it comes to sustainability there are increasingly more expectations towards organizations to change in order to address the most important challenges our societies are

faced with. These expectations are multifaceted and emerge from various avenues. The concept of an “institutional field” i.e. the actors that make up a firm’s social environment (Hoffman, 2001), which introduces a more dynamic perspective whereby organizations are not entirely passive to institutional controls is also important (Wooten & Hoffman, 2016). Actors can comprise firms, consumers, regulatory bodies, lobbying groups, trade associations, competitors, NGOs and other social pressure groups (Wooten & Hoffman, 2016). This theoretical perspective informed two of the papers in this project (Papers III and IV). The major insight garnered from institutional theory is that organizational change comes about through “indirect system wide institutional change rather than direct individual corporate change” (Hoffman, 2001, p. 15) hence the importance of exploring the effect of different constituents on firms. Papers III and IV sought to understand the enabling conditions, drivers and barriers to environmental management and therefore to organizational engagement with sustainability through an investigation of the factors that have the potential to influence organizations.

Despite the usefulness of institutional theories, however, there are some limitations to the institutional lens such as the relatively limited role afforded to power, politics and material technology (Geels, 2020), the limited emphasis on the dimension of time crucial to sustainability (Bansal & Knox-Hayes, 2013) and the fact that institutional theory is silent regarding normative assumptions that are intricately linked to sustainability (Jennings & Hoffman, 2016; Markard, 2017) In general, “the business management literature remains focused on understanding the social, organizational or institutional implications of corporate sustainability, in isolation from quantitative indicators of ecosystem functioning” (Whiteman, Walker & Perego, 2012, p. 4). A more recent theoretical lens, loosely referred to as “sustainability transitions”, can be useful in terms of not only understanding organizational behaviour but also leveraging that knowledge to bring about large scale transformations towards sustainability (Markard, 2017). Transition theories borrow many elements from institutional theory such as insights on organizational behaviour and change (Geels, 2020) but have an explicit emphasis on bringing about transformational change and a normative component underlying this emphasis which is shared also by sustainability science (Jennings & Hoffman, 2016).

1.5 Sustainability transitions

There are a number of definitions for the term “sustainability transition” in the literature but the most commonly agreed-upon one is that of a large scale transformation “deemed necessary to solve grand societal challenges” (Loorbach, Frantzeskaki & Avelino, 2017, p. 600). Several high level policy

reports have been published in recent years emphasizing systemic approaches and the need for a sustainability transition (e.g. Chapman, 2019; EEA, 2019a; 2019b; FAO, 2018c). Sustainability transitions are characterized by certain attributes that are distinctive to sustainability challenges which distinguishes them from other challenges humanity has faced in the past (Patterson et al., 2017).

First, sustainability transitions are value-laden and contested, as such, trade-offs and conflicting views need to be explicitly addressed and often decision-making proceeds in the presence of highly contested perspectives (Markard, Raven & Truffer, 2012). Second, sustainability transitions emphasize the role of policy since transitions are based on specific policy targets. Following from that, it is then unsurprising that politics and power also play an important role and it is expected that vested interests, coalitions and alliances will influence policy-making for sustainability transitions (Geels et al., 2020). Fourth, these transitions are considered to be long-term, complex and uncertain. They often require investment in technical, institutional and even social infrastructure which can help transition sectors and societies to more sustainable pathways but can also create unfortunate and unintended consequences in the form of path-dependencies or lock-ins (Loorbach et al., 2017).

The historical transition towards the automobile, i.e. “privately-owned, gasoline-powered vehicles used primarily by single occupants” (Sovacool & Axsen, 2018, p. 730), in the transportation system is an oft cited example used to illustrate the types of change that need to come about in the transition towards more sustainable transport (Kanger, Geels, Sovacool & Schot, 2019). As can be gleaned from the transition towards automobiles, the diffusion of a new technology does not involve only end-users but is accompanied by other significant changes involving a broader set of actors and various factors such as business, cultural, regulatory and transnational factors (Kanger et al., 2019). In addition, the discourse on what constitutes sustainable transport is often constrained by various cultural and psychological factors intricately related to the use and function of automobiles (Sovacool & Axsen, 2018). Sustainable transport was encountered in this project as an important topic in the Icelandic tourism sector’s environmental management. Barriers to sustainable transport for the tourism sector were found to be both wide-ranging (involving multiple actors, policies and consumer preferences) as well as constrained by expectations and assumptions tied to the automobile with little space afforded to alternative mobility options (Paper III).

Finally, sustainability transitions are context-dependent and multidimensional, characterized by systemic interactions whereby one economic sector can interact with one or more sectors which can lead to both

synergies and trade-offs. Trade-offs need to be considered and ameliorated in decision-making from a management and policy-making perspective. This can, then, also lead to the recognition of synergies which can make sustainability transitions more effective and more equitable (Markard et al., 2012). Ameliorating the effect of uncoordinated approaches to common challenges is not easy but the first step has to be to accept that cross-sectoral effects are part of the equation and need to be recognized and explicitly addressed (Boas, Biermann & Kanie, 2016). Cross-sectoral effects emerged in several of the papers in this project, e.g. in Paper IV the importance of energy policy to the fisheries sector in Iceland and in Paper V the effect of the tourism sector on food consumption and policy. Sometimes the appropriate approach is to re-define and re-categorize a challenge such that its connection to other issues becomes more obvious as has been with the case of food in the last years (EEA, 2017). When food is addressed as a systemic issue, the interlinkages between different stakeholders, different sectors and different priorities becomes clearer and the pathways to sustainability transitions can gain a synergistic quality (EEA, 2017).

1.6 Measuring sectoral contributions to sustainability

The necessity of a sustainability transition at all levels is not debated, what is debated now is how to go about achieving these necessary transitions (Turnheim, Asquith & Geels, 2020). There is a need for knowledge and skills development in governing transitions especially for policy-makers. The need to both assess and monitor progress points to “a major opportunity to develop new indicators, evaluation procedures, and assessment tools that can help in governing transitions” (Turnheim et al., 2020, p. 118).

There are various sustainability assessment tools designed to assess progress towards sustainability such as: indicators and indices, product-based assessments (e.g. life cycle costing), integrated assessment tools (e.g. impact assessment), various monetary valuation tools (e.g. contingent valuation) (see Ness, Urbel-Piirsalu, Anderberg & Olsson, 2007 for an overview). Despite their differing methodologies, the ultimate aim underpinning all these tools is to change theory into action effectively creating the space for sustainability to be something we do (targets to meet) rather than something we talk about (an aspiration) (Bell & Morse, 2008).

The last few decades have been characterized by an enormous flow of information with relatively easy access becoming more and more common. However, our capacity to process and make sense of it all is not increasing alongside the sheer volumes of data available to us a click away (Roetzl, 2019). This is where indicators can be an important and useful tool. Indicators

are symbolic representations of a trend or property in a complex system or entity often accomplished through the use of numerical values, graphical illustrations, colour schemes etc. Indicators condense raw data into comprehensive and, ideally, easily comprehensible, collections of data revealing important signals of change and the direction of different issues providing important insights for policy-making and management (Hák, Moldan & Dahl, 2007).

Sustainability indicators have become increasingly more prevalent in the last two decades and can be found at the national (Cook et al., 2017), regional (EEA, n.d.) and international (UN, n.d.) levels; at the sectoral/industry (COM, 2016) and system-levels (FAO, 2014); and for all the dimensions of sustainability either separately (Moldan, Janoušková & Hák, 2012) or together in integrated indicator sets often via indices (Costanza et al., 2016). One of the most recognised sets of indicators is the one developed for the 17 Sustainable Development Goals (SDGs) which are based on 247 indicators underpinning the 169 targets associated with the Goals. The SDGs cover all sustainability dimensions including environmental, social, economic as well as governance goals. Recent studies have shown that there are numerous interconnections among the Goals whose simultaneous pursuit can sometimes produce synergies and sometimes lead to trade-offs (Singh et al, 2018). One of the important tasks in terms of sustainability transitions now is to achieve change at both the national and international levels so that policy and action become mutually reinforcing (Hák et al., 2007). Few studies have looked at the contribution of sectors to national and global sustainability which is what we attempted to do in Paper I (contribution to international sustainability goals) and Paper II (contribution to national sustainability performance).

The preceding sections presented the general background and motivation for this project, the theoretical approaches underpinning it and, briefly described the role of indicators in sustainability assessments. The next section describes the methodology which guided the project and the various methods used.

2 Methods

2.1 Methodology

The underlying philosophical stance for this project is pragmatism. Pragmatism rejects the age-old philosophical divide on the nature of reality and whether it is “out-there” to be discovered (positivism) or socially constructed (anti-positivism). For pragmatists both views are equally true and it is necessary to transcend the dualist dichotomy that these debates have been based on. As Morgan (2014) puts it: “On the one hand, our experiences in the world are necessarily constrained by the nature of that world; on the other hand, our understanding of the world is inherently limited to our interpretations of our experiences” (p.4). Such a worldview is very suitable to the research scope of environmental studies that lie in between the natural and the human and the interactions between the two. Research on the environment needs to cross the theoretical and methodological divides over qualitative and quantitative paradigms that have kept the research of ecological and human systems largely separate so far (Connolly, Svendsen, Fisher & Campbell, 2015). It is, thus, the nature of the problem which determines the method used and the focus is on solutions and the outcomes of research not on methods and propositions (Creswell & Clark, 2011).

This project was largely explorative in nature; the principal aim was to broaden the understanding of the various topics; not to demonstrate causality. This was especially true for studies within the Icelandic context where the research is scantier as regards environmental and sustainability issues and their relation to specific economic sectors. Therefore, much of the data collection was based on qualitative research in the form of interviews (Papers III-IV) and focus groups (Paper I). In Paper I, a mix of qualitative and quantitative methods was used in order to provide quantitative summary outcomes from qualitative discourse. In Paper II, quantitative secondary data analysis was deemed appropriate for answering questions related to the measurement of environmental sustainability using previously developed indicators (see figure 2 for an overview).

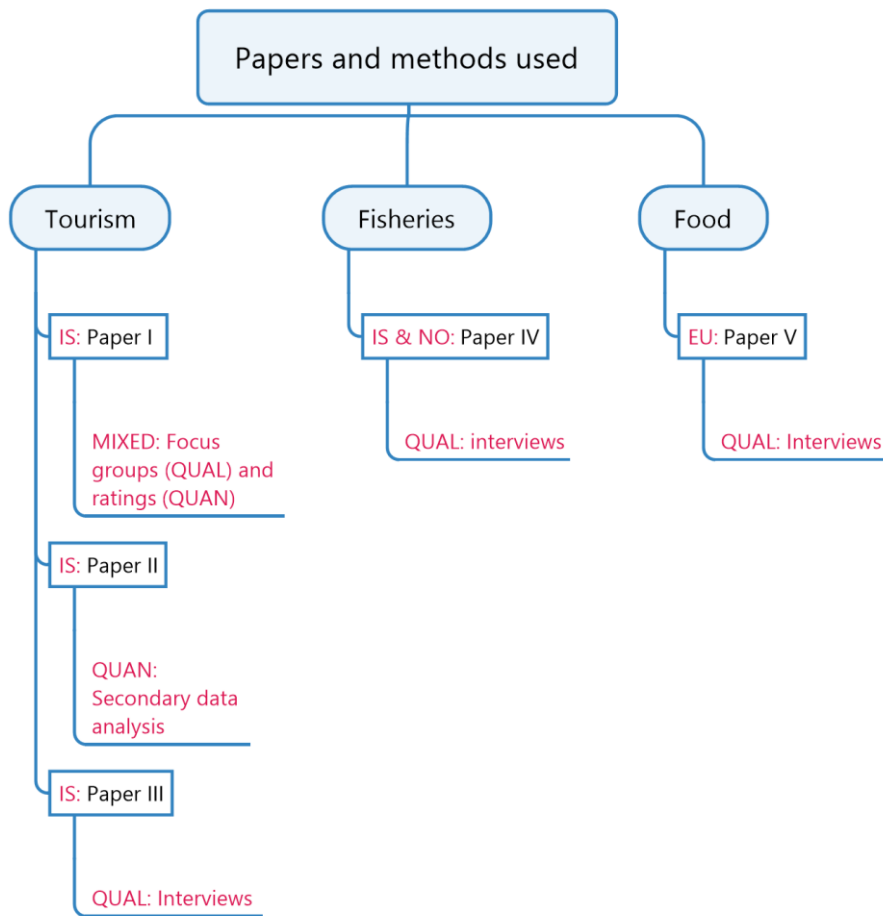


Fig 2. Summary of the papers and methods used - including national context (note: QUAL: qualitative; QUAN: quantitative)

The specific form of qualitative methodology used in this project was based on Corbin and Strauss' grounded-theory (Corbin & Strauss, 2015). The main purpose of grounded theory is to construct theory from data. What distinguishes grounded theory from other forms of qualitative methodology apart from its emphasis on theory building is that a) the concepts on which the theory is based are not decided upon prior to the research but derived from the data and b) data collection and analysis happen concurrently and it is the analysis that drives further collection of data. Concepts arise from data analysis and guide further data collection in a cyclical manner. Although this project did not aim to construct theory, grounded theory-inspired methodology was used to guide the research process. The reason for this choice is the afforded flexibility of this methodology. Notably, data collected can come from various sources – e.g.

interviews, documents, video recordings etc. – but can be analysed in the same way through the method of constant comparisons where conceptually similar data is grouped together (Corbin & Strauss, 2015).

2.2 Data collection

Data collection was based on various methods depending on the research question at hand. As such, semi-structured interviews, focus groups and secondary data analysis were used to provide answers to research questions. Primary data was often complemented by secondary data such as company websites, sustainability reports, online conference repositories and the researcher's own notes taken during the interviewing process (memos and field notes). In what follows these forms of data collection are briefly discussed.

2.2.1 Primary data: Interviews

In broad terms, there are three types of interviews: unstructured, semi-structured and structured interviews. In an unstructured interview the researcher presents the participant(s) with a general theme and asks them to speak freely about it. In an unstructured interview participants have more control over the interview as they can choose which topics to discuss, for how long and in what depth. Unstructured interviews can be difficult but also very rich in information when the ultimate goal for the research is to build theory as is often the case with grounded theory studies. In contrast, a structured interview is a highly scripted setting where the question framework is faithfully followed through and questions are asked in the pre-scribed turn order and each participant gets the same set of questions. Although this increases consistency across interviews it is not the best way to gather data since it restricts the researcher's flexibility and freedom to explore various topics that were not pre-determined (Corbin & Strauss, 2015).

Semi-structured interviews, as the name itself implies, lie somewhere in-between unstructured and structured interviews. They are conducted using an interview guide which ensures that all participants discuss the same topics but the researcher can choose to delve on different topics each time depending on the participant's focus and the questions do not have to be asked in a pre-specified turn-order. During the interview, the researcher can ask further questions not included in the guide to gather richer information on any topic that he/she is interested in. In addition, after the topics on the guide have been covered participants can add anything they might feel is important that was not covered already (Meriam & Tisdell, 2016).

All the semi-structured interviews conducted in the different projects of this dissertation used a question guide. Especially with regards to cross-country

research these common guides provided common issues to be discussed but afforded researchers the flexibility to probe new and more context-specific topics. The order of the questions was somewhat constrained in order to allow for issues to spontaneously arise before the interviewee guided the discussion towards those topics that were not brought up. This was done to explore which topics were high on the interviewee's agenda each time before probing further into specific areas of the interviewers' interest.

Semi-structured interviews with tourism sector representatives and fisheries sector representatives were the primary sources of data for Papers III and IV respectively, where the focus was on eliciting top managers' perspectives. The focus on medium and large companies in papers III and IV was based on several considerations. For Paper III the focus on medium and large companies was for two main reasons: a) the two expert interviews with trade associations indicated that larger companies are more likely to have implemented some form of environmental management. This was important because the study's aim was to explore companies with differing levels of implementation of formal environmental management, and b) practical considerations precluded a lot of travel and thus, limited the scope to companies with headquarters in the capital. Ironically, conducting this research during the pandemic would have removed this limitation by the widespread and more accepted use of online tools. For Paper IV the study focused on medium and large companies because larger companies have greater capacity for value-added activities and the aim was to explore these activities. An interesting finding in both papers was that even larger companies face barriers to implementing forms of environmental management. Paper V utilised a systems approach to stakeholder mapping with the aim of selecting relevant actors from a broader range of stakeholders for the European food system. The final pool of interviewees, thus, included policymakers (at the national and EU-level), business associations, individual companies, consumer organizations, consultancies, Non-Governmental Organizations (NGOs), and academic experts in health, nutrition and behavioural sciences.

2.2.2 Primary data: Focus groups

Focus groups with experts were utilized in one of the papers (Paper I) in order to stimulate interactive discourse among experts in different stakeholder groups for the tourism sector in Iceland. Focus groups, rather than interviews were chosen for the opportunity of knowledge co-creation (Hennink, 2014) among different experts on topics relevant to the tourism sector through the lens of the SDGs. The SDGs were a relatively new development in the policy and management field so these focus group discussions provided participants with information about the specific targets associated with each SDG and the

opportunity to debate and scrutinize a sector's possible contribution to these global Goals. The aim was not to create consensus but rather to draw out each expert's specific perspective on the various themes associated with the SDGs and provide them with the opportunity to discuss these topics with people from different backgrounds.

2.2.3 Secondary data: Documents and events

Documents were used as supplementary information to the interviews, such as organizations' or companies' websites and sustainability or other relevant reports when available. In addition, attendance (both physical and online) at relevant conferences and associated field notes were used to triangulate the primary data and gain a more holistic view of current industry and policy discourses (Meriam & Tisdell, 2016).

2.2.4 Secondary data: Quantitative data from online databases

In Paper II, the use of secondary quantitative data from national and international databases was used in the application of environmental sustainability indicators for the tourism sector. Where data was not available, relevant institutions, experts and private companies were contacted to determine data availability and reasons for the lack of data.

2.3 Qualitative Data Analysis

Data analysis was conducted based on the principles of grounded theory but not with the explicit purpose of building theory. In grounded theory data collection and analysis have to take place concurrently so that information gathered can be allowed to influence further data collection (Corbin & Strauss, 2015). In more concrete terms, this could mean that the interview guide will be changed based on what the researcher has learned during the first interviews and even later in the process. It could also mean that the research question changes depending on which topics or concepts emerge from the analysis. During analysis the researcher is constantly "moving between the abstract and the concrete" asking questions and constantly making comparisons along the way (Corbin & Strauss, 2015, p. 86). The details of the data (the concrete) need to be managed alongside the search for patterns and relationships in the data (the abstract).

The main analytic method used is coding. Coding is quite simply the labelling of relevant pieces of data be they words, phrases or whole sections. It is the "assigning [of] some sort of shorthand designation to various aspects of [the] data so that you can easily retrieve specific pieces of the data" (Meriam & Tisdell, 2016, p.199). Once the data has been coded the researcher can start conceptualizing it more abstractly by categorizing codes in relevant higher order

dimensions. Through the constant comparison method, coded data is constantly compared with one another to determine differences and similarities. The data is then grouped together based on shared features on a certain dimension. The dimension is then given a name and a colour which essentially becomes a category. Categories and the relationships between them form the results of the study. Documents and other secondary sources can be analysed in the same manner (Corbin & Strauss, 2015; Meriam & Tisdell, 2016). The qualitative analysis software Atlas.ti 8 was used for coding and analysing data (Friese, 2012).

However, the analysis already starts when the researcher transcribes the interview by the use of so-called researcher's comments which are thoughts, ideas and interesting topics injected in the transcribed interview under the same heading. Then the researcher writes memos which are written records of preliminary analysis and interpretation which then feed into the final analysis of the data. The use of a research journal is also important to detail which direction was taken and why certain decisions were made along the way (Corbin & Strauss, 2015). In this project, both a research journal and memos were utilized albeit mainly in analogue form using time stamped notebooks with all entries indexed for easy access and retrieval.

Another way to conceptualize data is through the use of diagrams (mind maps) which are visual representations of concepts in the data and the relationships between them. These mind maps further guided the research in terms of questions that remained unanswered and in the analysis of emerging categories. The software MindJet MindManager was used to engage in preliminary analysis of emergent categories in all the qualitative-based research projects. See figure 3 below for an example.

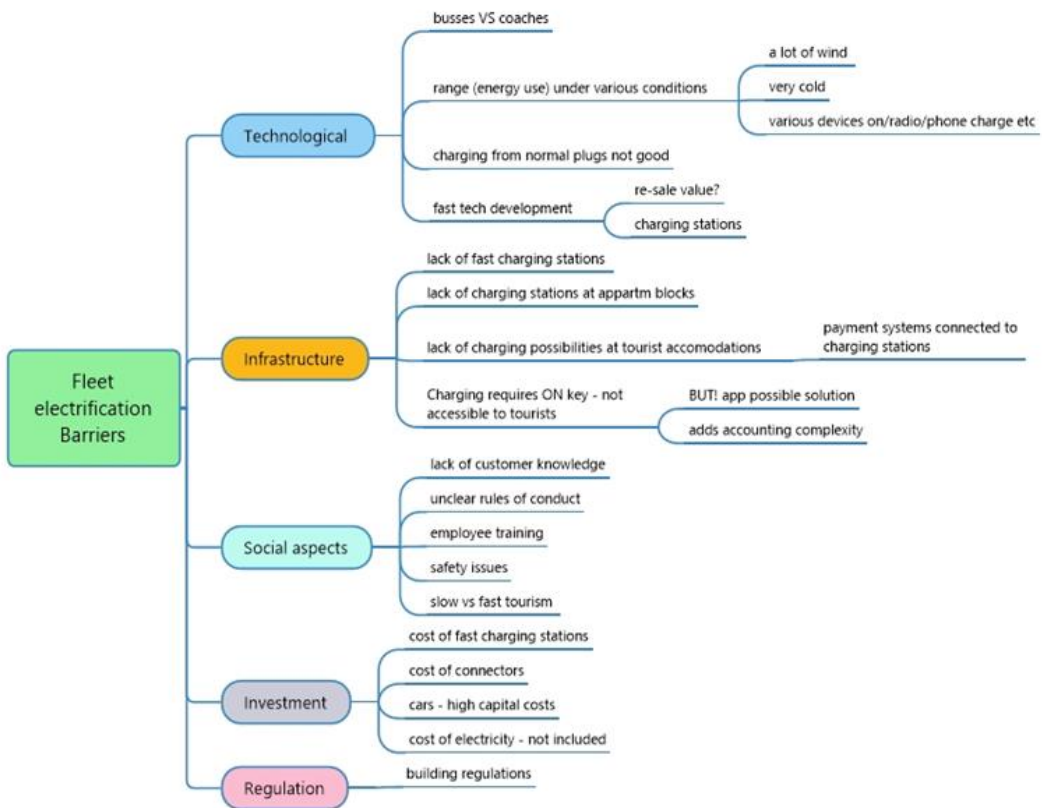


Figure 3. Example of the use of a mind map during preliminary analysis with MindJet MindManager.

2.3.1 Validity and Reliability

To increase the internal validity of a qualitative study it is possible to ask the participants to confirm whether a certain interpretation made by the researcher really matches their perspective – also called respondent validation. Another way to increase internal validity is the method of triangulation through either the use of different collection methods, multiple sources of data or, alternatively, multiple investigators analysing the same data and multiple interpretations of the data considered (Meriam & Tisdell, 2016). In this study, due to the fact that interviewees were for the most part elites, respondent validation was impractical and time-consuming. During the interviews, however, participants were often asked to confirm the researcher’s understanding of a certain aspect of the discussion to reduce ambiguity. Triangulation was based primarily on the use of other sources of data (e.g.

online repositories of industry conferences, reports and company websites) and through multidisciplinary collaboration where different interpretations could be considered and discussed among researchers with different backgrounds and perspectives (Meriam & Tisdell, 2016).

2.3.2 Researcher Bias and Assumptions

In qualitative research the researcher is “as much a part of the research process as the participants and the data they provide” (Corbin & Strauss, 2015, p. 4). My background is very interdisciplinary; I had knowledge of environmental issues (both in terms of the science but also in terms of policy and management) and a background in social and environmental psychology. I had (and still have) a keen interest in the intersection between the natural environment and human behaviour – both individual and organizational. Knowledge of business and organizational studies was, however, more limited at the beginning of my PhD studies. In addition, my methodological background was quantitative and heavily based on advanced statistics with some knowledge of qualitative methodology but rather limited experience and practice. During my PhD studies I took courses in business and qualitative methods in order to gain knowledge about these fields. Learning to use qualitative methods after years of training exclusively in quantitative methods was a challenging but very rewarding journey.

When conducting qualitative research, it is necessary to keep an open mind and to base all interpretations firmly on the data collected. Being aware of one’s assumptions and biases is an integral part of this process (Corbin & Strauss, 2015). My background in psychology had predisposed me to the individual versus organizational approach to sustainability, but business management literature and courses helped me shift my focus to the organizational and institutional levels. I am very grateful to all those who were willing to participate in my research project for their insights and for giving me the opportunity to approach sustainability issues from multiple perspectives. It should be noted also that all the papers in this thesis were part of a multidisciplinary collaboration with colleagues from different backgrounds and disciplines. This is beneficial as it enriches the analysis with perspectives of researchers with differing understanding providing validity to the interpretation of the data.

2.3.3 Translation Issues

Data collected in Iceland was analysed in Icelandic but relevant quotations were translated into English. In multi-disciplinary and/or multi-national collaborations detailed summaries were compiled of the data and team meetings conducted to corroborate the direction the analysis was taking. Transcripts were

not translated into English in whole only those parts of the text that were included in the papers as direct quotations. For those quotations standard back-translation techniques (Brislin, 1970) were used where necessary to ensure that they accurately captured cultural meanings.

2.4 Mixed methods

Paper I used a combination of qualitative and quantitative data to provide answers to the research questions. This section briefly addresses the particular choice made regarding mixed methods in the study. There are many different ways of conducting mixed methods research all depending on the focus and questions the study aims to answer. Some of the issues differentiating one mixed method study from another are: a) how much weight is given to qualitative or quantitative data, b) whether data collection happens sequentially or simultaneously and c) whether the goal is to transform qualitative data into quantitative data (or vice versa) (Creswell & Clark, 2011).

The mixed methods design in Paper I was one of simultaneous data collection where qualitative and quantitative data were given equal weight in the analysis. In addition, the design was fixed i.e. the use of mixed methods was planned and predetermined beforehand (Creswell & Clark, 2011). It was based on focus groups with experts, the explicit intent of which was to stimulate debate among the participants before asking them to provide their judgements on each topic through ratings. The setting was designed to facilitate discussion among different stakeholder groups while retaining each individual participant's perspective in the form of a rating. Participants were told that the purpose of the exercise was not to reach a consensus but to gain a better understanding about the topics at hand and have the opportunity to listen to other participants' views with different backgrounds and/or agendas before submitting their rating. The analysis of the data then compiled these ratings and summarized them in a table but drew heavily from the discussions of the groups in order to provide depth of understanding to the numerical summaries.

3 Paper I: Synergies and Trade Offs in the Sustainable Development Goals—The Implications of the Icelandic Tourism Sector

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Article

Synergies and Trade-Offs in the Sustainable Development Goals—The Implications of the Icelandic Tourism Sector

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Abstract: The development of major economic sectors can provide the bedrock on which long-lasting national economic prosperity is formed. Iceland’s tourism sector is an example of a rapidly expanded industry in recent years, to the extent that it has become the largest sectoral contributor to the nation’s economy. The growth of the sector has led to a number of sustainability impacts, thus presenting opportunities and challenges in terms of meeting the 17 Sustainable Development Goals (SDGs) of the United Nations. Using the case study of Iceland, this paper aims to advance the conceptual understanding of the synergies and trade-offs between a nation’s tourism sector and performance across the 169 targets of the SDGs. Empirical results were derived from four theme-based focus groups comprised of expert participants, who were tasked with completing scoresheets concerning their perception of the extent of synergies and trade-offs for each target. The majority (126 in number) of the mean scoresheet outcomes for the SDG targets revealed neither synergies nor trade-offs. However, 32 synergies and 11 trade-offs were identified. Many of the target synergies related to new economic opportunities, such as jobs, employment, and training for young people. Target trade-offs tended to be environmental and social. In particular, concern was voiced about the greenhouse gas emissions of the Icelandic tourism sector, which derives from international aviation, cruise ships, and rental car usage. The outcomes of this study are of particular relevance to tourism companies, policy-makers, and governance institutions, all of whom are increasingly endeavouring to link their activities with the fulfilment of the SDGs, maximising synergies, mitigating the extent of any potential trade-offs, and potentially transforming trade-offs into synergies. Furthermore, the results are likely of interest to academics focused on researching the broad sustainability impacts of economic sectors and their contribution to meeting the visionary goals of the SDGs.

Keywords: decision-making; tourism; sustainable development goals; Iceland; synergies; trade-offs

1. Introduction

Concerns about the sustainability of natural resources and a need for sustainable development have been expressed and reiterated over the years in a series of global political gatherings. These have included Our Common Future in 1987, the Earth Summit of 1992, the World Summit on Social Development in 1995, the World Summit on Sustainable Development in 2002, and Rio + 20 in 2012 [1,2]. The 17 United Nations’ Sustainable Development Goals (SDGs) (a schedule of all of the Sustainable

Development Goals and their respective targets are provided in numeric order in Table S1 to this paper) have been widely acclaimed as the culmination of this global dialogue, transitioning from the Millennium Development Goals to provide a comprehensive global blueprint for a route to a more sustainable future and confronting challenges linked to poverty, climate change, inequality, environmental degradation, and securing peace, justice, and prosperity [3].

The 17 SDGs and their respective targets are interconnected, containing synergies but also trade-offs (in this study, we define synergies and trade-offs in accordance with the study by Singh et al. (2018) [4]. Synergies are understood to be co-benefits, occurring in alignment with the various activities of the Icelandic tourism sector. Trade-offs are hindrances and drawbacks linked to the same set of activities) that may be difficult to reconcile [4–7]. This is perhaps most clearly evidenced in relation to Goal 8, ‘Decent work and economic growth’, which sets a target for all countries to sustain per capita economic growth in accordance with national circumstances [3]. Many economists have argued that maintaining stocks of natural resources should be allocated priority over the flows of income and economic growth sourced from their depletion [8,9]. Such ‘strong sustainability’ arguments emphasise the limited substitutability of natural for produced forms of capital, and in so doing shift the management objectives of an economy towards the pursuit of a sustainable yield of renewable resources [10–13].

As Hall et al. (2015) articulated, pursuing economic growth entails trade-offs: “Despite repeated attempts to posit sustainable forms of development, including with respect to alternative and sustainable tourism, the global ecological footprint of humanity continues to grow and run down the stock of the world’s natural capital. In other words, the achievement of sustainable development via economic growth strategies, even if they constitute so-called green growth, appears extremely difficult if not impossible” [14] (p. 28). National compliance with the overarching growth objective, targets, and indicators of goal 8 may lead to trade-offs relating to goals such as numbers 11, 12, 13, 14, 15, and 16. Equally, synergies may exist between goal 8 and other goals, such as 1, 2, 3, 4, 5, and 6. The extent and character of these trade-offs and synergies are likely to vary given the context of the nation, whether it is a developed or developing economy, and the extent to which a nation’s economic expansion is delivered through reliance on the growth of a single industrial or service-based sector. This is evident in the case of the tourism sector, which is a major driver of economic growth in both developing and developed nations [15,16].

Although there has been general academic discussion concerning the potential impacts of tourism activities on the SDGs [17,18], so far no academic study has sought to evaluate the extent of synergies and trade-offs between a national tourism sector and the goals of the 17 SDGs. Thus, this paper’s aim is to evaluate the extent to which a national tourism sector stimulates synergies and trade-offs linked to the pursuit of the SDGs, including their respective targets. The selected case study for this task is Iceland, which is the nation with the fastest rate of economic growth in the OECD in recent years, predominantly due to its burgeoning tourism sector [19]. In the period subsequent to the banking collapse of 2008—the largest in history relative to the size of its economy—spiraling bankruptcies and unemployment threatened the sustainability and economic prosperity of the nation [20]. The tourism sector has been the engine of Iceland’s economic recovery, with the number of tourists more than quadrupling between 2010–2017, from 488,600 to 2,224,603 [21]. For the first time ever, tourism in Iceland in the period 2013–2017 was responsible for higher foreign exchange earnings (42% in 2017) than exports of marine products (16% in 2017). Over the same time period, the number of people employed in the tourism sector has increased by 68% [21]. The total contribution (direct and indirect) of the tourism sector to GDP amounted to 34.6% in 2017 and this is projected to rise to 40.6% by 2028 [22].

This paper is structured as follows. Section 2 provides a brief literature review of existing publications focused on interactions and trade-offs in the SDGs. Section 3 communicates the recent importance of the tourism sector to the Icelandic economy in terms of growth, and outlines a summary of the known economic, environmental, and social consequences. Section 4 details the methodology for this paper’s evaluation, which is based on focus groups and the completion of evaluative scoresheets.

Section 5 combines the results and discussion. It summarizes the results from the focus groups and provides a matrix of the extent to which the Icelandic tourism sector is stimulating synergies and trade-offs across all of the targets of the SDGs. The discussion component focuses on the main implications of the study and provides a broader reflection on the contribution of Iceland's tourism sector towards meeting the SDGs. Section 6 details a brief conclusion and summary of the paper's main implications for policy-makers.

2. Overview of Existing SDG Interactions and Trade-Off Studies

Costanza et al. (2016) heralded the publication of the SDGs as “*a global consensus, years in the making*” and “*an important step in the transition to a sustainable world*” [23] (p. 59). The authors also recognized that the publication of the SDGs, however seminal, was only a starting point. They called for future work analyzing how the goals and targets interconnect, especially their synergies and trade-offs, voicing that this quest demands an interdisciplinary contribution from academics, scientists, and policymakers. Several authors have begun to embrace the challenge. In this brief literature review, a summary details the current approaches to evaluating synergies and trade-offs in the SDGs, together with reports that highlight the various institutional challenges relating to their practical implementation.

Nilsson et al. (2016) detailed a conceptual framework, evaluating the extent to which interactions occur between the 17 SDGs, focusing predominantly on the issues of poverty, equality, environmental conservation, and climate change [4]. As an analytical support tool, the authors outlined a seven-point scale of interactions between SDGs. These are rated from +3 (most positive) to −3 (most negative), with four criteria considered in this evaluation being: (1) reversibility of the interaction; (2) bidirectional attributes of the interaction; (3) extent of the impact of the interaction; and (4) certainty of the interaction. Examples cited of the most positive interactions include ending all forms of discrimination against women, which was deemed by [4] to be indivisible from ensuring the full participation of women and their equal opportunities for leadership. At the other end of the scale, a cited example of the most negative interactions is the pursuit of the full protection of nature reserves, which is specifically linked to goals 14 and 15, and has a trade-off with regard to ensuring public access for recreation. Through their approach, [4] emphasised the importance of governance institutions undertaking mutually reinforcing actions (‘policy coherence’) to minimise trade-offs [4].

The work of Singh et al. (2018) investigated co-benefits and trade-offs between the targets of Goal 14, ‘Life Below Water’, and other SDG targets [4]. A framework was developed to consider three hierarchical considerations: (1) the compatibility of the relationship (is it a co-benefit, trade-off, or neutral); (2) the contribution of one SDG target for the fulfilment of another; and (3) whether the compatibility of the relationship should be considered to be context-dependent or not. The workshop was split into 16 sessions with contributing experts from the fields of marine science, economics, ocean governance, and social anthropology. Participants were tasked with populating a matrix representing the seven targets of SDG14 versus the targets of the 16 other SDGs. It was found that all of SDG14's targets are related to the other SDGs, with two out of seven targets being particularly significant. These were the increase of economic benefits to Small Island Developing States and least developed countries, the elimination of overfishing, and illegal and destructive fishing practices. As well as highlighting the general contribution of marine environments to sustainable development, the approach of [4] has potential transferability to work analyzing synergies and/or trade-offs concerning other SDGs.

Nerini et al. (2018) conducted a study that was similar in general focus to Singh et al.'s (2018); however, the spotlight of their attention was shone on Goal 7, ‘Ensure access to affordable, reliable, sustainable and modern energy for all’ [7]. Synergies and trade-offs were characterised between the pursuit of SDG7 and other SDGs. Using an approach of qualitative content analysis and expert consultation, the authors uncovered 143 synergies and 65 trade-offs linked to 143 targets. In particular, the authors specified three human capacity domains in relation to the synergies and trade-offs linked to SDG7. These were (1) realizing aspirations of greater well-being; (2) building physical and social

infrastructures for sustainable development; and (3) achieving the sustainable management of the natural environment. The authors called for better organisation and connectivity of the evidence, enabling actors to work more effectively together to pursue sustainable development [7].

Bowen et al. (2017) considered some of the same governance challenges highlighted by [7] in relation to the simultaneous delivery of multiple SDGs [6]. The authors also highlighted the example of SDG7, and how compliance necessitates the contribution of various actors and agencies, each with its respective stakeholder interests [6]. Furthermore, [7] reflected on how terminology can have different meanings, with understandings of ‘affordable’ and ‘reliable’ varying relative to the national context. Such complexities led the authors to outline three major governance challenges that must be addressed in order to ensure the successful implementation of the SDGs. These were as follows: (1) ensuring collective action by creating inclusive decision spaces for stakeholder interaction; (2) embracing inevitable trade-offs through a focus on the principles of equity, justice, and fairness; and (3) guaranteeing that mechanisms exist to hold societal actors to account regarding their decision-making, policy actions, and outcomes [6].

Stafford-Smith et al. (2017) also addressed challenges in the implementation of the SDGs given the inevitability of trade-offs [24]. As the authors noted in accordance with the observations of [23], across the 17 goals, 42 targets address the means of implementation, whereas SDG17 is entirely focused on implementation, but there is no discussion concerning their various interlinkages and interdependencies. As a consequence, the authors are calling for greater attention to be given to interlinkages across three areas: economic sectors; societal actors; and between and among low, medium, and high-income nations. Seven broad recommendations were delineated by the authors to smooth interlinkages in implementation at a national and global level, covering the issues of: (1) finance; (2) technology; (3) capacity building; (4) trade; (5) policy coherence; (6) partnerships; and (7) data, monitoring, and accountability [24].

Overall, there is a growing body of research that is seeking to better understand and quantify, conceptually at least, the various interactions between the SDGs and their respective targets. The use of scoresheets and evaluative matrices has been adopted as a straightforward means of illustrating the extent of synergies and trade-offs, and to act as a starting point in the process of considering how governance institutions could potentially transform the latter into the former. However, such approaches are yet to be adopted in connection with the impacts of important national economic sectors, including tourism.

3. Tourism and Sustainability Impacts in Iceland

Iceland is a sparsely populated island in the North Atlantic Ocean with about 350,000 inhabitants. Around 62% of the population resides in the capital area of Reykjavík and Greater Reykjavík, while the rest of the population lives in the lowlands and around the coastline. About 80% of the island is uninhabited; it is characterised by rugged, volcanic, and mountainous areas with several glaciers, one of them being the largest in Europe. In terms of tourist attractions, Iceland has varied landscapes, many of which are relatively short distances from one another and vast wilderness areas, as well as a diverse array of nature-based activities such as horseback riding, river-rafting, hiking, glacier walks, and more [25]. Iceland’s tourism is heavily dependent on its natural attractions, as most tourists visit the country to experience its nature [19,21,26].

A recent book chapter [27] and paper [18] outlined the various economic, environmental, and social sustainability impacts of Iceland’s expanded tourism sector. In this section, the aim is not to repeat the level of detail contained in a very recent publication, but rather to provide a succinct summary of the synergies and trade-offs described in its contents. Table 1 summarizes the economic, environmental, and social impacts of relevance to the sustainability of the Icelandic tourism sector. Specific examples are added in the results section based on the observations reported in the focus groups, along with empirical evidence from relevant reports and academic publications. Key synergies and trade-offs reported by [27] relate to Iceland’s macro-economy and environment. Although tourism

has contributed to employment and a growing share of gross domestic product, and now constitutes the largest economic sector in Iceland's economy, it has imposed upward pressure on the Icelandic krona, ensuring that it is expensive to live in and visit the nation [28]. Equally, since much of Iceland's tourism is nature-based and the tourists are motivated by a desire to experience the nation's unique landscape features and fragile wilderness areas [26], this creates complexities for governance institutions [27]. There are challenges associated with infrastructure development, including maintaining carrying capacity and crowd management at popular tourist sites, such as the world-renowned locations on the Golden Circle route [27].

Table 1. Dimensions of tourism-related synergies and trade-offs in Iceland (structured in accordance with the framework of [29] and informed by [18,27]).

Type of Impact	Synergies	Trade-Offs
Economic dimension		
Economic environment	Increased expenditure	Localised inflation and national price increases
	Creation of employment	Replacement of local with foreign labour
	Increase in labour supply	Greater seasonal unemployment
	Increased value of real estate	Real estate speculation
	Increase in standard of living	Increased income gap between wealthy and poor
	Improved investment in infrastructure and services	Opportunity cost of investment in tourism means that other services and sectors do not get support
	Increased free trade	Inadequate consideration of alternative investments
	Increased foreign investment	Inadequate estimation of infrastructure costs of tourism development
	Diversification of economy	Increased free trade
		Overdependence on tourism for employment and economic development
Industry and firm	Increased destination awareness	Acquisition of a poor reputation as a result of inadequate facilities, improper practices or inflated prices
	Increased investor knowledge concerning the potential for new competition for investment and commercial activity in the destination	Negative reactions from existing local enterprises due to the possibility of commercial competition
	Development of new infrastructure and visitor facilities	
	Increase in accessibility	
	Improvements in destination image	Inappropriate destination images and brands
Environmental dimension	Changes in natural processes that enhance environmental values	Changes in natural environmental processes due to air and water pollution, and waste issues
	Maintenance of biodiversity	Loss of biodiversity and invasive species
	Maintenance and regeneration of habitat and ecosystems	Destruction of habitat and ecosystems exceeding physical carrying capacity

Table 1. Cont.

Type of Impact	Synergies	Trade-Offs
Socio-cultural dimension Community	Strengthening of community values and traditions	Weakening or loss of community values and traditions
	Exposure to new ideas through globalisation and transnationalism	Increase in criminal activity
	Creation of new community space	Loss of community space
	Greater security presence	Social dislocation
	Tourism as a general force for peace	Exceeding social carrying capacity
	Revival and upkeep of local traditions	Loss of authenticity
Psychological/Individual	Increased local pride and community spirit	Tendency towards defensive attitudes concerning host regions
	Greater cross-cultural understanding	High possibility of misunderstandings leading to host/visitor hostility
	Increased awareness of non-local values and perceptions	Increased alienation due to rapid changes to the local community

4. Research Methods

4.1. Focus Groups

This study was based on a series of four focus group interviews with experts, during which participants completed evaluative scoresheets on the extent to which the Icelandic tourism sector is contributing to synergies or trade-offs in meeting the targets of the 17 SDGs. Focus groups were selected as the research methodology for this study due to their capacity to integrate the expertise of relevant experts and use deliberation to stimulate an informed debate [30]. The interactive nature of the debate presented advantages over interviews with individuals, enabling participants to share views, hear the views of others, and perhaps refine opinions in the light of what they have heard [31]. In addition, in contrast to alternative deliberative techniques, such as the Delphi method, focus groups do not seek to arrive at a consensus of opinion, but rather to encompass the full breadth of expert insights, perspectives, and values. Furthermore, focus groups are less resource-intensive than the Delphi method, and do not suffer from the affliction of round-to-round participant dropout [31]. An overview of the method adopted in this study is provided in Figure 1.

In the first step, the SDGs were categorized into four different thematic categories adapted from the Stockholm Resilience Institute [32]. The Stockholm Resilience Centre has grouped the SDGs into three thematic categories: Biosphere (Goals: 6, 13, 14, and 15), Society (Goals: 1, 2, 3, 4, 5, 6, 7, 11, and 16) and Economy (Goals: 8, 9, 10, and 12), with SDG17 as a cross-cutting goal [32]. In this study, the SDGs were grouped according to four categories: Environmental; Economic; Social; and Institutional. Table 2 sets out this study's categorization.

Thus, the categorization diverged from the Stockholm Resilience Centre in the following ways:

- SDG7 on affordable and clean energy was grouped within the economic rather than the social theme because of its emphasis on the affordability of energy.
- SDG16 and SDG17 were placed in the institutional theme in order to facilitate discussion on the cross-cutting issues of institutional capacity and coordination, data collection, and implementation in the context of tourism and the SDGs.

Table 2. Categorization of Sustainable Development Goals (SDGs).

SDG Number	Short Title	Aim
Social		
1	No poverty	End poverty in all its forms everywhere
2	Zero hunger	End hunger, achieve food security, improve nutrition, and promote sustainable agriculture
3	Good health and well-being	Ensure healthy lives and promote well-being for all at all ages
4	Quality education	Ensure inclusive and quality education and promote lifelong learning opportunities for all
5	Gender equality	Achieve gender equality and empower all women and girls
11	Sustainable cities and communities	Make cities and human settlements inclusive, safe, resilient, and sustainable
Environmental		
6	Clean water and sanitation	Ensure availability and sustainable management of water and sanitation for all
13	Climate action	Take urgent action to combat climate change and its impacts
14	Life below water	Conserve and sustainably use the oceans, seas, and marine resources for sustainable development
15	Life on land	Promote, protect, and restore terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation, and halt biodiversity loss
Economic		
7	Affordable and clean energy	Ensure access to affordable, reliable, sustainable, and modern energy for all
8	Decent work and economic growth	Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all
9	Industrial innovation and infrastructure	Build resilient infrastructure, promote inclusive and sustainable industrialisation, and foster innovation
10	Reduced inequalities	Reduce inequality within and among nations
12	Responsible consumption and production	Ensure sustainable consumption and production patterns
Institutional		
16	Peace, justice, and strong institutions	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all, and build effective, accountable, and inclusive institutions at all levels
17	Partnerships for the goals	Strengthen the means of implementation and revitalise the global partnership for sustainable development

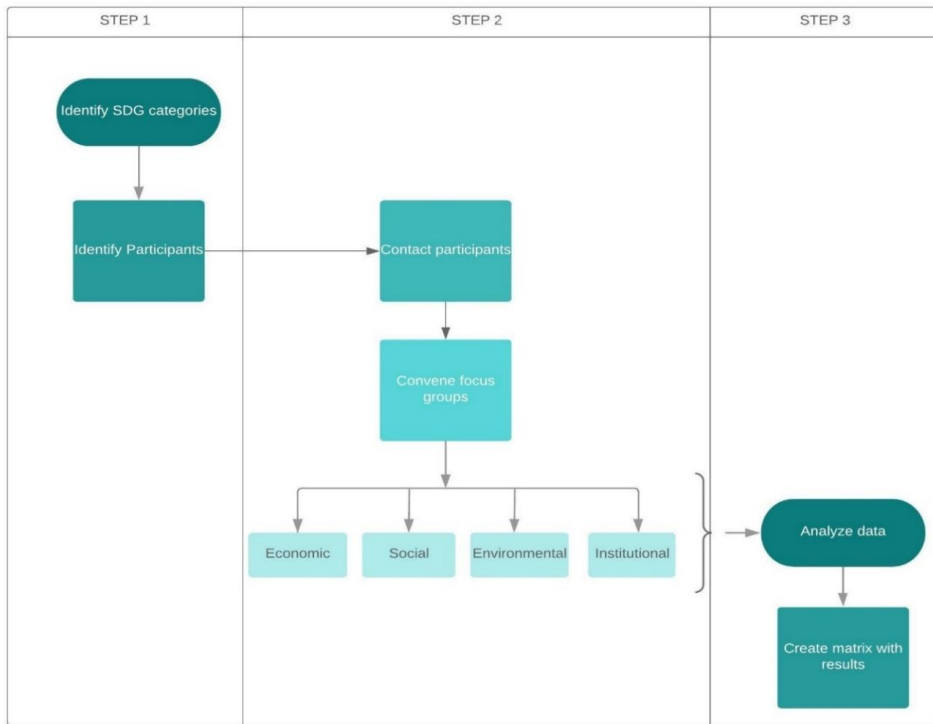


Figure 1. Flowchart of the research procedure in this study.

4.2. Participants

Once the categories were formed, the researchers identified an initial pool of 53 experts through stakeholder analysis. Close attention was paid to the stakeholder map recently produced in the ‘Nordic Tourism Policy Analysis’ report [33], which highlighted all the major tourism sector stakeholders in Iceland. Then, expert opinion guided the researchers towards determining and approaching key stakeholders for the theme-based focus groups. The specific participant selection criteria adhered to the approach advocated by [31] and were as follows:

- Purposive sampling:** Participants was chosen based on their expected knowledge in terms of the content of each SDG goal, their related targets, and the tourism sector. Participants were contacted by email and informed about the study and its aims. They were also asked to propose an expert to take their place if they were unable or unwilling to participate in the focus groups. This was done to ensure that participants were key informants in their respective fields and to utilise the snowball method.
- Representative sampling:** Each focus group had to include participants from various stakeholder groups: business, academia, non-governmental organisations (NGOs), tourism organisations, and governmental institutions.
- Composition:** Equal numbers of male and female participants were included in the initial pool of participants to ensure an equitable gender balance.

There were 20 participants in total. Of these, there were eight males (40%) and 12 females (60%). The number of attendees in each thematic focus group was as follows: environmental (6), economic (4), social (5), and institutional (5). The structure of participants was as follows: business (4), academia (5), NGOs (3), tourism organisations (4), and governance institutions (4). With regards

to the participants attending from governance institutions, there were three attendees from national institutes and ministries, and one from the local municipal government in Reykjavik.

The sessions took place between 3–24 April 2019 to test the materials and procedures. The four focus group meetings took place between 10 April–8 May 2019, and each lasted approximately 90 min.

4.3. Procedures

Each focus group discussion was moderated by two members of the research team. The moderators' role was to act as observers and facilitators in the discussion and to ensure that all the perspectives were heard and discussed. Materials were distributed in each group with the relevant SDGs and associated targets. Participants were invited to consider and discuss each SDG in their respective thematic group. Each group discussed the extent to which they considered synergies and trade-offs to exist between the Icelandic tourism sector and the targets specific to the SDGs in their respective thematic category. They were also asked to consider how to ameliorate trade-offs through policy-making or other measures. After the focus group, participants had deliberated on each SDG target for which they were asked to score the extent of the trade-off/synergy with the Icelandic tourism sector, with each SDG target evaluated using a seven-point scale. This was the same approach as the one adopted by [5]. The scale was as follows: (−3) strong trade-off; (−2) moderate trade-off; (−1) slight trade-off; (0) neither a trade-off nor a synergy; (+1) slight synergy; (+2) moderate synergy; and (+3) strong synergy (Table S1 to this paper includes all of the evaluative scoresheets used in the four focus groups. For ease of reference, these are arranged in numeric order of the SDGs rather than being grouped according to their thematic categories).

4.4. Analysis

The thematic focus group sessions were recorded and transcribed, and participant anonymity was guaranteed. The transcribed data from the discussions was used to enrich the numerical evaluation so as to include lines of reasoning in the final assessment. Each researcher listened to the recordings and summarised them. Then, these summaries were compared to ensure content validity. Finally, all the recorded data will be deleted upon completion of the research project. Results from the scoresheets were averaged and reported to two decimal places for each of the SDGs targets. Then, a straightforward traffic lights system was applied, akin to the indicator evaluation approach of [34], which fed into an evaluative matrix for all of the 169 targets. A red traffic light equated to a trade-off and was linked to a mean score of between −1.00 and −3.00. A yellow traffic was associated with a mean score of between −1.00 and +1.00, meaning that there was neither a synergy nor a trade-off. A green traffic light equated to a synergy and was linked to a mean score of between +1.00 and +3.00.

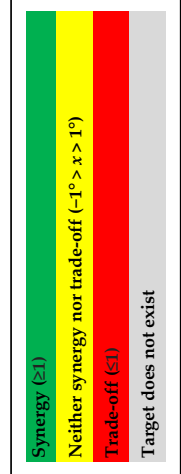
5. Results and Discussion

5.1. Summary of Main Outcomes

Table 3 sets out an overall matrix of scoresheet outcomes from the four focus groups. Mean scores (to two decimal places) from participants are provided with respect to each SDG target. Colors for each entry relate to the traffic-lights system of evaluation outlined in Section 4.4 of this paper. The gray spaces reflect cases where a particular target does not exist in relation to a specific SDG. Across the SDGs' 169 targets, there were 32 synergies (18.9%) and 11 trade-offs (6.5%) identified, whilst all the other targets were classed in the neither nor category.

Table 3. Evaluative matrix of synergies and trade-offs between Icelandic tourism and SDG targets.

Target	Sustainable Development Goal																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	-0.20	0.00	0.00	0.00	-0.40	0.00	-1.25	1.75	2.00	0.25	-1.00	1.25	0.80	-2.20	-0.20	-0.80	1.00
2	0.60	-0.60	0.00	0.00	-2.40	0.80	-1.00	0.00	0.00	0.50	0.00	1.75	1.00	-1.80	0.00	-0.40	0.00
3	0.00	1.00	-0.20	1.40	0.00	-1.80	0.25	2.25	1.25	0.50	0.00	0.75	1.20	-1.20	-0.60	0.80	0.00
4	0.00	0.40	0.00	1.80	-0.20	0.00	0.00	1.25	1.25	0.50	2.00	-0.75	0.00	0.00	-0.80	-0.40	0.00
5	-0.60	0.20	-0.40	0.00	1.00	0.00	1.25	1.25	0.50	0.75	0.00	0.75	0.00	-0.20	0.00	-1.20	0.00
6			0.20	0.00	0.00	0.00	2.50	0.00	0.00	0.00	-0.80	0.25	0.00	0.00	0.00	0.00	0.00
7			-0.20	1.00			0.00	0.00	0.00	0.75	0.00	0.25	0.00	0.00	0.00	0.00	0.00
8			0.00				0.25					2.00			-2.20	0.00	0.00
9			-0.40				1.75								0.00	0.00	0.00
10							1.25								0.00	0.00	0.00
11																	0.00
12																	0.00
13																	0.00
14																	2.00
15																	0.00
16																	1.00
17																	1.60
18																	0.00
19																	0.00
A	-0.80	-0.60	0.00	0.00	0.20	0.60	1.25	0.25	0.25	0.00	1.40	0.50	0.00	0.40	-0.20	0.00	0.00
B	-0.20	0.00	0.00	0.00	0.00	1.40	1.00	0.00	1.00	0.00	1.40	0.75	0.00	0.00	0.00	0.60	0.00
C		0.00	0.00	0.00	0.20			0.50		0.00	0.00	0.25		0.00	0.00		0.00
D			0.20														



Across six of the 17 SDGs (35.3%), zero synergies were identified. Exactly one-quarter of the 32 target synergies related to SDG8 (decent work and economic growth). Other goals with three or more synergies were SDG4 (inclusive and equitable education), SDG9 (industrial innovation and infrastructure), SDG11 (sustainable cities and communities), SDG12 (sustainable consumption and production), and SDG17 (partnerships for the goals). Out of the 32 target synergies, five had mean outcomes of more than 2.00, equating to moderate to strong synergies. These belonged to SDGs 8 (two targets), 9, 11, 12 and 17. The highest mean outcome across all targets was 2.50, which was identified in connection with SDG8, Target 6 on youth employment.

Trade-offs were identified within seven of the 17 goals (41.2%). However, only SDGs 7 (affordable and clean energy), 14 (life below water) and 15 (life on land) had more than one trade-off, and no SDG had more than the three linked to SDG14. For three of the SDGs with trade-offs—14, 15, and 16 (peace, justice, and strong institutions)—there were no counterbalancing synergies. Out of the 11 trade-offs, three had mean target outcomes of less than -2.00 , equating to moderate to strong trade-offs. These were linked to SDGs 5 (gender equality), 14, and 15. The lowest mean outcome and thus the largest trade-offs across all targets was -2.40 , which was associated with SDG5, Target 2 (violence against women and human trafficking).

5.2. Synergies

5.2.1. Economic

The focus group participants communicated the contribution that Iceland's tourism sector has made to economic growth and job creation, which was reflected in SDG8 having the most target synergies. Two of the targets linked to SDG8 had mean outcomes of more than 2.00, target 3—relating to entrepreneurship, development, and job creation—and target 6 addressing youth employment. Since the collapse of Iceland's banking sector in 2008 [20], tourism in Iceland has been a major driver of economic growth and an aid to economic stability, contributing (both directly and indirectly) about 40–50% of the economic growth in Iceland after 2011 [35]. In 2017, tourism outpaced other sectors in Iceland with 42% in foreign exchange earnings [21], making a direct contribution to gross domestic product (GDP) of 8.6% [36].

During the period 2008–2018, the number of people employed in the tourism sector and related activities grew by 98.5% [37]. Since 2015, there has also been a 40% increase in the number of firms in the Icelandic tourism industry [38]. The contribution of tourism to job creation and economic growth in Iceland appeared to be an underlying factor in the synergies found in relation to targets 1, 3, 5, 6, and 9 of SDG8, with target 9 directly focussed on the topic of sustainable tourism and job creation. Although much of the job creation in Iceland's tourism sector has related to traditional service sector roles, the construction sector has also expanded to try to keep pace with the increased supply of visitors, particularly through the building of hotels and visitor infrastructure [38].

Focus group attendees commented on the contribution that the Startup Tourism initiative has made in stimulating innovation and entrepreneurship across the sector in Iceland, as well as leading to job creation among young persons and economic growth. These were discussed as being central to synergies in SDG8 but also SDG9, which focusses more directly on the subject. The strongest synergy (mean of 2.00) was found in relation to Target 1 of SDG9, addressing the creation of resilient and sustainable infrastructure. Targets 3 (access to credit for developing infrastructure) and 4 (upgrading of infrastructure using clean technologies) of SDG9 were also found to be synergistic. Focus group participants commented on the recent advancements in infrastructure development linked to Iceland's tourism industry, observing the expansion at Keflavík International Airport and the provision of facilities at the most frequented visitor sites, including the Golden Circle. The airport has expanded in size considerably since 2012 to accommodate the increasing numbers of tourists and through-traffic, as it also serves as a hub between Europe and the Americas [35]. There was recognition amongst the participants that the growth of the tourism sector had quelled arguments in Iceland in favour of the

expansion of heavy industries, such as aluminium production, which, although fueled by renewable energy, is carbon intensive.

A total of three synergies linked to SDG12 were reported based on the scoresheet responses of the focus group participants. The strongest of these were associated with targets 2 (sustainable management of natural resources) and 8 (information and awareness about sustainable development). Focus group participants reported that the expanded tourism industry had led to both the need for greater management planning and policy interventions concerning the sustainability of Iceland's natural assets, and in turn had increased awareness of such issues amongst the population. These opinions are reflected to some extent in current government policy, which advocates the adoption of financial incentive instruments in the form of a tourism tax from 2020 onwards [39]. In addition, the government's financial plan for the period 2016–2023 earmarked 2.8 billion ISK to tourism-specific development in protected areas and popular destinations throughout the country [39].

5.2.2. Environmental

A total of three synergies were identified by focus group participants in connection with the environmental goals. No synergies were identified with respect to SDGs 14 and 15. One of the target synergies related to the cross-cutting objectives of SDG6 focused on supporting and strengthening the participation of local communities in improving water and sanitation management. Focus group participants opined that local communities around Iceland, whose livelihoods greatly depend on tourism, might envisage more sustainable management of water resources and sanitation as being economically advantageous. As far as the authors are aware, there is no documented evidence showing these effects, particularly in relation to sanitation and water treatment issues. On the contrary, there is anecdotal evidence that some areas have reached capacity limits and may soon need to be upgraded in line with increased use [40]. This is also important in terms of reducing ecological impacts to sensitive areas, such as for example in Lake Mývatn, where inadequate sewage treatment by hotels in the area has threatened the ecosystem [41]. Another report commissioned by the Tourism Task Force assessed access to toilets around the country in 2016. The report found that toilet availability in popular destinations and on the Ring Road that surrounds the island was far from satisfactory and often non-existent [42].

The other two synergies linked to SDG13 (climate action) involved numbers 2 and 3. Respectively, these targets address the integration of climate change measures into national policymaking, and education concerning climate change mitigation and adaptation. With regards to both targets, focus group participants suggested that the Icelandic tourism sector can increase pressure on national and local governments to reduce impacts on the climate, in part due to the importance and image of the sector. The increased adoption of certification schemes for quality and environmental management in Icelandic tourism, such as Vakinn, was cited as an example of the tourism industry leading by example and placing indirect pressure on the national government to enact policies that reduce the impacts of the sector.

5.2.3. Social

Across the six SDGs with a social focus, a total of eight synergies were identified, and half of these were linked to SDG4. Synergies were also found to be linked to SDGs 1 and 3.

In association with SDG4, synergies were found in relation to targets 3, 4 and 7. In the case of Target 3, focus group participants expressed an opinion that the Icelandic tourism industry has developed courses and training for people working in the sector. Participants also contended that the Icelandic tourism sector is making a strong, albeit slightly indirect, contribution to education for sustainable development (Target 7), because the national discourse has been focussed on these issues. Although this discourse has not been centered specifically on the term "sustainability", there has always been a lot of discussion about environmental issues such as the soil erosion of footpaths and walkways. In addition, focus group participants discussed the role of tourism in Iceland as a promoter

of peace via the many cultural exchanges that happen when people travel to the nation and return to their homeland with a new perspective.

In relation to the synergy reported for Target 4, focus group participants acknowledged many examples of entrepreneurship in tourism, even in the most remote areas of Iceland, which have led to the creation of jobs for Icelanders and necessitated imported labour. In recent years, Icelandic culture has been broadened through increased immigration, as workers have moved to the country in search of employment within the tourism sector. A recent report on tourism and the labour market in the capital area found that about half of the jobs in the tourism sector have been filled by immigrant workers [43]. Foreign immigration to Iceland has increased by 79% since 2011 [44], with the tourism and construction sectors absorbing most of these workers [28,45]. Many of these workers live and work in new hotels and guesthouses located a considerable distance from the capital city of Reykjavík [43].

Other synergies across the socially themed SDGs were Target 3 of SDG2, Target 5 of SDG5, and Targets A and B of SDG11. With regards to Target 3 of SDG2, multiple focus group participants had voiced the viewpoint that remote rural areas in Iceland appeared to be benefiting from tourism, with local agricultural activities and family farms brought to life again through the emergence of diversified income opportunities. The synergy in Target 5 of SDG5 reflected the observation that women have become more prominent in senior positions across the Icelandic workforce, and, specific to Icelandic tourism, female chief executive officers (CEOs) are in charge of some of the leading companies, including Elding, Icelandair Hotels, and the Radisson hotel chain. The synergy identified in relation to Target A of SDG11 appeared to reflect recognition that the expanded Icelandic tourism sector has stimulated the interest of policymakers concerning how to support the growth of cities and towns around Iceland, and how to ensure a more balanced distribution of visitors across the country. Target B of SDG12 was assessed to be synergistic given that the increased number of people present in Iceland has necessitated greater planning by the relevant authorities on disaster management. This is particularly due to possible evacuations caused by volcanic eruptions or glacial outburst floods, either of which might imperil the ring road around Iceland.

5.2.4. Institutional

Four synergies were identified across the two institutionally themed SDGs, all of which related to SDG17. These targets were numbers 1, 14, 16, and 17. With regards to Target 1, focus group participants asserted that the lack of earlier regulation of accommodation platforms, such as Airbnb, has since prompted the tax authorities to clamp down on potential tax evasion practices, albeit they recognized that the practice has not been ameliorated completely.

The strongest target synergy concerned number 14, which had a mean score of 2.00. There was recognition among the focus group participants that the Icelandic tourism sector was playing a strong role in ensuring policy coherence for sustainable development. Comments were made about how the Ministry of Tourism, Industry, and Innovation had formed a Tourism Task Force in 2015, which was required to develop a five-year plan for the sustainable development of the industry. The culmination of this work is currently occurring at the same time as a general national debate about how best to preserve Icelandic nature and develop the tourism industry [27].

Synergies linked to targets 16 and 17 related to partnership building among institutions. Focus group participants communicated that tourism to Iceland was emissions-intensive due to the remoteness of the island and need for most visitors to fly in and out. The Icelandic tourism sector was deemed to be indirectly highlighting the need for international solutions to the problem of greenhouse gas emissions from the aviation sector. In addition, it was stated that the Icelandic and New Zealand governments were cooperating to find common policy solutions to the sustainability challenge of nature-based tourism on a national scale. Domestically, with respect to Target 17, participants acknowledged that municipalities have responsibility for the development and maintenance of Icelandic tourist sites, but receive little or no financial benefit from the tourist flows. Therefore, public-private partnerships have been increasingly adopted to ensure that the supply of infrastructure meets demand.

5.3. Trade-Offs

5.3.1. Economic

Trade-offs were identified in only one of the five SDGs with an economic theme. These were targets 1 and 2 of SDG7. In relation to Target 1 on access to affordable, reliable, and modern energy services, focus group participants voiced concerns that access to energy may come at a cost to tourism due to negative effects on the landscape and natural wilderness. The discussion included a debate about competition between Iceland's energy and tourism sectors regarding the value of nature, with the energy sector potentially demanding access to resources that the tourism sector deems valuable enough to prohibit the development of energy infrastructure.

Although the main focus of the focus group debate was on the advantages of energy provision versus the preservation of natural resources for the benefit of tourists, the participants tapped into a wider debate in Iceland about the relative merits of infrastructure provision and what should be prioritised. The pace of tourism growth has outstripped institutional and governmental capacity to respond in a timely fashion, and so various public services and built infrastructure have been put under strain due to the increased numbers of tourists [45]. The airport has expanded in size considerably since 2012 to accommodate increasing numbers of tourists and through-traffic, as it also serves as a hub between Europe and the Americas. Effects of the airport expansion and associated increase in tourist numbers on other infrastructure and services have largely been overlooked [35]. A recent OECD report on Icelandic tourism argued that "major infrastructure decisions . . . need to be based on sound and wide-ranging analysis", taking into account not only economic effects but also social and environmental impacts [28] (p. 34). In part, this gap between policy and infrastructure needs reflects the initial rationale in the policy sphere during the first few years after the economic recession, wherein the tourism industry was conceptualised as one of the production industries in Iceland's economy. As Jóhannesson and Huijbens (2013) put it, "the mentality in regard to tourism development by the central authorities has to a large extent been similar to the production industries where more fish mean more money and larger aluminium smelters mean greater profits" [46] (p. 143).

The trade-off identified in relation to number 2 of SDG7 was in relation to the share of renewable energy in Iceland. Although Iceland is world-leading in this regard, the focus groups nevertheless recognised the negative contribution of the expanded rental car market, given its reliance on fossil fuel combustion. Iceland's transportation system is predominantly based on the private car in terms of the most frequent travel mode within the country. As a result, tourism relies heavily on rental cars, which have increased rapidly in the last few years from around 5000 rental cars in 2006 to 21,000 in 2016 [47]; almost 10% of the car fleet in Iceland is now comprised of rental cars [48]. Apart from the pressures on infrastructure, the increase in cars can lead to more traffic congestion, air pollution [49], and greenhouse gas emissions [50], especially in the capital region. The transportation sector has already been singled out as a major target area for improvement to increase the sustainability of tourism in Iceland [28]; it is also one of the nation's main policy avenues for climate action [51]. This is equally the case with transportation to and from Iceland, which is mostly by air, but there is also a growing volume of cruise ship traffic in the summer months [27].

5.3.2. Environmental

Almost half of all the trade-offs across the SDGs were associated with environmentally themed goals. Three trade-offs were determined in connection with SDG14: two in SDG15 and one in SDG6. Zero trade-offs were identified by the focus group participants in SDG13.

The three trade-offs associated with SDG14 were numbers 1, 2, and 3. All of the concerns voiced by the focus group participants related to the greenhouse gas emissions of the tourism industry in Iceland. In Iceland, greenhouse gas emissions from tourism have been attributed mostly to the transportation sector, with aviation estimated to account for between 50–82% of all tourism emissions, depending on the distance of flights [52]. According to the international bunker fuel data held in relation flights to

and from Iceland, Iceland's emissions from aviation have more than doubled in the period from 2000 to 2016 (the last submission year) [50].

In relation to targets 1 and 2 of SDG14, concerns were also raised about the impacts of cruise ships, with trade-offs discussed concerning their use of heavy fuel oil. Cruise ship tourism has also become a potentially significant source of pollution in the last few years. Cruise ships are associated with a number of negative environmental effects including air pollution, polluting discharges such as sewage, bilge oil, chemicals, and greenhouse gas emissions [53]. These impacts have yet to be quantified in Iceland, although cruise ship passengers have increased from about 28,000 in 2001 to about 145,000 in 2018 [54], which is an approximate increase of 420%. In relation to target 3 of SDG14, the group opined that the greatest threat to ocean ecosystems is acidification, and that this is directly related to the amount of greenhouse gases released. Thus, if tourism in Iceland increases, it will adversely impact the ocean ecosystem, even if indirectly.

A trade-off was also identified in relation to Target 3 of SDG6. The focus group participants were concerned about the impacts of the Icelandic tourism sector on water quality, particularly in small, remote communities. The example of Lake Mývatn was mentioned. Increases in tourism have placed upwards pressure on current facilities, creating the need for upgrades, and focus group participants opined that many very small municipalities are struggling to secure sufficient funds for these.

The trade-off in Target 2 of SDG15 related to concerns about afforestation practices in Iceland. Whether the issues raised were related to tourism is debatable. Participants observed that the trees planted in Iceland are often not native species. The go-to plants for afforestation are often coniferous rather than birch due to their rapid growth. However, when planted in the wrong sites, they can reduce biodiversity; thus they could be deemed to be unsustainable.

The joint-largest trade-off (mean of -2.40) among the environmental goals related to Target 8 of SDG15. This was connected to the potential for tourists to introduce invasive species to Iceland. Focus group participants discussed the potential for freshwater ecosystems to be impacted by alien species through tourism activities, for instance via fishing equipment or wellington boots. Participants also reflected further on the issue of ballast water and cruise ships. According to the group, it makes economic sense for cruise ships to unload ballast water at the ports, since doing this when passengers disembark saves time.

5.3.3. Social

Two trade-offs were identified in relation to the socially themed goals. These were Target 2 of SDG5 and Target 1 of SDG11. No trade-offs were found in connection with SDGs 1, 2, 3, and 4.

Target 2 of SDG5 concerned the elimination of all forms of violence against women in the public and private sphere, including human trafficking and sexual exploitation. It was felt that this situation was worsening in Iceland due to the tourism sector. As far as the authors are aware, there are no academic studies that corroborate the opinions of the focus group, although there have been anecdotal reports in the English-language media [55], a critical United States (US) government report on the extent of human trafficking [56], and a recent domestic study by the Icelandic Travel Industry Association on wage exploitation and financial fraud [57].

Target 1 of SDG11 concerns access to safe and affordable housing. Focus group participants raised the issue of immigrant workers in the tourism industry being forced to live in unsuitable accommodation, such as converted garages or industrial buildings. There was also discussion concerning the affordability of housing in Iceland due to a supply shortage spawned by the hosting of tourists within the Airbnb market. Although Airbnb has helped to meet the demand for tourist accommodation, it has also led to fewer available apartments for local residents and increased prices in the housing and rental markets. The Central Bank of Iceland estimates that the number of apartments that were mainly used for short-term lodging through Airbnb were about half to more than two-thirds of the new apartments in 2016 [58]. In total, it has been estimated that 15% of the total rise in real house prices in the period 2014–2016 can be attributed to the growth of Airbnb apartments in that period [58].

Therefore, housing has become less affordable for young people and low-income households [28]. Immigrants in Iceland are particularly vulnerable to increases in prices in the rental market [59]; at the same time it is also more difficult for them to secure rental accommodation [60]. The number of apartments that were used only for short-term renting did not increase in 2018, and although there is still a housing shortage, it is estimated that the supply of housing, especially affordable dwellings, will gradually rise to match demand over the next few years [38].

5.3.4. Institutional

A single trade-off was identified, belonging to Target 5 of SDG16. Focus group participants expressed the view that tourism was probably having a countering effect on reducing bribery in all its forms in Iceland. This opinion appeared to be formed from anecdotal evidence about the practices of some tourism companies in Iceland. Examples were cited of hotels selling bottled water to tourists and some restaurants having a tip jar, even though the service charge is included in their menu prices. Equally, the discussion concerning corruption proceeded to focus on issues of rights and power—for example, the individuals and companies who win contracts to provide tourism services, build certain infrastructure, obtain loans, and how these people are connected. Others in the group contended that fixing these issues was not really within the remit of tourism, and these issues were really societal and political challenges for Iceland to address.

5.4. Implications of Results

This paper set out to evaluate the impacts of Icelandic tourism on performance across all of the SDGs and their respective targets, with the aim of determining whether the sector stimulates synergies and/or trade-offs. The majority of the mean outcomes with respect to the SDG targets showed neither synergies nor trade-offs. Overall, this study suggests that the Icelandic tourism sector makes a largely positive contribution towards the meeting of multiple objectives across the SDGs, with evidence of almost three times more synergies than trade-offs. However, several trade-offs pertain to environmental goals, and their incidence and degree should not be understated based on the outcomes from this study.

The significance of Iceland's tourism sector to the national economy was reflected in synergistic effects with SDG8. This was the only SDG to have an overall synergy with the Icelandic tourism sector. This outcome should be of interest to tourism companies in Iceland, employees in the sector, politicians, and agencies seeking to maximise the economic benefits of tourism across the nation, such as the Iceland Tourism Cluster. There is increasing interest around the world in matching company and business sector objectives with the SDGs and their respective targets, and thus one of the main practical advantages of this work is that it identifies, at least specific to Iceland, the links between corporate activities and SDG targets. New entrepreneurial activities linked to tourism in Iceland, aided and abetted by innovative initiatives such as the Iceland Tourism Cluster and Startup Tourism, directly contribute to job creation and synergies with at least five targets in SDG8, especially number 9 on sustainable tourism and job creation.

Businesses specialising in infrastructure works may also wish to take note of the results. Synergies in the environmental sector were identified, including a need for communities around Iceland to have sufficient infrastructure to cope with the influx of tourists. In many cases, built infrastructure has been put under strain in recent years due to the large increase in users over a short time period, and many roads and various facilities, especially in the countryside, are not up to par [40]. The physical condition of the roads is important for tourism in terms of safety and access to certain areas, and can also be an important factor influencing the distribution of visitors around the island. Improved road conditions might reduce the number of incidents that the police and emergency services handle. A prominent example of infrastructural improvement that is important for tourist safety is the changing of single to double-lane bridges, especially on the most frequently used Ring Road around Iceland [40]. The lag in infrastructure development to accommodate the increased numbers of users is partly due to private and public sector oversight, as the soaring popularity of Iceland as a tourist destination was

relatively unanticipated. In some cases, the lack of appropriate infrastructure is related to the lack of tourism revenues for those municipalities that are responsible for development in their regions [28]. The Federation of Icelandic Industries published a report in 2017 on the state and future outlook of built infrastructure in Iceland. The report assessed the current condition of infrastructure and estimated the associated maintenance costs for the coming decade. The assessment found that the road transport system, sewer and drainage systems, and the other airports and landing areas received the lowest marks and are in need of maintenance and upgrades in the coming decade [40].

Politicians, relevant ministries (for example, the Ministry of Environment and Natural Resources, and Ministry of Tourism, Industry, and Innovation) and agencies working to increase Iceland's share of renewable energy and reduce greenhouse gas emissions may wish to take note of environmental trade-offs linked to the fossil fuel consumption of tourists, especially via cruise ships, international aviation, and rental car usage. Cruise ship tourism has also become a potentially significant source of pollution in the last few years. Cruise ships are associated with a number of negative environmental effects including air pollution, polluting discharges such as sewage, bilge oil, and chemicals, and subsequently, greenhouse gas emissions [53]. These impacts have yet to be quantified in Iceland, although cruise ship passengers have increased from about 28,000 in 2001 to about 145,000 in 2018 [54], which is an approximate increase of 420%. The hiring of rental cars has increased considerably in the last few years from around 5000 rental cars in 2006 to 21,000 in 2016 [47], and they now form almost 10% of the car fleet in Iceland [48]. Apart from the pressures on infrastructure, the increase in cars can lead to more traffic congestion and air pollution [49], and greenhouse gas emissions [50], especially in the busy capital region. The transportation sector has already been singled out as a major target area for improvement in regard to increasing the sustainability of tourism in Iceland [28], as well as being one of the nation's main policy avenues for climate action set out in Iceland's Climate Action Plan for 2018–2030 [51].

Concern was also voiced during the focus groups and reflected in the quantitative outcomes that some migrant workers in the Icelandic tourism industry were exploited and abused during their time working in Iceland. These concerns also been voiced in the English-language media in Iceland [61,62]. This should be of concern to various institutions in Iceland, including the Red Cross, municipalities, the police (especially in relation to stories of human trafficking) and the Ministry of Welfare.

Outcomes from this study should be of interest to a very broad array of domestic stakeholders, including individuals training to work in the Icelandic tourism sector, service providers, and policymakers who are tasked with maximising the benefits of synergies and either minimising the extent of trade-offs, or finding ways of intervening to transform these into synergies. They should also be relevant to academics specialising in tourism studies, as well as those from other disciplines seeking straightforward and practical methodologies that can be deployed to evaluate the contribution of economic sectors to performance across all the SDGs.

5.5. Contribution of Iceland's Tourism Sector to Meeting the SDGs

It was made clear to focus group participants that they were asked to assess the contribution of tourism to meeting or not meeting the SDGs and their respective targets. They were specifically requested not to evaluate whether a particular SDG or target was being met. However, it is important to consider the outcomes from this study in the light of Iceland's current performance across the SDGs.

A recent evaluation by the OECD reviewed the SDG performance for all the member states. In the case of Iceland, it was found that the nation had already achieved 17 of the targets based on the data available for 111 of the 169 targets [63]. The nation was compliant in areas relating to adult information and communication skills, air quality, and the share of renewable energy. Even though Iceland was compliant, outcomes from this study suggest that the tourism industry presents one of the few drawbacks linked to even better performance for air quality and the share of renewable energy in Iceland. This is reflected in the transition to electric car usage being one of the main policy ambitions of Iceland's Climate Action Plan for 2018–2030 [51]. Equally, objectives 12, 13, and 14 of Iceland's Climate

Action Plan recognise the environmental impacts of cruise ships and shipping, seeking to increase clean energy use for ferries, increasing the share of renewable energy utilised by ships, and advancing electrical infrastructure in harbors, respectively [51].

The OECD assessment also observed several challenges for Iceland in meeting the SDGs, with the nation considered to be very far away from meeting 5% of the targets [63]. These include targets relating to energy intensity and hazardous waste. The outcomes from this study suggest that the Icelandic tourism industry is unlikely to make either a positive or negative contribution to meeting the targets related to energy intensity or hazardous waste.

Iceland was assessed as being furthest away from meeting the SDGs on energy, sustainable production, and biodiversity (SDGs 7, 12, and 15, respectively) [63]. There are parallels with the results of the focus groups from this study. Their assessment revealed two trade-offs linked to SDG7 and two trade-offs for SDG15. Trade-offs linked to SDG7 concerned potential conflicts between increased renewable energy generation and the need to preserve nature for the benefit of tourists. This argument is part of an ongoing debate in Iceland about whether to establish a national park in the central highlands of Iceland, which would preserve the landscapes for Icelanders and tourists [64]. Although forest-based tourism is very limited in Iceland, focus group participants also recognised the tendency to plant non-native tree species as part of Iceland's programme of afforestation, which is a strategy that is mainly aimed at sequestering greenhouse gas emissions in pursuit of Iceland's climate change objectives. This approach was deemed to be contrary to the biodiversity objectives of SDG15.

5.6. Broader Applicability of Methods to Other Contexts

The methodological approach adopted in this paper has relevance and applicability to other studies seeking to acquire a conceptual understanding of the links between a specific sector of an economy and its contribution to SDG outcomes. The study outcomes may also be of particular interest to other nations who rely heavily on nature-based tourism, such as New Zealand, Australia, and Costa Rica. Equally, the outcomes pertaining to developing nations with significant tourism sectors may be very different. Nature-based tourism has long been advanced as a means of generating economic growth, particularly in least economically developed African states [65]. If a similar study to this one were to be adopted in a developing nation, the results might be quite different. This study found no synergies or trade-offs relating to 126 of the 169 targets (74.6%) across the 17 SDGs. Very often, this was because of the manner in which the targets were worded, which rendered objectives specific to developing nations or small island states. Due to the lack of flexibility to encompass separate objectives for developed nations, such as Iceland, many of the targets were deemed by the focus group participants to be irrelevant, especially in the social and institutional sessions. Many more of these targets would very likely be relevant and synergistic with tourism and the sector's contribution to wealth creation in developing nations, for instance those relating to poverty eradication, access to basic services, and ensuring the full and active participation of women in employment.

5.7. Methodological Limitations

Insights gleaned from focus groups rely heavily on the availability and willingness of experts to contribute to the panels. Although the researchers made an exhaustive effort to identify and source experts who were best suited to contribute to the deliberations, a small number were unavailable—for example, a representative from the police for the institutionally themed session—and some cancelled their participation on the day. This may have had an impact on the results in ways that are difficult to quantify. Equally, the irrelevance of many of the SDG targets to a developed nation such as Iceland, or a persistent failure to identify links between the Icelandic tourism sector and the SDG targets, may have led to some experts becoming frustrated with the evaluative process.

The scoresheet system was a useful means of establishing the conceptual links between the Icelandic tourism sector and the SDGs, but the extent of the identified synergies and trade-offs should be considered with some degree of caution. Furthermore, the arbitrary decision on the part of the

researchers to classify all the mean target outcomes in the range of -1 to $+1$ as neither synergies nor trade-offs may mean that some minor synergies and trade-offs were overlooked. This study does not provide a substitute for quantitative evaluations of impacts, but, especially in the case of trade-offs, rather implies areas needing further evaluation, monitoring, and consideration by the Icelandic Tourism Task Force, which is focused closely on the local sustainability impacts of Icelandic tourism. Additionally, the extent of trade-offs and synergies identified in this study may in part be reflective of emotional responses to the issues involved, for instance, the extent of social impacts relating to human trafficking. That is not to say that this impact is minor in actuality, but rather that its extent needs further evaluation.

Alternative deliberative techniques, such as the Delphi method, were rejected as the selected methodology for this paper due to the forging of a consensus rather than the elicitation of multiple values and viewpoints on the hotly debated topic of the Icelandic tourism sector. However, the adoption of the Delphi method would also have offered some advantages, in particular through the provision of a greater range of statistical information and avoidance of biases generated by outlier information.

6. Conclusions

The complex interactions between the SDGs and their respective targets have demanded further analysis of the links between key economic sectors and performance outcomes across all of the SDGs' 169 targets. This study used four theme-based focus groups and evaluative scoresheets to determine the synergies and trade-offs pertaining to Iceland's tourism sector, which has almost singlehandedly been responsible for transforming the nation's economy following its financial crisis of 2008. Based on the results, it was determined that there were a total of 32 synergies and 11 trade-offs across the SDGs' 169 targets. Key areas for Icelandic policymakers to focus on in the next few years include reducing greenhouse gas emissions associated with the transportation of tourists to and within Iceland, particularly via aviation, cruise ships, and rental cars. Equally, attention needs to be paid to the pressing demands on local infrastructure stimulated by the influx of tourists to Iceland, particularly the nation's road network and sewage systems. From a tourism management perspective, maximising synergies across the SDGs' economic dimensions will require the retention of a considerable volume of tourists to Iceland which equates to, many multiples greater than the scale of the national population. Mitigating trade-offs will necessitate policy interventions by various governance institutes and sound investment to minimise the negative environmental impacts of Icelandic tourism and ensure that critical infrastructure is sufficient in scale and standard.

This study stimulates several ideas for further research. In particular, greater consideration needs to be given to the particular policy initiatives that could be applied to minimise the extent of trade-offs and opportunities to transform these into synergies. Additionally, the contributions of local Icelandic communities, which are heavily dependent on tourism, need to be considered in more detail linked to Iceland's SDG performance. The methodology adopted in this paper could also be applied to other key sectors of the Icelandic economy, such as fisheries, in order to gain a broader portrayal of the relationship between economic sectors and SDG performance. All of these research lines are equally relevant to other nation-states.

Supplementary Materials: The following are available online at <http://www.mdpi.com/2071-1050/11/15/4223/s1>. Table S1: Evaluative scoresheets, including all SDGs and respective targets.

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4 Paper II: Challenges of national measurement of environmental sustainability in tourism

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5 Paper III: Exploring drivers and barriers of environmental management in the tourism industry: the case of Iceland's tourism

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6 Paper IV: Realising blue growth in the fishing industry in Iceland and Norway: Industry perceptions on drivers and barriers to blue growth investments and policy implications

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7 Paper V: Stakeholder perceptions on policy tools in support of sustainable food consumption in Europe: policy implications

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Article

Stakeholder Perceptions of Policy Tools in Support of Sustainable Food Consumption in Europe: Policy Implications

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Abstract: Transitioning agri-food systems towards increased sustainability and resilience requires that attention be paid to sustainable food consumption policies. Policy-making processes often require the engagement and acceptance of key stakeholders. This study analyses stakeholders' solutions for creating sustainable agri-food systems, through interviews with a broad range of stakeholders including food value chain actors, non-governmental organizations, governmental institutions, research institutions and academic experts. The study draws on 38 in-depth, semi-structured interviews conducted in four European countries: France, Iceland, Italy and the UK, as well as three interviews with high-level EU experts. The interviewees' solutions were analysed according to a five-category typology of policy tools, encompassing direct activity regulations, and market-based, knowledge-based, governance and strategic policy tools. Most of the identified solutions were located in the strategic tools category, reflecting shared recognition of the need to integrate food policy to achieve long-term goals. Emerging solutions—those which were most commonly identified among the different national contexts—were then used to derive empirically-grounded and more universally applicable recommendations for the advancement of sustainable food consumption policies.

Keywords: sustainable food consumption; agri-food systems; transition; stakeholders; semi-structured interviews; policy tools

1. Introduction

There is growing recognition that contemporary agri-food systems are neither sustainable nor resilient, and that they are in need of profound transformation in order to meet multiple challenges [1].

The challenges faced by agri-food systems are complex and interconnected. Food is a cross-cutting issue implicated in multidimensional sustainability, such as environment, health, food security and socio-economic issues, amidst growing demand driven by population growth and increased affluence. Food production, trade and consumption both exacerbate and are affected by mounting environmental challenges, such as climate change, biodiversity loss and resource depletion (e.g., soils and water) [2,3]. The need to transform agri-food systems to address these challenges has been highlighted in various socio-economic and political agendas by academia and other institutional actors recently at both the international and regional levels; e.g., [1,3–6]. The food system concept has become important in both research and in policy discourse, as it addresses the complexity of food as a cross-cutting issue [7]. The Food and Agriculture Organization of the United Nations (FAO) [8] defines a food system as “the entire range of actors and their interlinked value-adding activities involved in the production, aggregation, processing, distribution, consumption and disposal of food products that originate from agriculture, forestry or fisheries, and parts of the broader economic, societal and natural environments in which they are embedded” (p. 1).

The concept of a food system highlights not only the complex processes of producing, transporting, consuming and disposing of food but also the multitude of actors involved and the diverse impacts that result from each of these processes. Making agri-food systems more sustainable will require the integration of policies at several different levels—local, national, regional and international—with the aim of meeting common goals. It will also require the integration of policies from different policy spheres, such as agriculture, climate and the environment, health, and worker’s rights. A coherent and holistic vision is necessary to guide institutions towards sustainability [7]. For these requirements to be realized, it is necessary to examine the role of different actors in the agri-food system and take into account their perspectives on the availability and feasibility of various policy options [9].

Food and Sustainable Consumption and Production Patterns

The need to shift consumption and production patterns towards sustainability was first recognized internationally at the 1992 Earth summit in Rio de Janeiro [10]. Until that time, the emphasis had been almost exclusively on the production side, and consumption had not been adequately addressed by policy makers [11]. Today, nearly three decades later, Sustainable Consumption and Production (SCP) are an integral part of the Sustainable Development Goals (SDGs) (i.e., goal 12; responsible consumption and production) [12]. The inclusion of consumption and production within a single goal points to the recognition of their complex interaction, and the importance of addressing both concurrently in an integrated and holistic manner. Food, along with water and energy, were highlighted as integral issues for the achievement of goal 12 [12].

As a crosscutting issue, food is related to all of the SDGs, both directly and indirectly [13,14]. The EAT Lancet Commission’s report identified food system transformation as essential to meeting the SDGs, as well as the Paris agreement on climate change. It enumerated two targets and five strategies for achieving the goals of healthy diets and sustainable agri-food systems. Addressing the consumption side, the report proposed that sustainable diets are an important component of agri-food systems’ transformation can deliver benefits to human health and simultaneously ensure that food systems do not compromise environmental sustainability. Sustainable diets, alongside improvements in food production practices and reductions in food loss and waste, were projected as three of the most impactful ways to achieve healthy and sustainable agri-food systems [3].

It is increasingly recognized that the consumer is a limited agent of change due to the complexity of highly global food systems, human cognition and behaviour, and the structural characteristics of the food environment [15,16]. However, the recognition of this in policy agendas remains limited [17]. Policies that support sustainable food consumption without heavily relying on the consumer solely as an agent of change are crucial for the transition to more sustainable food systems [14].

Many recent food policy documents and reports include the aim of a transition to sustainable food systems, e.g., [3,18,19], reflecting the widespread adoption of the concept in the policy domain. The

concept of sustainability transitions refers to the need to bring about the “large-scale societal changes deemed necessary to solve grand societal challenges” [20] (p. 600). In the last two decades there has been a wealth of academic studies published on sustainability transitions in general [20,21], and within the context of agri-food systems more specifically [22,23]. Research on agri-food system transitions, as opposed to energy and mobility transitions, is more recent, but is developing at a fast rate. However, research gaps have been identified where studies have tended to place less emphasis on the role of Food Value Chain (FVC) actors and civil society, and are instead more frequently based on single case studies [22].

Though there is broad agreement on the need for a transition, many different transition pathways have been proposed based on different conceptualisations of key issues [24] and the actors advocating change [25]. Often, practitioner viewpoints have been ignored, with a danger of developing policies that are unworkable or which have unintended negative consequences [26]. Sustainability transitions require that attention be paid to the context, including the region, sectoral elements, the policy domain and cultural characteristics [22]. The different underlying conceptualizations, ambitions and goals of the different actors involved in food systems, as well as the complexity of their interactions and interdependencies, are also crucial factors to take into account [9]. Broad stakeholder consultation and engagement are thus essential to the process of delineating solution pathways to more sustainable agri-food systems.

This study was part of a larger Horizon 2020 project called VALUMICS, the general aim of which was to provide tools and approaches to enable decision makers to evaluate the impact of strategic and operational policies aimed at enhancing fairness, integrity, and resilience in future scenarios of sustainable Food Value Chains (FVCs). This study’s specific aim is to explore and analyse stakeholders’ proposed solutions for creating sustainable agri-food systems based on findings from in-depth interviews, in order to identify policy recommendations.

The paper is structured as follows: Section 2 presents the methods, while Section 3 details the findings. Section 4 discusses the main findings and presents policy recommendations. Finally, Section 5 is the study’s overall conclusion.

2. Materials and Methods

2.1. Semi-Structured Interviews

A total of 38 semi-structured interviews were conducted with 40 experts (in two of the interviews there were two participants) in: France (10), Iceland (16), Italy (6) and the UK (3), including interviews with EU-level experts (3), during September–November 2019. Each interview lasted approximately 60 min on average, with a total of approximately 40 h of recorded material. Most interviews were conducted face to face, except for two, which were conducted via a web conferencing platform due to practical considerations. The interviews followed a common format and a structured interview guide developed by the authors of this study. The interview guide comprised three sections focusing on three distinct topics: (1) the drivers and motivations of mainstream food consumption behaviour, (2) the role and influence of consumers on sustainable food value chains and, (3) potential solutions to enable more sustainable food consumption behaviour. This study was largely based on the discussions ensuing from Section 3 of the framework.

The interviews were recorded, and detailed summaries—including a selection of quotations—were compiled for each interview. All summaries and direct quotations were translated into English using standard back-translation techniques [27], except for the UK interviews and interviews with EU-level experts, which were conducted in English. Practical considerations precluded the full transcription of the interviews, but the compiled summaries were based on the recorded sessions and extensive note taking by the interviewers. Participants were assigned pseudonyms and are only referred to by those in the analysis in order to preserve their anonymity. The pseudonyms are composed of a number followed by the national code for easy reference (see Appendix A). All of the participants

received a participant information sheet and were required to sign a consent form detailing their rights, as required by EU Horizon 2020 regulations on data management concerning ethical and societal aspects [28].

2.2. Participants

Participant selection in this study was based on purposive sampling [29]. Participants were chosen based on their position and knowledge in their company/organization. For the private sector, CEOs and high-level managers (i.e., senior decision-making roles) were included for their expert knowledge of market trends and corporate decision-making and management. Elite interviews can be challenging—e.g., due to issues of positionality, power and restricted access—but they provide important insights into high-level decision-making processes [30]. For other stakeholders, participants were included based on their expertise and involvement in food systems; e.g., policy-makers directly involved in food policy-making. In some cases, interviewees recommended other experts in order to strengthen the inclusion of key informants in the study (snowball sampling).

The inclusion of stakeholders representing all of the key actors in European agri-food value chains was pursued. The authors had access to a stakeholder platform as part of the larger project (VALUMICS), and were, therefore, able to secure interviews with elites. In the few cases where stakeholders declined participation, they recommended another potential participant to take their place. Reasons for declining were often related to practical and time constraints on the part of the interviewee and, occasionally, the interviewers themselves. For example, one stakeholder responded after the analysis of the interviews had been undertaken and, therefore, their participation had to be declined. A positive and somewhat surprising aspect of this process was the relative ease of access to interviewees and their willingness to participate. This may be an indication that the topic of sustainability in food systems is high on the agenda of both FVC actors and other stakeholders.

The process resulted in a final pool of interviewees, which included policymakers, business associations, individual companies, consumer organizations, consultancies, Non-Governmental Organizations (NGOs) and academic experts (relating to health, nutrition and behavioural science). Three interviews with EU-level experts provided a higher-level perspective. Table A1 in Appendix A details the relevant characteristics of the participants in this study, including the position of their organization in the value chain, their own role in it, and the context (national or EU-level).

2.3. Analysis

Drawing on Galli, Favilli, D'Amico and Brunori's [31] typology, five broad food policy categories were utilized to analyse and structure the findings from the in-depth stakeholder interviews. Figure 1, below, presents an overview and brief explanation of each category.

The interview data were coded via the analytical method of constant comparisons, resulting in emerging commonalities and differences in terms of the discussed solutions [32]. All of the recommended solutions mentioned by participants were subsequently categorized using the policy tools typology based on Galli et al. [31] (see Figure 1). Policy tools are the means by which policy implementation is achieved [31], and categorizing the findings through this typology highlights the range and popularity of the proposed solutions. Galli et al. [31] typology was deemed most appropriate for this study due to its broad inclusion of different types of policy tools. Early in the interviewing process, it emerged that the proposed solutions were wide-ranging, and a typology was sought that would reflect the range while at the same time classifying solutions in a comprehensive yet accessible manner. The identified policy solutions were categorised from most commonly mentioned to least commonly mentioned in each country, in order to identify commonalities and differences across contexts. The use of standard country codes aided the cross-context analysis.

Direct activity regulation	<ul style="list-style-type: none"> • e.g., limitations, quotas, prohibitions, authorizations etc.
Market-based	<ul style="list-style-type: none"> • e.g., subsidies, loans, guarantees, certification schemes, taxes, charges, fees, fines etc.
Knowledge-based	<ul style="list-style-type: none"> • e.g., information, communication, research, education, etc.
Governance	<ul style="list-style-type: none"> • role and distribution of different actors' responsibilities e.g., business, governmental institutions, NGOs, consumers etc.
Strategic	<ul style="list-style-type: none"> • e.g., framework conventions, guidelines, strategic action plans, and roadmaps

Figure 1. Classification of policy tools, with examples (adapted from [31]).

The reported findings in Section 3 focus on commonalities, in order to provide more universally applicable recommendations. Though not discussed, less commonly identified solutions in Tables 1–5 detail a range of policies that are more context-specific. For example, among Icelandic participants, a common solution was the provision of cheaper electricity for greenhouses as a way of increasing the production of vegetables.

The focus of the analysis is at the European level regarding stakeholders' insights into possible solutions for more sustainable food systems. As such, the resulting policy recommendations are firmly rooted in practitioner perspectives. Semi-structured interviews enable a discussion on set topics and guarantee that all of the participants engage with them. However, they are also flexible enough to allow new topics to emerge based on what each participant places greater importance upon [29]. The emergence of new topics is an advantage of qualitative research in general, as it encourages researchers to shed their own preconceptions about the topic under investigation and explore different perspectives in greater depth [32].

3. Findings

Several proposals for transitions to more sustainable food consumption emerged from the interviews. In this section, the most commonly identified proposals are presented, and illustrative direct quotations by the interviewees are reported in the text. Tables 1–5 list all of the proposals, including those that were least commonly identified. The subsection titles below constitute higher-order themes, which correspond to the policy tools in the order that they are presented in Figure 1. It should be noted that the sequence of higher-order themes is presented in this way for ease of reference and does not represent prioritization by either the participants or the authors. In Section 4, the findings are discussed and specific policy recommendations are presented based on the findings from the stakeholder interviews.

3.1. Integrate Policies on Environmental Sustainability for More Effective Food System Management

According to participants, solution pathways should include regulations and incentives that place sustainability amongst the top priorities of food systems' management (see Table 1).

Table 1. Possible solutions identified by stakeholders classified as direct activity regulation policy tools.

Policy Tools	Proposed Solutions by Stakeholders
Direct activity regulation	EU-level mandatory regulations imposed on all for a level playing field (IT, UK) Reduce fertilizer and pesticide use (IT, UK)
	<p style="text-align: center;">Less Commonly Identified</p> Ban production of certain unsustainable products (EU) Enforce minimum requirements for Extended Producer Responsibility (EU) Make product reformulation for nutritional benefits mandatory (FR) Reduce air transport of food (FR) Ban disposable plastics (IT) Ban the landfilling of biodegradable waste to reduce food loss/waste (IS) Improve food inspection to ensure food safety and quality (IS) Abolish the right for retailers to return expired food (IS) Implement fixed production quotas (UK) Enforce high quality standards (UK)

Some participants argued that, despite the importance of prioritizing sustainability objectives in the management of food systems, such a shift in prioritization would have implications for food prices, which limits uptake:

Consumers will not push for it. So why would any company change a running system when the willingness to pay and the ability to pay is not supported by the customers' demand on a broad scale? (P19-UK)

Efficiency and sustainability were often discussed as competing goals that are not easy to reconcile, especially with many consumers being unwilling to pay price premiums for more sustainable products.

Real change can only be generated by the EU. Until certain management practices are allowed, it is difficult to behave more sustainably because everyone else can be more economically competitive. (P23-IT)

Emphasis was therefore placed on the need for EU-level regulations to ensure a level playing field for all.

Implement sustainability by imposing strict rules where products have to comply with the law. If not, then we might lose democratic stability in our countries. Law is the only way to put all in the same position bound by law. That would account for retailers, producers and consumers in the same way. (P19-UK)

A variety of more specific regulations were proposed by participants to ameliorate the environmental impacts from food systems, ranging from banning the disposal of biodegradable waste via landfill, imposing plastic packaging bans, and making sustainable agriculture mandatory (see Table 1). Reducing fertilizer and pesticide use through regulation was the only specific regulation to emerge in more than one of the countries where the interviews were conducted. In both cases, it was related to their impacts on soils and the importance of protecting them for agricultural production.

Views were, however, mixed regarding whether new regulatory frameworks should be based on coercive measures or voluntary schemes. Some of the participants highlighted the value of the latter:

This is a mandatory step that companies will undergo in the long run. If you want to speed up the transition you can do it in a coercive or a proactive way. In my opinion, it is better to encourage than to mandate. (P22-IT)

3.2. Utilize Market Incentives in Support of Sustainable Food Consumption

Many participants endorsed the use of various market tools to advance sustainability goals (see Table 2). Among the most commonly mentioned were public and green procurement, and the use of ecolabels and certification schemes.

Table 2. Possible solutions identified by stakeholders classified as market-based tools.

Policy Tools	Proposed Solutions by Stakeholders
	Public and green procurement (FR, IS, EU) Certification schemes and ecolabels (FR, IS, IT)
	Less Commonly Identified
Market-based tools	Taxation to encourage sustainable production and consumption (IS, EU) Price guarantees (IT, UK) Increase subsidies for organic farmers (FR) Decrease the price of electricity for greenhouse vegetable growers (IS) Reduce subsidies for meat production (IS)

Several participants maintained that the public sector also has an important role to play in driving sustainable consumption, including from the demand side (P31-FR). Policies to encourage sustainable food systems have until recently been mainly geared towards the supply side (CAP, Programme Ambition Bio, etc.) and have rarely focused on demand side interventions [33]. A recent example of a policy targeting demand by utilizing green public procurement is the 2018 EGalim food law in France. It requires that 50% of products offered by mass public catering companies to school canteens be sustainable (including 20% organic products) by 2022 [34]. The EU follows six public procurement strategic priorities, one of which is the increase of innovative, green and social procurement.

Many participants discussed food labels (ecolabels and certification schemes) as a way to increase the sustainability of FVCs by signaling to consumers the added value of these products and thus justifying their higher prices.

There was this article in the paper some 2–3 years ago with the title ‘cheap food is an expensive deception’ and that is exactly what it is; an expensive deception. (P12-IS)

We are not confident that consumers can fully appreciate and understand information on value chain price distribution. (P26-IT)

Interviewees were concerned about food fraud and false labelling, and how these may hinder the transition to more sustainable food systems. The examples of selling haddock as cod and horse meat as beef were mentioned by some, as well as the lack of consistency in origin labels despite the EU directive mandating the specification of the country of origin. In addition, interviewees identified as problematic the large number of different labels and certifications available in the market, because of their capacity to confuse consumers.

There are so many different labels, instead of having one label where you’d know yes this here is PLA [bioplastic material] and you can distinguish it from the [plastic materials]. [. . .] So, you know, a more integrated approach [to labels]. (P8-IS)

Despite these issues, labels and various environmental and health certification schemes were thought to be increasing in prevalence, mirroring consumers’ concerns regarding the impact of food systems. Concerning organic production, for example, one participant highlighted that organic products are gaining scale and becoming ‘mainstream’ for large grocery retailers:

Large-scale retailers have started to produce their own organic brands (private labels), which means that there is an ever-increasing and real interest of the food distribution system in organic products. (P26-IT)

Views were, however, mixed in terms of the appropriate governance of labels, with some participants proposing public-led schemes, and others highlighting the importance of private governance schemes. Those in support of more public sector oversight argued for the need to counter greenwashing attempts by mandating harmonized quality standards throughout the value chain.

3.3. Increase Transparency and Education on FVCs and Invest in Food Innovation

Various knowledge-related tools were proposed by interviewees (see Table 3).

Table 3. Knowledge-related policy tools identified as solutions by interviewees.

Policy Tools	Proposed Solutions by Stakeholders
Knowledge-related tools	Consumer education regarding food supply chains (IS, IT, UK, EU) Increase transparency (through e.g., traceability) (FR, IT, IS, EU) Invest in food R&D (FR, IS, IT)
	Less Commonly Identified
	Social marketing (connect health to sustainability) (IT, EU) Training of culinary professionals (e.g., Chefs) to incorporate sustainability concerns (IS, EU) Behavioural interventions (e.g., nudging) (EU) Improve science communication about nutrition, health and sustainability (IS)

Most commonly discussed was the importance of educating consumers about the environmental and social impacts of food production.

People want to reconnect with their food (apples grow on trees), to understand where their food comes from. They want to recognize the products they eat. (P24-FR)

The perspectives of academic researchers and consultants' diverged somewhat from those of other stakeholders, in that the former argued for more evidence-based policies to influence consumer behaviour. As such, they emphasized the importance of developing sustainable food consumption policies based on behavioural insights, as a way to produce evidence based—rather than assumption based—policies. Experience in this regard was drawn from food waste reduction strategies (P30-EU), insights from health behaviour change (P11-IS), the effects of advertising on consumption (P2-IS), and the effects of nutrient-based labelling (P11-IS, P38-FR).

Several interviewees discussed the need for transparency to foster accountability in FVCs and communicate with consumers more directly:

Everything that unveils [this process] and shows how it really is [is a positive development] because people are not stupid and they want to know. But the industry has sort of [...] thrown a veil over it and [the product] just arrives ready at the store for you.

(P15-IS)

As a manufacturer, you must pay attention to the increasing demands for traceability of ingredients and food safety, and ensure a very strong sustainable supply chain. (P21-UK)

Various technologies were mentioned in the context of increasing the transparency of FVCs: most commonly blockchains and QR codes. Interviewees highlighted the importance of informing consumers about FVCs in terms of both gaining a market advantage—e.g., by highlighting the origin of products (P32-FR)—as well as fostering more realistic consumer expectations about various food characteristics, such as freshness and the role of technology in extending product life (P15-IS).

Many participants argued that solution pathways require the fostering of stronger communication between producers and consumers, with the potential for increasing the resilience of food value chains:

Today, direct feedback and the ability to speak with customers immediately is an important part of the information chain. This increases the reaction pressure on the manufacturing companies. (P21-UK)

Retail stakeholders observed that, in recent years, consumers have already taken on a more active role in driving change in the food system (P32-FR, P34-FR, P37-FR). Millennials were thought to be especially resourceful, proactive and militant, applying pressure on companies through their use of social media and consumer screening apps (P34-FR).

Some stakeholders mentioned increased investment in food R&D as being important for improving productivity and for adding value-added at all of the stages of the FVC. Food R&D discussions ranged from innovations in agriculture that can improve farming output and quality (P35-FR) to more direct distribution to consumers and online retailing (P27-IT, P5-IS), and the potential for food packaging innovations which are less harmful to the environment (P6-IS).

3.4. Promote Multi-Stakeholder Approaches and Address Power Asymmetries

Many interviewees discussed the role, distribution of responsibilities and power of different actors in the governance of food systems, with particular attention being given to large retailers and civil society's influence (see Table 4).

Table 4. Possible solutions identified by stakeholders classified as governance policy tools.

Policy Tools	Proposed Solutions by Stakeholders
Governance tools	Leverage the power of large retailers (FR, IS, IT, UK)
	Civil society's role in governance (FR, IS, EU)
	Less Commonly Identified
	Cooperative models (IT, EU)
	Public-Private Partnerships (PPPs) for sustainable solutions (IS, UK)
	Pay attention to cultural differences when formulating food policy (UK, EU)
	FVC actors' collaboration on sustainability initiatives/break silos (EU)
	Food policy councils to improve stakeholder engagement and participation (EU)
	Enable degrowth and post-growth policies (EU)
	Integrate food policy considerations with urban planning (FR)
Strengthen consumers' association with political and financial support (IS)	
Advance a cross-sectoral approach to food policy (IS)	
Academia's role as an independent facilitator among different FVC actors (IT)	
Strengthen public participation (e.g., through citizen panels) (UK)	

Interviewees believed that retailers have an important role to play in the transition to sustainability, in part due to their significant negotiating power in food systems.

Retailers often increase their sustainability commitment. Thus they often ask their suppliers to give a "present picture" of their sustainability agenda, and a short to medium-term forecast of the future for the sustainability management issues (such as plastic use in the products). Thus retailers can have a positive impact (and be part of the "solution") on the sustainability practices of the whole food system. (P23-IT)

Views were mixed, however, as some participants were concerned about power asymmetries in international FVCs, which sustain retailers' advantages over other FVC actors.

If you would map it out, most production companies in the world are under the ownership of just a few companies. [Just look at] how these companies have behaved in the past with regards to child slavery, how they treat their employees, their environmental policy and [yet] those are the companies that are most eager to sign pretty papers. (P4-IS)

Some participants, however, expressed confidence in the ability of private companies to drive changes in FVCs, e.g., through voluntary agreements and initiatives (P37-FR). There were, however, mixed perspectives regarding the shift to plant-based diets and meat free alternative foods, with some regarding it as a niche market and others claiming that that it is a long-term and more substantial shift, reflecting rising sustainability concerns amongst European consumers. In this process, NGOs assumed responsibility for demonstrating expected future trends and pressuring companies toward a more proactive stance in the transition to more sustainable food systems (P40-FR). Yet other participants emphasized that these trends are often counteracted by other concurrent trends, pointing to cross-sectoral effects:

Bacon has never been as popular in Iceland; bacon sales increased so much that Iceland had to import pork bellies in order to meet the demand. So it's [both] this ketogenic [diet fad] and the tourism industry [. . .] they all want bacon for breakfast. (P3-IS)

EU-level participants emphasized the need for multi-stakeholder forums where different FVC actors exchange knowledge and information in order to address sustainability issues from a food system perspective and break down silos.

We need to build food policy councils which frame the food policy in Europe in the national and local levels. This may help break the silos and bring all stakeholders together, including farmers, producers, retailers, employers, consumers, to talk and increase transparency in food systems in Europe. And this would also enable capturing cultural and local differences. (P29-EU)

Many participants highlighted the role of civil society in raising the awareness of environmental issues and pressuring the food sector (among other sectors) to address sustainability challenges. At the time of the interviews, the climate youth movement (spearheaded by Greta Thunberg) and the civil disobedience movement Extinction Rebellion (XR) had both been very vocal and visible in the media [35,36], and to some extent in the academic discourse [37,38]. It is thus unsurprising that this was high in the consciousness of the participants.

The biggest icon in the world today is a 16-year-old girl which is amazing. And the scared old men do all they can to bring her down. And all she is saying is 'read and listen to the scientists'. (P13-IS)

Social movements affect industry indirectly through their influence on public policy, often by shifting public debates to incorporate new and presently marginalised perspectives [39]. As an Icelandic producer argued:

[Radical discourse] pushes the cart in the right direction. (P16-IS)

The role of NGOs in food system governance has also become more prominent in recent decades, though it takes diverse forms often relying on collaboration [40]. As a participant from an international NGO argued:

Generally speaking, agricultural supply chains adopt a passive posture with regard to changes in consumer behaviour, meaning that they tell themselves that they will adapt once demand has changed. But at the same time, there are things to anticipate because we can't adapt food production overnight [...]. Our goal is to get them to be more proactive about changes by showing that the demand is already there. (P40-FR)

3.5. Local-Level Solutions Supporting Seasonal and Regional Products and a Circular Economy Framework

The most commonly identified solutions that emerged were ones that can be classified as strategic tools (see Table 5).

Table 5. Possible solutions identified by stakeholders classified as strategic policy tools.

Policy Tools	Proposed Solutions by Stakeholders
Strategic tools	Support seasonal production (FR, IS, UK, EU) Support regional/local production (FR, UK, EU) Emphasize local-level solutions (IT, UK, EU) Implement circular economy policies (FR, IS, IT) Reduce animal production (FR, IS, UK)
	Less Commonly Identified
	Provide clear quality guidelines (IS, UK) Promote the need for long-term thinking in business (IS, UK) Align national/regional policy with global issues (FR) Utilize a system-perspective on food production (IS) Governments must agree on common international sustainability goals (UK)

Some participants emphasized the importance of seasonal products in achieving sustainable food production (P18-IS, P19-UK, P29-EU, P32-FR, P38-FR, P40-FR). They argued for the importance of shortening FVCs by initiatives such as buying straight from farms and effectively dispensing with intermediaries. This could increase farmers' margins and reduce food waste.

Many participants, however, shared a critical view regarding trends such as the consumption of locally produced vegetables, and their appraisal of the slow food movement was by and large unfavourable. They argued that such trends still do not achieve a high market share and face numerous challenges in terms of mainstreaming and up-scaling:

We see a growing awareness of regional and national product demands as well as the trend towards old types of fruits and vegetables. But it is a very slow and small movement that is fighting its way up the social media. If I look at the supermarkets, then the shelf meters have moved rather to convenient food and serve the growing amount of single households. (P20-UK)

For the food industry at large, the local consumption and production of fruits and vegetables is still a marginal activity serving a relatively small segment of consumers:

People who value freshness are entering the weekly farmer's market, which is increasingly enjoying new popularity. But, [. . .] it is a very, very small part of the entire population. Thus, these people are irrelevant for the majority of the food industry. (P20-UK)

Such a divide between the mainstream production and consumption of food raised concerns, as a closer relationship between both sides was considered by some to be a key element in achieving resilience:

The closer the relationship between producer and consumer, the stronger and more resilient the whole food chain. (P24-IT)

Concerning organic production, one interviewee highlighted that organic products are gaining scale and becoming part of the marketing strategy of large European retailers. It is unclear, however, how far the organic sector will develop (P26-IT).

When discussing the challenges and barriers towards more sustainable fresh food consumption (such as fruits and vegetables), participants highlighted the structural nature of the problem, in which the market is characterised by farms and manufacturers that are mostly targeting the mass market, which is very price conscious:

It is a structural problem, as most farms and manufacturers are conventional producing companies. The conversion would cost a lot of time and money, and we would not have guarantees that the market or the customers will pay for it. (P20-UK)

Another participant pointed out that the discourse on imported versus locally produced food is usually not based on systems thinking regarding the different stages of production, e.g., sourcing the inputs:

There is chicken and chicken. Danish chicken is not in the local environment. But what is more local: to import the chicken or to buy the chicken feed (because that's imported)? [...] You need 2 kg of feed to produce 1 kg of meat. Which is more environmentally-friendly? Clearly the imported meat because the feed for that chicken is close to the chicken factory. (P4-IS)

A fundamental question relates to how FVCs address current and future challenges by increasing resilience. Tendall et al. [41] definition of resilience in the context of food systems, as “the capacity over time of a food system and its units at multiple levels, to provide sufficient, appropriate and accessible food to all, in the face of various and even unforeseen disturbances” (p.19), also reflects the perspective of those stakeholders who discussed resilience in these interviews. The prioritization of key policy-making decisions about sustainability in food value chains would need to be based on a shared vision for the future and a common awareness of the relevant time scales, as one participant put it:

Are we looking at the [...] chain that is ... just now - our lifespan - or are we looking at the value chain in terms of the future? And which is more important? Is the world ending? Is it not ending? And where are we at in this picture? And which are our interests? (P10-IS)

Another participant noted that the focus on the future of agriculture was already visible in the global retail industry:

What is most noticeable now [in food product exhibitions] is the focus on the future [...] and [there is awareness that] when considering current agricultural practices there will not be enough land, water etc. to continue on the same path. (P18-IS)

Interviewees frequently discussed the circular economy framework as a strategic direction for integrating environmental sustainability goals in agri-food systems. Many argued that the framework was important for advancing concrete solutions to sustainability issues in food systems.

Food loss (i.e., the loss of agricultural produce due to damage) and food waste (i.e., the throwing away of food still fit for consumption) [42] were discussed by several interviewees. As the CEO of a wholesale firm in Iceland emphasized, food loss should be addressed as a systemic problem at all stages of the value chain:

Food loss is a “hot potato” nobody wants to own it but it is present. [...]. In order to succeed in this then someone has to own it. It is best that the one who has it on their table should also be the one who owns it. You don't tidy up your own garden by throwing everything over to your neighbours' just because he is taking the garbage anyway. (P4-IS)

Another of the proposed solutions that emerged from the interviews was the need to reduce meat consumption. Interviewees identified increased consumer demand for alternative plant-based products in three countries, but many highlighted the need for policy to support a transition to more sustainable agri-food systems, e.g., by reducing subsidies to the meat industry (P6-IS). New challenges were also identified in the case of dairy companies attempting to meet the demand for plant-based alternatives by investing in and buying up companies that produce dairy substitutes. As the products these alternatives are derived from are often sourced from abroad (e.g., cashews, almonds, etc.) this raises new and different challenges for the structure of supply chains (P34-FR).

4. Discussion and Recommendations

The findings indicate that there is widespread recognition among different stakeholder groups across different national contexts of the challenges that are faced by contemporary agri-food systems. There is also consensus regarding the need to transform agri-food systems to increase their sustainability and resilience. Where perspectives differ, however, is on how this transition can be achieved such that it is as smooth and as fair as possible for all of the relevant parties, including consumers and FVC actors. Interviewees also voiced concerns regarding food systems' abilities to support future generations amidst numerous challenges. In this study, we used a typology of policy tools [31] to structure these findings and highlight the commonalities across different stakeholder groups in different countries in order to derive recommendations drawing from these diverse perspectives. The following discussion addresses some of the main themes and topics that emerged from the interviews.

Many of the proposed regulatory instruments mentioned by the interviewees are already incorporated in the EU's Farm to Fork Strategy: the EU's plan for transitioning towards fairer, healthier and more environmentally-friendly food systems in the EU. The strategy comprises one of the 11 components of the EU Green Deal, the ambitious aim of which is to make Europe the first climate-neutral continent by 2050 [43]. The successful implementation of this strategic framework will, however, also depend on aligning the Common Agricultural Policy (CAP) with the sustainability objectives of the EU Green Deal [7] and the SDGs [44]. Addressing soil erosion was the most commonly mentioned environmental issue in need of direct regulatory intervention. There is a wealth of research to support the effect of the excessive use of fertilizers and pesticides on soils, which is reflected also in the soil protection measures that are being introduced in various European countries in the absence of a common EU directive for soil protection [45].

Emphasis was also placed on voluntary and cooperative governance solutions, which reflects the increased engagement of private actors in the governance of food supply chains [46]. FVCs have become increasingly globalised in the last few decades, leading to more complex food governance. Globalization has led to the fragmented territorial jurisdiction of value chains and the increased participation of international and regional organizations in governance [47].

The topic of governance is also relevant to the discussion of private versus state-run labelling/certification schemes. The literature indicates that the support for private labels often rests on the need for the innovation and flexibility that can arise from less rigid standards [48]. However, the large number of available eco-labels (by one estimation, over 450 [49]) has often been identified as a challenge both in our interviews and in the academic literature [50]. The differences between interviewees regarding the role and governance of labels in part reflects the varying stances regarding consumers' 'right to know' versus 'need to know' about food production processes [51]. Diverse perspectives also exist in academic debates on the efficacy [52,53] and legitimacy [54] of labels and certification schemes as management tools.

Differing perspectives aside, studies show that consumer trust in eco-labels tends to increase with the use of third-party accreditation [55], which can also circumvent the public-private divide. In terms of achieving environmental sustainability goals, the emerging scientific consensus is that these schemes in and of themselves "cannot drive transformation of production practices toward greater environmental sustainability" [56] (p. 431). "Whatever the outcomes of labelling and certification schemes, their emergence owes to the lack of regulatory oversight; their existence is, thus, necessary in dealing with regulatory gaps" [57].

Certification schemes and labels are one response to the identified demand for transparency. It was deemed important by the stakeholders in this study to find concrete ways to counter consumers' growing scepticism regarding technological advancements in food production, which is evident in the recent proliferation of 'free-from' food labels [51]. Other solutions to create more transparent FVCs which were discussed were digital technologies such as the use of QR codes and blockchains. These technologies appear promising in their ability to provide objective, real time data about increasingly global FVCs to consumers and other stakeholders, reducing risks for FVC actors and increasing

regulatory compliance. However, a number of challenges remain, e.g., complications for tracing at the production stage, gaining consumer acceptance [58], and the possibility of exacerbating power asymmetries between FVC actors (especially smallholders) [59].

Many stakeholders in this study emphasized the importance of both technological advancements and food innovation to bringing about sustainable transitions for agri-food systems. Recent research indicates that public investment in food R&D in wealthy countries has been steadily dropping in the last few decades, and although private investment has increased, both types are necessary in order to address agri-food system challenges [60]. Research also indicates that more integrated chains and government structures that enable collaborative relationships between actors are important for fostering more environmentally-friendly innovation [61]. Innovation has an important role to play in the transition to more sustainable food systems, requiring appropriate incentives, regulations and social licence [62].

Cross-sectoral effects were discussed less frequently, but are an important consideration, particularly for policy-makers. An example, which arose from this study, was the unprecedented growth of the Icelandic tourism industry, which was very impactful in terms of food demand and food policy-making in Iceland. Cross-sectoral effects (and ensuing policy failures) highlight the need to take account of these effects when designing sustainable food policies [63]. From a wider perspective, it is also imperative to consider trade-offs and synergies relating to the water–energy–food nexus [4,64], e.g., the effect of biofuel production on food security [65]. Previous research has identified food policy silos, which can prevent an appropriate response to issues that transcend specific sectors [64]. The Sustainable Development Goals' wide scope also requires the integration of policies heretofore constrained by silos [66], which can also ameliorate trade-offs from cross-sectoral effects.

Another topic generating much discussion was the importance of local and seasonal production to sustainability. However, there was no clear consensus on what precisely constitutes local and seasonal production. The terms 'local' and 'seasonal' have no clear, commonly agreed-upon definition which obscures the discourse [67,68]. Seasonality can be interpreted in two distinct ways: from a global perspective (i.e., a natural production season consumed elsewhere in the world) and from a local perspective (i.e., a natural production season consumed within the same climatic region) [68]. Territoriality has been proposed as a concept to address the need for more locally-focused (bottom-up) versus national/regional-level (top-down) approaches which take into account the specific requirements of rural versus urban areas [69–71].

Whether seasonal and local products can deliver sustainability benefits in contrast to global value chains is an important research question. The evidence to date indicates that local and short value chains can deliver economic and social benefits to producers, but some local systems of production may generate greater carbon emissions than conventional supply chains due to relatively fragmented distribution which is reliant on a mass of small-scale movements [72]. However, distinguishing local from global FVCs is often very complicated, as, in practice, few FVCs are purely local or purely global. The answer is, thus, complex and far from unequivocal, pointing to the need for a less divisive discourse and an increased focus on identifying trade-offs and synergies among local and global food chains [67,73].

The growing scientific consensus that shifting consumption to a more plant-based diet should be a major component of effective strategies toward healthier and more sustainable agri-food systems [3,74] was also reflected in this study's interviews. However, substantial reductions in meat consumption, by at least 50% globally in order to keep within environmental limits [3], face public resistance due to various cultural, personal and social values associated with meat consumption [75,76]. Interviewees mentioned various meat alternatives as viable ways to promote meat reduction in more reticent consumer segments. Research indicates, however, that the sustainability gains of meat alternatives may not be as extensive as implied in the discourse, due to the high level of processing that they typically require [77].

Finally, a topic that emerged from the interviews was the importance of new business models, with a circular economy model for agri-food systems being the most discussed. Although widely used, circular economy as a term lacks a single, agreed-upon definition [78,79], but has, nonetheless, achieved widespread uptake by policy-makers and the business community alike [80]. This is evident from our interviews since the concept was discussed by a wide array of stakeholders, from FVC actors to NGOs and policy-makers. The following definition by Jurgilevich et al. [81] is most appropriate here, as it encompasses most of the issues that emerged from the interviews when discussing circular economy policies in the context of agri-food systems:

Circular economy regarding the food system implies reducing the amount of waste generated in the food system, re-use of food, utilization of by-products and food waste, nutrient recycling, and changes in diet toward more diverse and more efficient food patterns (p. 2).

Some authors identify challenges for the concept in achieving environmental sustainability due to the lack of rigorous scientific research underpinning environmental impacts [80]. One solution would be to utilise precise measurements for material flows, which would ensure that environmental aspects are accounted for (e.g., recycling rates provide no information on actual reductions in resource use) [78]. Effective policy-making should also address food loss and waste along the entire food supply chain, with an emphasis placed on developing and supporting closed-loop value chains [74]. Waste (including food waste) is one of the priority areas of the EU Circular Economy Action Plan [82], which in turn is part of the European Green Deal [83].

It should be noted that since these interviews were conducted, the UK has left the European Union, and as of 31 January 2020 is no longer an EU member (though partnership negotiations are ongoing) [84]. The Brexit debate has heightened concerns about EU cohesion, which could have wider implications for European food systems in the future [85]. The current pandemic has also thrown into sharp relief many of the concerns about EU cohesion and integration [86], though the implications are yet to be fully understood as the pandemic is still underway [87].

Finally, drawing from these stakeholder-based insights, the following recommendations were formulated from an agri-food system perspective to include all of the relevant actors and target recommendations accordingly (see Table 6.)

Table 6. Policy recommendations targeted to different stakeholder groups in support of sustainable food consumption, derived from findings.

Policy Tool	Policy Topic	Stakeholder Group	
		Government	Civil Society
Direct activity regulation	Policy integration	Integrate health and nutrition goals with sustainability goals; Address policy contradictions with sustainability goals and integrate agri-food policies with environmental sustainability targets (e.g., climate neutrality); Formulate policies that capitalize on cross-sectoral synergies	Identify policy gaps and inconsistencies to more effectively achieve policy integration for sustainability; Advocate systemic solutions alongside changing lifestyles
		Formulate labelling/certification policy based on evidence of the limitations of private sector voluntary initiatives; Monitor compliance and effectiveness of labels in achieving sustainability goals; Align public procurement policies with sustainability objectives	Device strategies that promote long-term perspectives in food production and consumption; Support a shift of production to more sustainable patterns (e.g., reduce meat production)
Market-based tools	Market incentives	True cost pricing including social costs; Food education in schools; Utilize behavioural insights; Transparency about policy trade-offs; Shape the food environment to promote sustainable diets and support private sector initiatives to this effect	In the absence of a mandatory label, use only well-established and reputable third-party accredited labelling schemes; Avoid greenwashing
Knowledge-related tools	Transparency and education	Invest in food innovation that advances sustainability goals; Develop frameworks for assessing innovation based on sustainability criteria and metrics	Increase consumer literacy on complexity of food consumption; Educate on the sustainability and health gains of sustainable diets
	Food innovation	Target policies towards FVC actors with the power to change the system; Support consumer groups; Identify and engage broad scope of stakeholders	Monitor and educate about the effectiveness of specific food innovations on sustainability goals
Governance tools	Power asymmetries and influence	Formulate policies that override false dichotomies among local and global FVCs	Target pressure on FVC actors and governmental bodies with the most power to implement transformative policies; Educate about the limited role of consumers and the need for systemic change
	Local vs. global FVCs	Monitor environmental performance with appropriate indicators and frameworks	Promote policies that optimize sustainability outcomes
Strategic tools	New business models; circular economy	Monitor environmental performance with appropriate indicators and frameworks	Scrutinize circular economy policies and evaluate them on the basis of sustainability outcomes; Inform consumers about the effectiveness of specific circular economy policies

5. Conclusions

This study elicited the perspectives of stakeholders of agri-food systems in four different European countries, analysing the most commonly identified and cross-cutting solutions for transitioning to more sustainable food production and consumption. The most commonly proposed solutions can be classified as strategic tools, reflecting a shared recognition of the need for policy cohesion in the service of long-term goals. This finding mirrors the emphasis in the academic literature on addressing food as a systemic cross-cutting issue which demands the determination of common goals and the coordination and collaboration of many different governance actors [88]. A mix of policy instruments capitalizing on synergies [74] while recognizing trade-offs [89] is more conducive to effectively addressing pressing challenges due to the complexity of agri-food systems and their multiple interactions with other systems [90].

The topics and possible solutions discussed during the in-depth interviews with stakeholders reflect their concerns and perspectives at the time of the data collection. Although the study was conducted before the recent Covid-19 pandemic [91], it remains relevant. Besides the obvious and inescapable connections to be made between the ecological health of ecosystems and human health [92], many of the recommendations which were geared towards increasing the sustainability of agri-food systems would also contribute to their resilience to future challenges.

Nonetheless, some pertinent issues which the literature regards as important to consider as we attempt to transition to more sustainable food systems did not emerge from our interviews. One important aspect that received little attention, despite its evident influence on policy-making, is the effect of binding international trade agreements and how these interact with both regional and national policy. Policy for the public interest (as all sustainability policies are by definition) may be hindered by trade-policy goals, necessitating the consideration of these interactions when regulatory frameworks are reformed to address sustainability challenges [93]. Another topic which received little discussion was the effect of EU competition law on collaborative practices. Previous stakeholder-based research indicates that competition law can be a substantive barrier to collaborative sustainability initiatives [94]. Furthermore, nutrition and the importance of healthy diets was discussed very little in our interviews, and the discussion also lacked the crucial connection to poverty measures and the effects of food insecurity [95] which the current pandemic has further exposed [96]. Access to healthy diets is an important issue for cash-strained households which resort to less healthy but cheaper convenience food products, thus exacerbating environmental and health issues [95]. Future research should also address and analyse the global impact of European food systems. Although this study did not explicitly address the global dimension of European food systems, sustainability goals necessitate a global perspective [95]. Finally, differences in national contexts require a more in-depth investigation, since several topics which emerged from our study were more context-specific. Nonetheless, identifying common ground in proposed solutions is important within the context of European policy-making.

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Appendix A

Table A1. Stakeholders' descriptives (the type of organization and the stakeholder's role in it), and pseudonyms with country codes.

No.	Organization/Company Type	Interviewee's Role	Pseudonym	Context
#1	Business association	Expert	P1	IS
#2	Research organisation	Research Analyst	P2	IS
#3	Business association	Marketing and Administrator	P3	IS
#4	Wholesaler	CEO	P4	IS
#5	NGO	CEO	P5	IS
#6	Policy-maker	CEO	P6	IS
#7	Wholesaler	Quality Manager	P7	IS
#8	Producer (Drinks)	CSR Manager	P8	IS
#9	Marketing	Project Managers	P9 & P10	IS
#10	Academic institution	Expert	P11	IS
#11	NGO	Chairman	P12	IS
#12	NGO	Chairman	P13	IS
#13	Producer (Meat)	Product Development Manager	P14	IS
#14	Entrepreneur	CEO	P15	IS
#15	Producer (Dairy)	Product Development Manager	P16	IS
#16	Retailer	Marketing Manager and Purchasing Manager	P17 & P18	IS
#17	Producer (Dairy)	Head of Strategy	P19	UK
#18	Producer (Frozen foods)	Head of Crop Cultivation	P20	UK
#19	Manufacturer (Milling equipment)	CEO	P21	UK
#20	Agricultural association	Director	P22	IT
#21	Producer/Processor (Dairy)	Company Associate	P23	IT
#22	Network/Association	Vice Director	P24	IT
#23	Producer (Dairy)	Marketing Director	P25	IT
#24	Processor Association	President	P26	IT
#25	Research Institute	Manager	P27	IT
#26	NGO	Global Campaign Strategist	P28	EU
#27	EU organisation	Member	P29	EU
#28	Academic institution	Researcher	P30	EU
#29	Public agency	Project Manager	P31	FR
#30	Retailer	Market Manager for Fruits and Vegetables	P32	FR
#31	Research organisation	Director of Prospective and Consumption Division	P33	FR
#32	Producer	Health and Diet Advocacy Director	P34	FR
#33	Start-up	Co-founder	P35	FR
#34	Public agency	Head of the Evaluation, Foresight & Transversal Analysis	P36	FR
#35	Consultancy	Associate Director	P37	FR
#36	Research organisation	Researcher in Nutrition	P38	FR
#37	Retail	Director	P39	FR
#38	NGO	Food and Agriculture Programme Expert	P40	FR

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8 Summary and Discussion

8.1 Summary

This section briefly summarizes the aims and results/findings of each paper before discussing these in more detail in the next section (Section 8.2).

Paper I sought to contribute to the conceptual understanding of the synergies and trade-offs between a sector and its performance across the 169 targets of the Sustainable Development Goals (SDGs). Once again, the Icelandic tourism sector was chosen which at the time of the study had surpassed Iceland's other economic sectors in terms of its GDP contribution. The study examined the tourism sector's contribution to the SDGs with a specific focus on revealing synergies and trade-offs. Synergies, i.e. co-benefits of tourism positively contributing to the fulfilment of one or more SDG targets were found in 32 instances. Trade-offs, i.e. drawbacks of tourism activities negatively affecting the fulfilment of one or more SDG targets were found in 11 instances. The study was based on thematically differentiated focus groups with experts from a broad and balanced range of stakeholders in the Icelandic tourism sector. Findings were classified through a ranking system for easily accessible and comprehensive results targeted to policy-makers and managers.

Paper II reviewed and applied a previously developed, national-level environmental sustainability indicator set (Cook et al., 2017) to an economic sector in order to determine whether environmental impacts can be discerned from the sector on the national level. Iceland's tourism sector was chosen due to its fast-paced and unprecedented growth at the time of the study; the implication being that a national-level indicator set should be able to capture impacts from an economic sector that was already one of the largest in the country. Capturing these impacts was determined to be important in terms of the environmental performance of the nation as a whole. In addition, the paper aimed to highlight data collection gaps in terms of environmental impacts from the tourism sector in Iceland. Data gaps were found in most thematic categories applied to the tourism sector indicating the need for increased efforts in the collection of pertinent environmental data for Iceland's sustainability performance assessment.

Paper III explored the perspectives of high level managers of medium and large tourism companies and relevant organizations in Iceland in relation to the tourism sector's management of environmental issues. The study attempted to determine the factors influencing organizational change in the tourism sector in Iceland in response to environmental issues. Through in-depth interviews and industry and policy conferences, it found the drivers, barriers and enabling conditions important for more effective management of tourism environmental impacts in Iceland. A key finding was that the policy and regulatory framework in the tourism sector had been slow to develop in an exceedingly fast-growing sector. Complicated institutional frameworks and increased societal pressure to address key environmental issues had created difficulties not easily overcome by the sector alone.

Paper IV explored the perspectives of high level management among medium and large companies and relevant organizations in the fisheries sector of Iceland and Norway to determine the factors that enable blue growth, i.e. economic growth achieved from the sustainable use of aquatic resources. Specifically, the study determined which drivers and barriers managers perceived as crucial in the further growth of their firms and industries as a whole and how the policy environment could encourage positive change. One of the main findings was that strict fisheries management regimes common in both countries constituted a necessary requirement for sustainable growth as they stimulated rather than constricted value-added activities. However, both industries were still mired in debates on equitable social outcomes and the paper argued that for blue growth to be achieved, these issues would have to be ameliorated. Governance of shared aquatic resources also emerged as an important aspect of blue growth in a rapidly changing world.

Paper V explored stakeholders' views on policy tools for achieving sustainability transition in European food systems. Semi-structured interviews with a broad range of stakeholders from all relevant food system actors were conducted in four European countries. The study's aim was to explore and analyse stakeholders' proposed solutions for creating sustainable agri-food systems. The proposed solutions were then categorized by the use of an adapted policy tools' typology into five categories: direct activity regulations, market-based, knowledge-related, governance and strategic policy tools. The findings were, then, used to derive policy recommendations targeted to three stakeholder groups which emerged as important actors in the study: government, food value chain actors (ranging from primary producers to retailers), and civil society.

The structure of this concluding chapter is as follows: Section 8.2 briefly discusses the overall outcomes and implications of the thesis. Section 8.3 outlines some of the academic and practical contributions of this thesis. Section 8.4 provides a short discussion of the limitations of the thesis and delineates future research directions. Finally, Section 8.6 concludes the thesis.

8.2 Discussion of findings and results

This thesis was comprised of two different but interconnected streams of research on how economic sectors contribute to sustainability both in terms of their impacts (positive and negative) and in terms of their management of negative impacts. Though much of the research focused on Iceland, in two of the papers' cross-country comparisons provided a wider perspective on pertinent issues for Iceland and other Nordic and European nations. In this section, the findings and results from the five papers will be discussed in terms of:

- a) The role of assessment in sustainability transitions - assessing the contribution of a sector to national and global sustainability (papers II and I) and,
- b) management of sustainability issues contributing to sustainability transitions in the tourism (paper III) and fisheries sectors (paper IV), and in European food systems (paper V).

8.2.1 Assessing sectoral contribution to national and global sustainability

The largest challenge we face is how to go about accommodating our economic activities within resource limits and planetary boundaries (Rockström et al., 2009; Steffen et al., 2015). As discussed in the introduction (Chapter 1) without assessing the current state of affairs and progress towards environmental sustainability, policies run the risk of being ineffective (Miller & Twining-Ward, 2005). As an assessment tool, indicators provide a practical methodology for measuring performance towards certain goals with the hope that this will then improve our chances to reach a more sustainable state (Hák, Moldan & Dahl, 2007).

In this research strand, the focus was on the Icelandic tourism sector as an economic sector that had been growing remarkably fast and yet was apparently largely understudied in terms of its environmental and social impacts (Sutherland & Stacey, 2017). This provided the impetus to investigate more closely how the Icelandic tourism sector's sustainability implications in connection to the Sustainable Development Goals (SDGs) (Paper I) and how it was impacting on Iceland's national environmental sustainability (Paper II).

Paper I provided an overarching view of the Icelandic tourism sector's impacts by attempting to assess its contribution to the SDGs which encompass all sustainability dimensions (UN, n.d.) Few empirical studies had been done examining a national sector's contribution to the SDGs at the time of this study and none had focused on a national tourism sector's contribution. Yet, as was discussed in the introduction (Chapter 1), economic sectors are explicitly addressed in many of the underlying targets and indicators for the SDGs. Specifically, tourism is directly implicated in three of the SDGs: 8 (on sustainable economic growth and employment: 8.9), 12 (on sustainable consumption and production: 12.b) and 14 (on sustainable use of oceans: 14.7) (UNWTO, n.d.) and has been conceptually linked to many of the other Goals, as well (Boluk, Cavaliere & Higgins-Desbiolles, 2017). From a strong sustainability perspective, there was the immediate implication that SDG 8 might lead to trade-offs (negative effects) with, at least, some of the "biosphere" SDGs (6, 13, 14 & 15; see also figure 1). As such, it was deemed prudent to systematically assess the possible trade-offs but also synergies (possible co-benefits) among a growing and important national economic sector with the global Goals that Iceland aspired to reach.

Studying interactions with and among the SDGs in different contexts, at different levels and for different topics is a research field that has flourished in the last few years and will surely continue to be productive. Previous studies on the SDGs have emphasised the importance of policy integration for successful implementation of the Goals and highlighted the need to disentangle the complex interactions among them (Nilsson et al., 2016; Lyytimäki et al., 2020). Explicitly taking into account trade-offs and synergies among the Goals has been also highlighted as crucial to their successful implementation because we need to ensure that progress in one of the Goals does not impede progress in other ones (Nilsson et al., 2018; Singh et al., 2018). So far, studies have been done examining interactions among the Goals and their associated targets (Ament et al., 2020), across different sectors (Blanchart et al., 2017), within specific regions (Lyytimäki et al., 2020) and for cross-boundary effects (Zhao et al., 2020). More recently, there have also been studies on sectors and their contribution to the SDGs at various levels, national (e.g. on Thailand's fisheries sector: Sampantamit et al., 2020), regional (e.g. European fisheries: Saida & Chuenpagdee, 2019) and global (e.g. the forestry sector: Baumgartner, 2019; inland fisheries: Lynch et al., 2020).

Drawing from Nilsson et al. (2016) tourism's contribution to each Goal and associated targets was systematically assessed in Paper I by eliciting the opinion of key experts from a broad base of tourism stakeholders. Focus groups were chosen as the most appropriate method because of the lack of quantitative data (an issue encountered also in Paper II) and because some topics might be

contentious and there was the distinct possibility for them to be perceived differently by different stakeholder groups. Eliciting the perspectives of key informants among all relevant categories of stakeholders was important for the study's overall validity. A recent review of 70 empirical studies on interactions in the SDGs found that expert and stakeholder knowledge played an important role in many of these studies especially where quantitative data was lacking but also because such knowledge is vital in contextualizing the SDGs (Bennich, Weitz & Carlsen, 2020). One of the main outcomes of Paper I was that by and large the tourism sector's contribution towards meeting many of the targets associated with the SDGs was synergistic. However, almost half of the trade-offs in this study were associated with SDGs in the environmental sphere with stakeholders highlighting greenhouse gas emissions' reduction as a major area of concern.

Paper II focused exclusively on national environmental sustainability with the aim to review a previously developed indicator-based national environmental sustainability assessment tool (Cook et al., 2017) and assess its ability to capture impacts from a growing economic sector. National indicator sets on environmental sustainability are widely used tools for monitoring and assessing progress towards policy goals (Olafsson et al., 2014). For Iceland in particular, a nation with a small but highly specialized economy (Jóhannesson et al., 2018), certain sectors can have outsized effects on its sustainability necessitating an emphasis on the particularities of the national context. Assessing the impacts of different sectors on a nation's overall environmental sustainability performance is important because disaggregating and allocating impacts to the different economic sectors can help advance more accurate sectoral and national policies. It was also important in terms of testing the applicability of the measuring tool itself i.e. the indicator set previously developed by Cook et al., 2017. Although a national-level indicator set should be able to discern impacts from a fast growing sector, it was also anticipated that the set would likely not be entirely suitable due the inherent complexity of the tourism sector. Indeed, some indicators turned out to be suitable, some not and some were missing altogether. Sector-specific satellite indicators to compliment the national-level indicator set were proposed as a way to address some of the shortcomings of the set (see Paper II).

Besides these methodological insights, one of the most valuable implications of Paper II was pinpointing specific areas of improvement in data collection practices. Another major implication of the study was also that a more comprehensive assessment of tourism's environmental impact in Iceland was necessary. Most studies had been based on the principles of carrying capacity and focused on soil erosion and trampling effects in specific and largely protected areas (MII, 2018). No studies had looked at energy use, air and

water pollution in the context of Iceland's tourism sector. This constituted not only a major research gap but also indicated that these environmental categories might not be receiving necessary policy and/or management attention even as the pressures were increasing with the rise in tourist numbers. Considering tourism's fast paced growth and its dependency on the natural environment in Iceland, it seemed a foregone conclusion that all these issues would need to be attended to in the very near future. Paper II also revealed that there had been no systematic study done to examine these topics and raised the question of how tourism as a sector driving most of economic growth in Iceland would perform against the 17 SDGs that Iceland was committed to (Paper I). Recent developments in the tourism policy field indicate that sustainability issues are likely to receive more attention in the future. The development of carrying capacity indicators based on stakeholder consultation (EFLA, 2018) and sustainability indicators for protected areas (Ólafsdóttir et al., 2018) both were performed at a similar time as the work for this thesis. In both cases, these are integrated indicator sets taking into account all the dimensions of sustainability and are not limited to environmental issues. The carrying capacity indicators (EFLA, 2018) cast a wide net and include pressures on infrastructure (both built (e.g. sewage systems) and social (e.g. health and security services) and include also tourist perceptions and locals' tolerance of tourism. Data collected through this process is meant to then inform policy regarding areas in need of improvement both in terms of infrastructure but also in terms of the tourists' and locals' experience to guide decision-making for future development. How implementation will proceed – how this information will be used to guide development - remains to be seen.

8.2.2 Management of sustainability in the tourism and fisheries sectors, and in European food systems

The second research strand of this thesis focused on topics related to the management of environmental and sustainability issues within two different sectors - tourism and fisheries - and the cross-cutting theme of the European food system. In this research strand, stakeholder interviews formed the backbone of data collection to provide answers to research questions. In all cases, stakeholder engagement and consultation were deemed necessary in order to provide an in-depth perspective into high-level decision-making, strategies, and policies in relation to management issues in the different sectors and contexts. There is significant overlap in these studies. The tourism sector's effect on both food policy and food innovation can be discerned in discussions by stakeholders in the research that was conducted for papers IV and V. Paper V on the sustainability of European food systems provided an overarching view of some of the issues dealt with in more depth in paper IV (on blue growth).

Using insights gleaned from institutional theory, papers III (tourism) and IV (fisheries) explored the perspectives of high-level managers in the tourism and fisheries sectors on the drivers and barriers to more sustainable activities within each sector. The focus of paper III was broader than the one in paper IV, in part because the fisheries sectors in the two countries under study, Iceland and Norway, have established regulatory systems and long standing institutions. The tourism sector in Iceland was still somewhat in flux in the sense that administrative and institutional capacity as well as policy frameworks and strategic direction were still being formulated.

There was not much space for discussion in Papers III and IV for the interesting intersections between tourism and fisheries in Iceland due to the specific scope in each paper. However, Iceland's fisheries and tourism sectors have often been compared to one another in political and industry discourses, the idea being that fisheries policy can inform tourism policy to create a successful and profitable sector. This view emerged from some industry representatives in Paper III especially when discussing appropriate business and environmental policies in the tourism sector. As discussed in Paper III, views were mixed regarding the appropriate level of coordination for tourism policy with some suggesting that the role of local institutions should be minimized. The comparison to the fisheries industry was often made to illustrate management issues within the tourism industry. One tourism industry representative, for example, argued that there should be more centralised management with a tourism research institute guiding decision-making drawing a parallel to the role of the Marine Research Institute in the fisheries sector. Experts pointed out, however, that the comparison between the two sectors is not entirely appropriate when discussing management issues because the tourism sector is far more complex (see Paper III).

Some tourism scholars have also pointed out that the comparison between tourism and fisheries has not been particularly helpful in informing tourism policy, much less environmental and sustainability policy (Jóhannesson & Huijbens, 2013; Jóhannesson, 2016). As tourism was seeking legitimacy and entering the political sphere as a "real" economic sector, it was compared to the long-established, more traditional fisheries sector with tourism and tourists being "translated into fish" (Jóhannesson, 2016, p. 82). One of the interesting points in terms of this comparison is that the fisheries sector has been tightly regulated via the Fisheries Management System and with a scientific institution – the Marine Research Institute - afforded a leading role (Jóhannesson, 2016; see also Paper IV). But as Jóhannesson (2016) argued, this analogy between fisheries and tourism created an ideology of tourism as industrial production effectively encouraging a logic of volume (see also Jóhannesson & Huijbens, 2013) to the possible detriment of sound environmental policy.

Another way to draw parallels between these two sectors is to consider the concept of common pool resources i.e. systems in which it is “difficult, but not impossible, to define recognized users and exclude other users altogether” and “each person’s use of such resources subtracts benefits that others might enjoy” (Ostrom, 2008, p.9). The fisheries sector relies on a natural resource that belongs to the Icelandic nation but has been largely restricted by Individually Transferable Quotas (ITQs) to a few entities. The requirement to pay resource rent for this utilisation is part of the arrangement for the use of a common pool resource (Gunnlaugsson & Kristofersson, 2020). Tourism also depends on common pool resources which includes the broader landscape, natural resources, built (manmade) infrastructure and socio-cultural resources (Briassoulis, 2015). Common pool resources in the context of tourism are, however, very complex; these resources may be used by tourists and non-tourists alike, for a variety of activities and are often in constant development and under the purview of various institutions. In addition, different components of these resources are variously private, public, or common and open access. Governance and management are complicated because of the various public (at multiple levels) and private actors (Briassoulis, 2015). Tourism depends on infrastructure that is largely publicly funded and maintained raising questions on whether and how to shift some of the financial burden to tourists and tourist companies (see also Paper III).

There are no straightforward solutions in terms of the choice of economic instruments best suited for tourism. In Iceland, as in other Nordic countries, the use of economic instruments such as entrance or user fees is complicated due to the public right of access (i.e. the right to roam) (Øian et al., 2018). The attempt to create a “Nature Pass” (entry fee to public lands) faced great opposition by politicians, tourism companies and the public at large and was quickly abandoned (Fontaine, 2015). Soft measures have mostly characterised visitor management at National Parks in Iceland e.g. through information provision regarding desirable behaviour for nature protection alongside charging fees for parking and other services (as opposed to entrance fees) (Nordic Council of Ministers, 2019). Various tax and VAT measures do not receive much support from the private sector which fears that additional costs will impact on the destinations’ competitiveness (Øian et al., 2018). Destination Management Organizations (DMPs) which rely on public-private partnerships at the destination level (regions within the country) may be a way to secure funds for development and formulate a strategic (common) direction (Øian et al., 2018) but it remains to be seen if and how sustainable development considerations will be integrated.

Sustainable development considerations can be found in Icelandic tourism and other policy documents dating back to 2006 and 2002 respectively, reading

these documents gives the impression that sustainable tourism is one of the major priorities for the tourism sector (Ólafsdóttir, Kristjánsdóttir & Björnsson, 2018; Øian et al., 2018). In practice, however, the reality is more complicated. As Ólafsdóttir et al. (2018) found in a quantitative survey of Icelandic tourism companies, in terms of implementation there is still a long way to go. In their study they found that a large majority of companies had not really considered environmental management and many even associated the concept with unnecessary and potentially damaging governmental interference. It is important to note that these results diverge from the findings in Paper III but the reason is clear. Iceland's tourism sector has long been characterised by a few large companies and many smaller family-based companies (Jóhanesson & Huijbens, 2010). The companies interviewed for Paper III were medium to large and had already implemented some form of environmental management in their operations.

Recent developments in the policy sphere for the tourism sector reflect increasing emphasis on the importance of sustainable tourism amidst increasing recognition of the complexities of the tourism sector and the difficulties of aligning tourism with sustainable development. As Paper III's analysis indicates, the complex realities of the tourism sector e.g. the multiplicity of governance actors involved in tourism management, the complex administrative realities, the way infrastructure can both hinder and promote environmental protection, demand extensive collaboration among public and private actors and a common guiding vision to coordinate activities. Jóhanesson, Huijbens and Sharpley (2010) argued that "official policy needs to come to terms with what sustainable development means in practice and issue concrete plans of activities that reflect the implications of sustainability" (p. 294). The new policy framework (MII, 2019) has placed more emphasis on capacity limits in both environmental and social terms, but implementation will be crucial particularly post-Covid. Carrying capacity indicators (taking into account social, economic and environmental dimensions) were also recently developed for the sector as a whole (EFLA, 2018) as well as sustainability indicators for use in protected areas (Ólafsdóttir et al., 2018). This is important foundational work that has taken place in the last few years which can help to underpin lofty policy ideals with real monitoring of performance and, thus, has the potential to more concretely address sustainability. The hope is that comprehensive data on the environmental dimension can bring the attention to aspects in need of improvement in the same way that the implementation of Tourism Satellite Accounts hastened the Icelandic tourism sector's recognition as a "real" economic sector (Jóhanesson & Huijbens, 2010).

The challenge still remains, however, regarding greenhouse gas emissions from air transport on which Iceland is highly dependent upon as a tourist

destination (Sæþórsdóttir, Hall & Wendt, 2020). Papers I and III, showed that although awareness is high regarding the “hot potato” of greenhouse gas emissions from air transport, solutions to address these emissions are mostly at the international-level (e.g. through the European Union’s Emissions Trading Scheme). This emphasis on international-level solutions is also evident in the newly developed carrying capacity indicators (EFLA, 2018). The set includes an indicator to assess greenhouse gas emissions from tourism transportation but excludes emissions from international air transport or cruise ships emissions because “the Paris Agreement does not apply to emissions from international flights or shipping, and therefore there will be no indicator for the environmental impact of air transport, despite the fact that there has been a large increase in international aviation in Iceland in recent years” (EFLA, 2018, p. 71; translated from Icelandic by the author). The issue of how to account for these emissions and what solutions are viable in the realm of climate change mitigation highlight the difficulty of addressing sustainable tourism at the international level. Yet, international tourism is one of the aspects of the “Great Acceleration” (Steffen et al., 2015; see also Chapter 1) and how it can be accommodated within resource limits and planetary boundaries is an integral question in terms of its sustainability (Eijgelaar, Amelung & Peeters, 2016; Hall, 2019; Higham & Miller, 2018).

In Papers III and IV, it emerged that regulations and policies (or lack thereof) play an important role in how companies manage environmental issues. For the fisheries sectors of Iceland and Norway, it emerged that a strict management regime encouraged technological and institutional innovations which has led to an increase in value-added activities. In Paper III, it emerged that an enabling policy environment is crucial to tourism development with a strategic policy framework and policy integration playing a key role to the sector’s capacity to address negative environmental impacts. Tourism was also often discussed as a way to provide further business development opportunities for the fisheries sector in Iceland in Paper IV. Some companies could see synergies with tourism in terms of future product development (e.g. “fish souvenirs”) and fish-related experiences for tourists. The growth of the tourism sector and the associated growth in air-carrier freight had also encouraged more fresh fish exports for the Icelandic fisheries sector. The high carbon footprint of transporting fresh fish via aviation to markets abroad (Smáráson et al., 2014) was not addressed by industry representatives (Paper IV) whereas the tourism sector was very aware of the carbon footprint from international aviation (Paper III). Concerns were also expressed regarding impacts by cruise tourism in both papers (Paper III and IV) as well as in Paper I. Concerns were voiced with regards to local ocean pollution and the possible negative effects for fisheries (Paper IV) and marine-based tourism activities (Paper III). The new law

banning Heavy Fuel Oil (HFO) at the ports may ameliorate some of those concerns (MENR, 2019). Recent research has shown that cruise tourism has been creating various other challenges for tourism development at small Arctic cruise destinations beyond pollution at ports (James, Olsen & Karlsdóttir, 2020). The Covid-19 pandemic also exposed various issues with regards to cruise tourism that had not been in the public eye before (Higgins-Desbiolles, 2020).

In general, the discussion of environmental issues by Iceland's fisheries sector representatives was almost exclusively focused on sustainable harvesting, utilization and eco-efficiency while wider supply chain effects (such as transportation emissions) went largely unaddressed. The Fisheries Management System has had a significant formative effect on the organizational environment of companies within the fisheries sector and for supportive companies in innovation. Yet it has also had a formative effect on the attitudes and the common understanding of environmental sustainability and what it entails within the fisheries sector. As Berkhout (2012) noted, how organizations 'see' their world (and what they don't see) is "in large part prescribed by rules defined by regulations and the market" (p. 96). As such, sustainable harvesting was seen as a necessary precondition to the fisheries sector's development and an area that the fisheries industries in both Iceland and Norway took much pride in. However, the Fisheries Management System has also limited the conceptualization of environmental sustainability to primarily the areas of sustainable harvesting, utilization and eco-efficiency largely eschewing wider effects such as carbon emissions from the entire life cycle of a product (i.e. seafood). In the case of Iceland's fisheries sector, for example, the transport of fresh Icelandic cod loins through aviation was found to have "huge environmental impacts compared to sea and road transport" in terms of carbon emissions in a Life Cycle Assessment study (Smáráson, Viðarsson, Þórðarson & Magnúsdóttir, 2014, p.42). As pointed out by Smáráson et al., 2014 advances in cooling and chilling technology could make sea transport a more viable option especially with climate change concerns increasing in public and political importance. The Covid-19 pandemic should also be an opportunity for companies to re-consider, among other things, transportation options in their long-term risk management plans to future shocks (Love et al., 2020).

Fisheries management will have to contend with issues such as general ecosystem health, cross-sectoral effects (e.g. marine pollution by other industries such as cruise tourism), shifting distributions of species and productivity due to warming and the increased potential of conflicts (Campbell, 2016; Karp, Peterson, Lynch & Griffis, 2018). Most of the fisheries sectors' representatives in both countries were aware of global environmental change especially climate change and its dangerous twin, ocean acidification, though

how these can be strategically addressed in a concrete manner was less clear. There is an opportunity to reframe climate change impacts on fisheries in terms of local resilience and adaptation in order to highlight their strategic importance to the sector as a whole (Campbell, 2016). Heinrich and Krausey (2016) conducted an integrated risk assessment of Norwegian fisheries to determine the sector's vulnerability to ocean acidification. Such assessments could be part of a preliminary but important step in developing response strategies (Heinrich & Krausey, 2016). Shared species and especially ones with shifting distributions (such as the mackerel) were discussed in both countries in no uncertain terms which indicates that ocean governance will have an increasingly important role to play in international environmental governance in the future (see paper IV).

Although a sectoral emphasis underlies four of the papers (I-IV), the systems perspective is more useful when addressing overarching sustainability issues (Saviano, Barile, Farioli & Orecchini, 2019). The prevalence of the systems perspective in the mainstream business and management literature is not high (Williams, Kennedy, Philipp & Whiteman, 2017). Systems thinking, however, has permeated international policy agendas on a variety of topics (e.g. EEA, 2019b; FAO, 2018c; de Coninck et al., 2018; IEA, 2019) and underpins the sustainability transitions literature (Geels, 2004). Paper V addressed European food consumption policy from a systems perspective eliciting perspectives from stakeholders in the entire food system in order to derive empirically rooted recommendations for policies in support of a sustainability transition. The paper's focus was on European food systems and was, therefore, based on cross-country comparisons with an explicit focus on commonalities i.e. issues that emerged in the majority of the countries. As such, there was less space afforded to context-specific issues that emerged in each country.

In Iceland there was much discussion of strategic food policy-making at the municipal, national and regional (Nordic and European) levels. At the national level, policymakers discussed placing emphasis on locally produced food and improving the marketing of local delicacies to foreign visitors which again shows the effect of the tourism sector on the Icelandic policy field (pre-Covid) (Matarauður Íslands, n.d.). At the municipal level, the municipality of Reykjavík's new food policy (Reykjavík City, 2018) included sustainability considerations e.g. in terms of purchasing local products (green public procurement), reducing food waste and increasing the consumption of vegetables. At the regional level, the Nordic Council released a report on sustainable food policy (Nordic Council of Ministers, 2018) and the EU's Farm to Fork strategy for transitioning towards fairer, healthier and more environmentally-friendly food systems in the EU were both high on the agenda (COM, 2020). Much of this policy work has been guided by scientific assessments perhaps most prominently the EAT Lancet Commission's report

(Willet et al., 2019) which identified numerous challenges and opportunities for a sustainability transition in food systems.

Seafood has, to date, been afforded somewhat less consideration since the emphasis has been largely on agriculture and less on fisheries and aquaculture. It is clear, though, that seafood has an important role to play in the transition due its lower environmental impacts (compared to red meat, especially) and its nutritional profile especially in terms of the provision of important nutrients such as omega 3 fatty acids (Troell, Jonell & Crona, 2019). In interviews with the fisheries sectors' representatives for Paper IV, there was a common understanding in both Iceland and Norway that seafood was an important component in the future of food production and was referred to as the “last wild protein”. Paper IV showed also that fisheries can be a valuable component of the sustainability transition by extracting more value from limited resources, utilizing by-products better and stimulating innovation, something that is discounted in the EU's Blue Economy strategy which excludes fisheries (COM, 2014).

This section discussed the findings and results of the five papers and the various interrelations between the different topics covered in the papers. The next sections present the contribution (Section 8.3), recommendations (Section 8.4) and limitations and further research (Section 8.5).

8.3 Contribution

In this section, some of the main contributions of this project are briefly discussed in terms of academic (Section 8.3.1) and practical (Section 8.3.2) implications.

8.3.1 Academic contribution

Paper I developed a methodology that can be applied to different sectors and contexts in order to measure contributions to the SDGs in a comprehensive manner based on expert consultation. The methodology was explicitly focused on revealing the synergies and trade-offs among the different Goals in terms of Iceland's tourism.

Paper II mainly applied a previously developed national-level indicator set in order to determine whether the indicator set would be able to capture effects from a specific economic sector – in this case Iceland's rapidly growing tourism sector. The paper contributed to sectoral assessments of sustainability, revealed gaps in environmental data collection and contributed to discourses about the global environmental effects of national sectors.

Paper III formulated a more detailed model of factors that have influenced environmental management in the tourism sector in Iceland, including necessary

enabling conditions which can be applied to different national contexts and other sectors. It expanded the conceptual model to include internal factors and barriers, and not only drivers, to environmental management highlighting at the same time the importance of policy and strategic direction for a sector's effective environmental management.

Paper IV explored the concept of blue growth as perceived by the industries of two different countries and compared it to the concept of blue growth in the academic literature. The study contributed to the theoretical expansion of the concept of blue growth emphasizing that the inclusion of social factors as well as a wider perspective on what constitutes sustainable use were both important in its achievement. In addition, it expanded the conceptual model it was based on to include barriers to blue growth investments while highlighting the role of policy in facilitating value-added activities.

Paper V contributed to the literature on sustainable food systems by engaging in stakeholder consultation targeting a broad range of stakeholders and advancing recommendations firmly rooted in empirical findings. These findings were largely supported by recent academic literature showing that there is a high level of agreement among academics and stakeholders on many of the challenges that food systems are faced with today. This was an encouraging finding showing that the policy sphere has increasingly become more evidence-based and that academic research has permeated industry and policy discourses. However, the study also found that although problem definition was largely consensual, the agreement on specific solution pathways was less so.

8.3.2 Practical implications and policy insights

This thesis had a more explicit focus on practical contributions to several pertinent issues especially in the context of Iceland's economic sectors where research is scantier. Though the focus is largely on Iceland, cross-country comparisons (in papers IV and V) offered an expanded perspective of sustainability issues which other countries are also grappling with.

Paper I provided an overview of all current sustainability issues within Iceland's tourism sector based on expert opinion from a broad range of stakeholders. Besides systematically examining the sector's contribution to the SDGs it also highlighted areas where actions would lead to further synergies e.g. in terms of employment opportunities and innovation important to managers and policy-makers alike. The paper also highlighted areas for improvement where trade-offs between tourism growth and negative environmental outcomes were revealed. Importantly for managers and policy-makers, the paper also showed, that some of the negative outcomes could be

transformed into synergies through appropriate investment in infrastructure in collaboration with local communities, businesses and other stakeholders.

Paper II provided a comprehensive review of the Icelandic tourism sector's effects on Iceland's environmental performance. The study revealed several gaps in data collection in terms of the tourism's sector environmental impacts. We attempted to procure necessary data and where not available to use credible assumptions and estimations to arrive at our results. While the study underestimated these impacts, they were, nonetheless, still discernible despite the limited data. Studies like this are necessary for all major economic sectors in Iceland as they can serve to both inform and galvanize action to ameliorate negative impacts and provide an evidence-based guideline to further development.

There are relatively few studies (e.g. Ólafsdóttir et al., 2018; Ólafsdóttir, Kristjánsdóttir, Bjarnadóttir & Bragason, 2009) on the Icelandic tourism sector's management of environmental issues, perhaps most notably a recent quantitative survey of tourism companies in Iceland (Ólafsdóttir et al., 2018) and a few unpublished master's theses (e.g. Bjarnadóttir, 2016; Geirsdóttir, 2017) and activity-based studies (e.g. Schmudde, 2015; focused on horse-based tourism impacts). Many of these studies were being conducted at a similar time as the research for this thesis. The OECD working paper (Sutherland & Stacey, 2017) provided an initial scoping review of the necessary issues to be addressed and recommended policy integration and strategic actions in collaboration with tourism stakeholders. The perspective of companies in the tourism sector seemed, therefore, important in order to delineate some of the factors underlying their response to increasing environmental pressures alongside fast-paced growth. Paper III's practical contribution was to confirm some of the issues raised earlier (Sutherland & Stacey, 2017; Ólafsdóttir et al., 2018) and to provide further information on the drivers and barriers that company managers perceived especially among companies that had implemented some form of environmental management already. It also highlighted some of the main issues managers were grappling with, what shaped their perspective towards environmental management in general, and the interactions between policy-making and corporate environmental management. Although it was largely an explorative study it revealed some of the barriers to implementation of environmental management that even large companies are faced with and can inform policy to address some of these.

Similar to Paper III, Paper IV focused on drivers and barriers to more sustainable use of aquatic resources (blue growth) in the context of Nordic fisheries. Capture fisheries have been considered to have limited growth potential especially where there are strict capture limits set by fisheries

management systems as in the case of Iceland and Norway. What this study showed, however, was that the structural changes associated with the fisheries management system and Individually Transferable Quotas (ITQs) may stimulate intensive growth through more efficient use of inputs (Boonstra, Valman, Bjorkvik, 2018) whereby companies are pushed to invest in innovative value-added activities. The case of these two countries can inform policy in the EU and elsewhere by highlighting the benefits of strict fisheries management regimes and ways to stimulate public and private investment in research and innovation for value-added activities.

Paper V's main practical contribution was to classify all policy solutions that emerged through stakeholder interviews and highlight the commonalities in policy proposals across different contexts. These proposals were then used to derive specific policy recommendations targeted to companies along the entire food value chain, governments and civil society. There was most agreement about the need for strategic policies to guide the transition toward more sustainable food systems – a finding which also emerged in Paper III. This highlights the important role that governments have both in reaching out and engaging with stakeholders and in formulating a strategic direction toward sustainability. The importance of policy integration across sectors and policy silos was also highlighted as an important message to managers and policy-makers alike since “if they look outside the priorities of their sectoral turf and at how they influence - and are influenced by - others, they are likely to find common interests and (unexpected) alliances” (Nilsson et al., 2018, p. 1499).

8.4 Recommendations

The outcomes of this thesis can be distilled into the following four recommendations:

- To improve data collection on environmental issues both at the national level and at the sectoral level. Data collection gaps discovered through this project regarding sectoral impacts were ubiquitous. This hampers the pursuit of sustainable development which requires the assessment of a state of affairs before targets and policies for sustainability transitions can be decided and implemented. Recent positive developments in this regard in connection to tourism sector data are very encouraging and should continue post-Covid.
- To consider the contribution of different sectors to national sustainability performance and to global sustainability goals and apply these results to the management and policy-making fields. The tourism sector has already begun this process with the development of sustainability indicators which provides the necessary current status

information for a sustainability transition. These efforts should continue post-Covid as Iceland rebuilds its tourism sector. Sustainability has only become more urgent since the pandemic and investing in green recovery programs is very important now.

- To formulate sectoral strategies based on overarching sustainability goals explicitly addressing trade-offs and synergies, drivers and barriers, and enabling conditions for successful implementation. Iceland could borrow from other Nordic countries' strategic policy tools which have created sectoral roadmaps for decarbonisation underpinning their national decarbonisation policies.
- To consult and engage a broad range of stakeholders in the formulation of strategies and policies in order to ensure policy cohesion in addressing grand challenges. Sustainability challenges are characterized by cross-sectoral and cross-system interactions with high complexity requiring the input and collaboration of different actors in the governance field.
- To assess risk management based on lessons learned from the current pandemic (e.g. in terms of supply chain disruptions, worker health, power imbalances in the food system) in order to increase resilience to future shocks whether they be climate change induced or another pandemic.

8.5 Limitations and further research

As with all research projects this thesis has some limitations which are discussed in this section alongside suggestions for further research which might also amend some of these limitations.

8.5.1 Theoretical limitations

Although the research conducted for the papers in this thesis was underpinned by the theoretical strands briefly discussed in the introduction, the aim of the papers was primarily to provide insights for policy-making and management. As such, theoretical discourse was relatively less pronounced than the discussion on practical and empirical implications. This is not to say that there are no theoretical insights to be gleaned from the papers. Section 8.3.1 briefly outlines these but future research could advance a more theoretical approach to the research topics.

An interesting finding from the papers in this project were the multiple interactions among different sectors and systems. An avenue for future research could be to apply transition theory concepts to tourism and fisheries in Iceland in an attempt to reveal these interactions in more detail and relate them to

sustainability transitions taking place in Iceland's' energy, mobility and food systems. This extension of the research here would provide further insights into the governance aspects of sustainability in Iceland and the effect of sustainability policies across different sectors and systems. Does policy in the tourism sector hamper or facilitate the pursuit of sustainability in the fisheries sector? or the food system as a whole? The papers here provided some initial clues as to what may be some of the answers to these questions. For example, fisheries companies viewed some of their value-added innovation as benefitting from the increase in tourists (a synergy) whereas, from the food system perspective, tourist consumption could sometimes lead to negative effects in terms of sustainability (increased meat consumption) (a trade-off).

Related to this, another less explored topic was the effect of power and politics on governance of sustainability transitions both at the sectoral level and at the system level. Some insights can be gleaned from the papers though none went into great detail into these topics. Some examples of interesting findings that merit further exploration are the tensions regarding tourism development and how much of it should be publicly versus privately funded; the tensions regarding the locus of control for tourism governance (national versus local); the tensions between energy needs for fleet electrification (in general) versus meeting the needs of heavy industry (the largest energy consumer in Iceland); the tensions regarding equitable social outcomes in the fisheries sector; the tensions of power asymmetries among different actors of the food system and the implications for justice and fairness in sustainability transitions. This list is not exhaustive and much could be explored further in future interdisciplinary research borrowing more from political science than this project has done.

Finally, this research project was mainly focused on sectors, nations and in one paper on a whole region (Paper V). Although, the global effects of policies in Iceland and other European countries are often hinted at or mentioned in passing, the analysis does not go into these in any particular depth. Future research would do well to consider the implication of policy making in rich western nations and the European Union as a whole, on the rest of the world. Sustainability is after all a global pursuit and no nation or region can act in isolation something that SDG 17² has attempted to integrate in the international governance sphere in a more concrete fashion.

² SDG 17: Strengthen the means of implementation and revitalize the global partnership for sustainable development (UN, n.d.).

8.5.2 Empirical limitations

Qualitative research can sometimes be limited by the selection of interviewees and all the best laid plans can be derailed when participants are in short supply. Two of the papers in this project (papers III and IV) were based on a relatively limited amount of interviews (11 and 10, respectively). Although the original pool of interviewees was quite large (e.g. 64 and 33 companies and organizations contacted for each paper), the resulting pool of participants willing to participate was quite low. In most cases, these interviews were in-depth and very detailed, many lasting an hour or more, which ameliorated this limitation somewhat. A further measure to ameliorate this limitation was to physically attend and use online repositories of industry events to gain broader insights of the tourism and fisheries sectors. This was done in a systematic fashion alongside the interview-taking process with field and summary notes taken for each event. Future research could build on the findings here in two ways: a) concentrate research on SME's which were not the topic of research in this project but which, nonetheless, requires examination and, b) create a quantitative survey based on the insights here in order to provide more generalizable results.

The aim of qualitative research is to provide in-depth understanding on the topics of interest and some topics are better served by the qualitative than quantitative approach, though the one does not preclude the other when one adheres to pragmatism. Although many of the findings in the qualitative research conducted for the majority of the papers in this project cannot be generalized, they still provide important and detailed information into high-level decision making processes. Especially regarding studies that focused on Iceland where research is scander, it was clear from the beginning of this project that an exploratory qualitative approach would be necessary. In addition, when researching a contested sphere with many tensions, disagreements and different conceptualizations, as sustainability is, in-depth conversations can help provide a fuller picture of the meanings different individuals imbue sustainability discourses with. The importance of this cannot be overstated. When attempting to transition sectors and systems towards sustainability it is important to know where the different governance actors are “coming from” i.e. what their perspective on sustainability is, in order to cross divides and reach common understandings in the pursuit of common goals.

8.6 Conclusion

This thesis had an interdisciplinary focus and addressed the following distinct but interrelated topics in five publications:

a) Application and appraisal of indicators to measure the sustainability impacts and contribution of a sector to the Sustainable Development Goals (Paper I) and national environmental sustainability (Paper II) using Iceland's tourism sector as a case;

b) Stakeholder perceptions on the drivers and barriers to improved environmental management by a sector - using the case of Iceland's tourism sector (Paper III);

c) Stakeholder perceptions on the drivers and barriers to more sustainable use of aquatic resources using the cases of Iceland and Norway's fisheries sectors (Paper IV) and,

d) Cross-country comparison of stakeholder perspectives to derive commonalities with regards to policy tools for transitioning European food systems to sustainability (Paper V).

Although the publications' research topics were varied, the thesis nonetheless mainly explored sectoral contributions to sustainability in terms of impacts and in terms of management with the explicit aim of informing policy-making and governance for achieving sustainability transitions. The final publication approached policy-making from a systems perspective revealing various cross-cutting food policy issues. The thesis' findings highlighted the importance of accurately assessing the contribution of different sectors to national sustainability performance and to global sustainability goals in order to inform management and policy-making.

Sustainability is an important endeavour that cannot be accomplished save for the coordination and collaboration of different actors in organizations across sectors. Assessment of sectoral impacts is an important starting point, followed by the formulation of a strategic plan on how to achieve sustainability goals. However, just as organizations alone cannot bring about transitions, so sectoral strategies will also have to be coordinated with each other to reach overarching national goals which in turn contribute to global goals. In all this, it is important to keep in mind that although sustainability is often perceived as a balancing act among different competing priorities, the alignment of these often produces numerous co-benefits (synergies) with the ultimate benefit being the safeguarding of our planet's life-support systems.

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