Food and Drink Innovation and Clustering in Scotland's Highlands and Islands: review of opportunities for engagement with the Arctic Region

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About this report

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This report was written by David Watts (based at the Rowett Institute), with help from Sarah Jones (formerly of Scotland's Rural College). Views expressed and any errors are the author's.

Abbreviations

AEC	Arctic Economic Council
AFIC	Arctic Foods Innovation Cluster
AR	Arctic Region (q.v. Figure 1)
BEAC	Barents Euro-Arctic Council
COVID-19	Coronavirus 2019
EU	European Union
GVA	Gross Value Added
HIE	Highlands and Islands Enterprise
LQ	Location quotient (a measure of spatial concentration)
MSME	Micro, small and medium-sized enterprise
NPA	Northern Periphery and Arctic Programme (EU Interreg)
NSR	Northern Sea Route
OECD	Organisation for Economic Cooperation and Development
PDO	Protected Designation of Origin
PGI	Protected Geographical Indication
RESAS	Rural and Environmental Science and Analytical Services (Scottish Government)
SE	Scottish Enterprise
SEFARI	Scottish Environment, Food and Agriculture Research Institutes
SEPA	Scottish Environmental Protection Agency
SFF	Scottish Fishermen's Federation
SIC	Standard Industrial Classification
SME	Small and medium-sized enterprise
TSG	Traditional Speciality Guaranteed
UHI	University of the Highlands and Islands

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Executive Summary

There is growing evidence of efforts to strengthen links between Scotland and its northern neighbours. Of particular interest has been the Arctic Region: states, nations and regions located wholly or partly inside the Arctic Circle or, as with the Faroe Islands (Denmark) and Labrador (Canada), which share significant climatic and cultural commonalities with them. Scotland's abundant natural resources, its strong historical and cultural links with the Arctic, and the socio-economic fragility of its sparsely-populated highlands and islands, with their traditional reliance on the production and processing of food and fibre, provide a strong basis for strengthening links with the Arctic Region.

A significant development was the launch of the Scottish Government's first Arctic Policy Framework in September 2019. This followed increasing engagement with Arctic and near-Arctic regions, primarily through the Arctic Circle, the largest network for international dialogue and cooperation on the region. The Arctic Policy Framework sets out the potential to reinforce Scotland's, and particularly the Highlands and Islands', close connections with northern countries and highlights shared opportunities and challenges in terms of culture, demography, connectivity, economy and sustainability.

This SEFARI Fellowship was set up to identify potential opportunities to engage with food and drink sector partners in the Arctic Region. The immediate impetus derived from a proposal, initiated by the University of Saskatchewan, to develop an Arctic Foods Innovation Cluster (AFIC). Key areas of interest for the Fellowship, which form the objectives for this report, included:

1. The Highlands and Islands as a food producing region (i.e. regional attributes shared with northern countries, e.g. provenance, slow maturing, depth of flavour, more sustainable, pristine environment, traditional methods; the opportunities and challenges facing the Highlands and Islands as a food producing region; and potential synergies with Arctic and near Arctic regions);
2. Cluster models (i.e. identification and comparison of clusters operating at local, regional, national and international levels);
3. Research and Innovation (i.e. Scottish food research strengths and innovation).

The work of the Fellowship was intended to combine analysis of secondary data and consultation with key individuals and organisations. However, given the impact on the food and drink sector of restrictions imposed in response to the COVID-19 pandemic, industry consultation was judged not to be appropriate. As there may be scope for industry consultation in future, this report identifies evidence gaps that such work could address.

The eight states exercising sovereignty within the Arctic Circle – Canada, Denmark, Finland, Iceland, Norway, The Russian Federation[1], Sweden and the United States of America (USA) – are members of the Arctic Council, an inter-governmental forum promoting cooperation and coordination in the Arctic region. Six bodies representing the indigenous peoples of the Arctic – the Aleut International Association, Arctic Athabaskan Council, Gwich'in Council International, Inuit Circumpolar Council, Russian Association of Indigenous Peoples of the North and Saami Council – are permanent participants in the Arctic Council. The UK, along with twelve other states, thirteen inter-governmental and inter-parliamentary organisations, and twelve non-governmental organisations, has observer status. The proposal for an AFIC arose from research done under the auspices of the Arctic Council's Sustainable Development Working Group.

[1] For economy, this report uses Russia(n) and The Russian Federation interchangeably.

The strategies and policies of Arctic Council members tend to focus, though with different emphases, on: international cooperation; economic development; the environment; and the rights and wellbeing of indigenous peoples and other residents of the Arctic region. The Russian Federation and the USA tend to prioritise economic development: both seek to further exploit Arctic mineral reserves and Russia plans to promote a Northern Shipping Route (NSR) through the Arctic Ocean. Norway also focuses on the potential for further mineral extraction, but is more explicit about the need for sustainable development. The latter is close to the views of Iceland and the Faroe Islands (part of the Kingdom of Denmark, along with Greenland), with the important distinction that both emphasise the sustainable exploitation of renewable natural resources; while the Faroese Government also sees opportunities in the development of the NSR. Finland and Sweden, while acknowledging the potential for sustainable economic development in the Arctic, appear to give greater prominence to working within the 'the capacity of nature' and to what the Swedish Government has called 'socially and culturally sustainable development' in collaboration with indigenous people. Canada's policy documents appear to go furthest in this respect, giving greater priority to the views of its indigenous peoples and of the provincial and territorial governments in planning for its Arctic region. However, there may be an element of catch-up here, as expert opinion suggests that Canada lags behind Finland, Norway and Sweden in the empowerment of indigenous peoples.

The proposal to set up an AFIC stems from a report, published in 2019, which identified three problems with Arctic food value chains:

1. General over-reliance on unprocessed food exports;
2. Bottlenecking of distribution points;
3. Limited innovation in primary and secondary product development.

Based on the report's findings, a consortium from seven Arctic Council member states (Sweden was not involved) undertook development work on an AFIC. Its developers envisaged the AFIC as an international hub connecting northern entrepreneurs, southern-based investors, research centres, businesses and bio-technology developers working in food industries that are of relevance to Arctic produce. Radiating out from this will be smaller hubs in participating countries that will focus on: business incubation; networking; consulting services; and research and innovation, particularly in by-product utilisation.

The starting points for understanding possible synergies with Scotland, and in particular the Highlands and Islands, are the Scottish Government's Arctic Policy Framework and the policy mapping work undertaken at Glasgow Caledonian University and the University of the Highlands and Islands (UHI) in 2019. This report also summarises additional policies and reports of relevance to the food and drink sector, before examining in more detail the potential for involvement by food and drink producers in Scotland's Highlands and Islands.

That more detailed examination begins with a discussion of clustering. The 'orthodox' definition of a cluster is a spatial concentration of economic activity in related sectors characterised by high incidences of traded and untraded economic interdependencies. However, researchers advise caution when discussing clustering in relation to primary production, which is often driven by the distribution of natural resources rather than other economic factors. With this caveat in mind, the structure of the food and drink sectors in the Highlands and Islands was examined for evidence of spatial concentrations of activity.

Government statistics show changing spatial concentrations in the food and drink sectors in Scotland's Highlands and Islands between 2009 and 2018. Shetland has concentrations of

employment in ship building, ship repair, sea fishing and fish processing. Relative levels of employment in aquaculture have grown in Orkney and Shetland but declined elsewhere. Overall, there appear to be spatial concentrations of at least two types of food-related employment in the marine sector in all six local authority areas in the Highlands and Islands. The evidence on agriculture is mixed. Concentrations of agricultural employment have changed relatively little, but the degree of farm specialisation may have declined. Even where concentrations persist, such as for dairying in Orkney and Argyll and Bute, this appears to have resulted from declines elsewhere, rather than growth in those areas. The concentration of employment in the distilling and blending of spirits increased between 2009 and 2018 throughout the Highlands and Islands (except Shetland). In all cases this was accompanied by increased employment. There may be an element of clustering here (although perhaps not in Na h-Eileanan Siar (the Western Isles)), with gin production benefitting from economic spillovers from the whisky industry. These findings are broadly consistent with previous research into clustering in Scotland's food and drink industries.

However, in the context of the Highlands and Islands a focus on economic clusters, of the orthodox variety described above, is arguably too limiting. For, even in sectors that show evidence of clustering, notably whisky production and salmon aquaculture, there has been considerable consolidation of ownership. This matters because, although these sectors are important employers, much of the decision-making and higher-paid employment associated with their executive functions is located elsewhere. Interestingly, a recent report makes the case for a 'social enterprise cluster' for food innovation in northern Canada. This chimes with the purpose of Highlands and Islands Enterprise, which has a dual remit as an economic and community development agency for the region.

There is also a case for adopting a broad definition of innovation in the context of food and drink production. Innovation is often associated with new technologies, but can also be applied to branding and food distribution networks. Section six of this report presents a branding case study: engagement with protected names schemes introduced by the European Union (EU) in 1993. Data on scheme registrations show that the Highlands and Islands has, per capita, more awards than any EU member state.

Section seven of this report reflects further on such issues, using findings from a separate survey, conducted by the author, of micro, small and medium-sized food and drink enterprises in Scotland. Responses show that land-based food enterprises in the Highlands and Islands tend to be smaller than those elsewhere in Scotland, reflecting the continuing importance of crofting. They also suggest that there may be higher levels of female entrepreneurship in the Highlands and Islands food and drink sectors than in the Scottish economy generally.

Over half of survey respondents considered it important that their main suppliers were as local to them as reasonably possible, were competitively priced and adhered to high levels of animal welfare; while more than forty per cent considered it important that their main suppliers had high levels of employee welfare and adhered to the principles of fair trade. Respondents from the Highlands and Islands tend to evince a stronger attachment to their local area than those from elsewhere in Scotland. Moreover, there is a statistically significant relationship between the strength of respondents' local attachment and the level of importance they attach to their main supplier being as local to them as reasonably possible. However, food and drink enterprises in the

Highlands and Islands also appear to be more willing than their counterparts elsewhere in Scotland to build significant trading relationships with suppliers located over 100 miles (180 km) away.

More than a quarter of survey respondents from the Highlands and Islands use some form of geographical branding on their produce. This was, surprisingly, slightly lower than the proportion based elsewhere in Scotland that do so. Respondents who use some form of geographical branding were more optimistic about their growth prospects: more than half expected their revenue to rise over the next five years; compared to less than a quarter of those who do not use any geographical branding. The largest perceived barriers to growth, for respondents throughout Scotland, were the availability of capital and time. Almost three-quarters of respondents from the Highlands and Islands use their own profits as a source of finance, compared to just over half who use banks. By contrast, about sixty per cent of respondents from elsewhere in Scotland used both sources. Thus, food and drink entrepreneurs in the Highlands and Islands may be less likely to apply to banks for finance.

Section eight of this report moves towards a gap analysis for the potential engagement of food and drink producers in the Highlands and Islands with their peers in the Arctic region. It presents, courtesy of Interface, a summary of Innovation Vouchers awarded to the food and drink sector. However, further work is needed to produce a detailed picture of innovative activities in the Highlands and Islands food and drink sector. Similarly, the wider conception of clustering advanced in this report requires testing and, if found useful, further development. This section suggests three areas on which such work might focus: fishing; 'alternative' food distribution networks and those based on geographical branding; and social and community enterprises.

An obvious but nonetheless important characteristic shared, to varying degrees, by the Arctic region and Scotland's Highlands and Islands is their peripherality. It significance stems from the fact that socio-economic peripherality is a product of the operation of economic, political and socio-cultural forces which, in general, are controlled or 'steered' by powerful agents based in core metropolitan areas. In other words, places and regions are peripheral not simply because they are remote from the main currents of economic, political and social change but also because they have been and remain subject to them.

This has significant implications for the encouragement of economic and community development through economic clustering, research and innovation. Such approaches seek to use, for the purposes of regional development, the very forces that help to maintain the peripherality of those regions. Moreover, economic and community development policies, which tend to emanate from core regions, can be insensitive to the contexts in which they are applied. This issue has particular salience in Arctic states that exercise sovereignty over the homelands of indigenous peoples. It is also relevant in the Highlands and Islands, homeland of the crofting way of life and the Gàidhealtachd.

This report, therefore, recommends against restricting attention to consideration of 'orthodox' cluster-formation and innovation policies. Widening the focus in the ways it discusses may help to secure wider community benefits. Inhabitants of peripheral areas, such as, for example, Scottish crofters and indigenous peoples living in the Arctic regions of Canada and The Russian Federation, frequently engage in small-scale processing and trading activities which, while they may not represent their main source of income, contribute to their and their communities' sustainability. In this context, it would be worth exploring broadening the policy focus from strictly economic

enterprises to include social and community enterprises. For, if sustainable development of the Arctic region, and of Scotland's Highlands and Islands, is a priority, then the development of their communities, in ways that are acceptable to those communities, should be a priority. A prerequisite for this is knowing what kind of development communities want and how they propose, with appropriate long-term support, to bring it about.

Such development needs to engage with the UN's Sustainable Development Goals. Goal 8 (decent work and economic growth) is a good fit, given that a key aim of a cluster-based approach to food production is to generate economic development. There is also a link to Goal 5 (gender equality), given the focus on female empowerment in the Scottish Government's Arctic Policy Framework. An 'orthodox' cluster-based approach would seem to emphasise Goals 8 and 9 (industry, innovation and infrastructure). However, a broader conception of enterprise suggests the relevance of Goal 17 (partnerships). In addition, Goals 13-15 (climate action, life below water, and life on land) are particularly important for the food and drink sectors, the Highlands and Islands and the Arctic region.

Goals 13-15 can conflict with Goals 8 and 9, but producers are finding innovative ways to balance them, for example, by focusing on Goal 12. A number of fishing bodies see a value in securing and maintaining third-party certification, for instance through the Marine Stewardship Council, to emphasise the environmental sustainability of their catch. There is a particular tension between livestock farming, which is one of the few possible agricultural uses of much of the poorer-quality land in the Highlands and Islands and plays an important role in sustaining crofting communities, and climate action, given that ruminants produce large quantities of methane, a potent greenhouse gas. This, in turn, suggests the importance of focusing on partnerships (Goal 17) to achieve gender equality (Goal 5) and responsible production and consumption (Goal 12) as a means of seeking to balance Goals 8 and 9 with Goals 13-15.

This report provides a basis for open and informed dialogue between policy makers and the communities and enterprises that, while they may have the most to gain from such engagement, will be the ones who will, with policy support, have to build and sustain it. Dialogue could initially focus on four sets of issues. First, it is necessary to build a better understanding of what stakeholders need to do to in order to work more closely with the food and drink sectors in the Arctic region. This could be approached by setting up a 'task and finish' group of policy and business stakeholders to work through the issues raised by this report and by recent development work in the Arctic region, such as on the AFIC. Secondly, the work of such a group could be informed by analysing the experiences of producers that have developed and worked with geographical branding. Food and drink enterprises in the Highlands and Islands have demonstrated a relatively high level of engagement with such branding schemes. Given that policy proposals emanating from the Arctic region, such as the AFIC, appear to favour geographical branding, such knowledge would be invaluable in helping to gauge the potential benefits and limitations of engagement. Thirdly, it will be necessary to understand the amount and types of investment that engagement in food and drink networks in the Arctic region will require and where this could come from. Lastly, consideration will need to be given to the governance arrangements for any engagement with the Arctic region. For example, it is the UK, not Scotland, which has observer status at the Arctic Council. Any engagement with initiatives developed under its auspices, such as the AFIC, may therefore require UK authorisation. It will also be vital to ensure that any such engagement, should it go ahead, empowers communities and enterprises in the Highlands and Islands to engage effectively.

1. Context, aims and objectives

In September 2019, the Scottish Government launched its first Arctic Policy Framework. This followed increasing engagement with Arctic and near-Arctic regions in recent years, primarily through the Arctic Circle, one of the largest networks for international dialogue and cooperation on the future of the region. The Arctic Circle delivers forums across the world and hosts an annual Assembly in Iceland to provide opportunities for knowledge exchange and collaboration, particularly in terms of innovation, science, climate change and sustainable development.

The Scottish Government has had Ministerial attendance at the last three Arctic Circle Assemblies and hosted an Arctic Forum event in Edinburgh in 2017. Scottish Ministers have also been regular contributors to Arctic Frontiers and the Scottish Government has gained access to a number of other bilateral and multilateral platforms. These have reinforced Scotland's, and particularly the Highlands and Islands', close connections with northern countries and highlighted shared opportunities and challenges in terms of culture, demography, connectivity, economy and sustainability.

This SEFARI Fellowship was set up to identify potential opportunities to engage with food and drink sector partners in the Arctic Region (AR). The immediate impetus derived from a proposal, initiated by the University of Saskatchewan, to develop an Arctic Foods Innovation Cluster (AFIC). Key areas of interest for the Fellowship, which form the objectives for this report, were:

1. The Highlands and Islands as a food producing region (i.e. regional attributes shared with northern countries, e.g. provenance, slow maturing, depth of flavour, more sustainable, pristine environment, traditional methods; the opportunities and challenges facing the Highlands and Islands as a food producing region; and potential synergies with Arctic and near Arctic regions);
2. Cluster models (i.e. identification and comparison of clusters operating at local, regional, national and international levels);
3. Research and Innovation (i.e. Scottish food research strengths and innovation).

It was intended that the work of the Fellowship would combine analysis of secondary data and consultation with key individuals and organisations. However, given the impact on the food and drink sector of the restrictions imposed in response to the Coronavirus (COVID-19) pandemic, it was decided that such consultation would not be appropriate. There may be scope to remedy this at a later date and, in anticipation of doing so, this report identifies evidence gaps that such work could address. To compensate for the loss of that wider consultation from the work of the Fellowship, this report includes a preliminary analysis of primary data gathered by the author from a representative survey of micro, small and medium-sized food and drink enterprises (MSMEs) in Scotland.

This report is structured as follows. Section two outlines the AR and, in the context of the food and drink sector, some of the policy priorities of its constituent states, nations and regions. The proposed AFIC is summarised in section three. Section four sketches some potential contrasts and similarities between Scotland and its Highland and Islands with the AR.

Subsequent sections reflect on the key areas of interest, or objectives, for the Fellowship.

Section five discusses the concept of economic clusters and analyses secondary data for evidence of the clustering of food and drink activity in Scotland's Highlands and Islands (key area 2).

Section six examines the distribution of EU protected names schemes and notes their relative concentration in the Highlands and Islands (key area 1).

Section seven uses data from a recent survey conducted by the author to explore the attitudes and behaviour of MSMEs in Scotland, comparing and contrasting (where appropriate) responses from those within and outwith the Highlands and Islands (key areas 1 & 2).

Section eight summarises food and drink innovation activity in the area covered by Highlands and Islands Enterprise, using data kindly supplied by Interface, and exemplifies some of the organisations and work in this arena (key area 3). It also reflects on the relationships between innovation, clustering and regional development (key areas 2 & 3).

Section nine outlines the main findings, considers the main evidence gaps and reflects on how they might be addressed.

2. The Arctic Region

Figure 1 The Arctic Region
Source: Glomsrød *et al.* (2017, 28), adapted from https://www.arcticstat.org/map.

Eight states have territory within the Arctic Circle, which is shown as a dashed line in Figure 1. These are, in order of the size of their Arctic territories: The Russian Federation; Canada; the USA; The Kingdom of Denmark (Greenland and the Faroe Islands); Finland; Norway; Sweden; and Iceland. However, the Arctic Region tends to be defined more broadly, encompassing all land in sub-state regions that extend into the Arctic Circle (e.g. Republic of Sakha (Yakutia) in The Russian Federation and Alaska in the USA) and parts of others that do not (e.g. Faroe Islands (Kingdom of Denmark) and Labrador (Province of Newfoundland and Labrador, Canada).

The definition of the AR adopted here is that of the Arctic Council: it comprises the areas in Figure 1 that are not shaded light grey. This is consistent with the definition used by the Economy of the

North project, which has conducted the most comprehensive economic analysis of the AR. The approximate size and population of the AR territory of each country are given in Table 1. Data for Scotland's Highlands and Islands are included for comparison.

Country	Land in Arctic region (square kilometres)	Population in Arctic region	People per square kilometre in Arctic region
Russian Federation[1]	4,900,000	2,400,000	0.49
Canada[2]	3,496,285	113,604	0.03
USA[3]	1,477,954	731,545	0.49
Greenland[4] (Denmark)	410,500	55,992	0.14
Finland[5]	165,671	662,350	4.00
Norway[6]	164,317	486,975	2.96
Sweden[7]	151,906	521,829	3.44
Iceland[8]	103,000	364,260	3.54
Faroe Islands[9] (Denmark)	1,399	51,999	37.17
Highlands & Islands (Scotland, UK)[10]	40,330	489,330	12.13

Table 1 The approximate size and population of the Arctic regions and of Scotland's Highlands and Islands

Notes and sources

1. Figures from Blakkisrud (2019). The Russian Federation's Arctic Zone includes: the whole of Murmansk, Chukotka Autonomous Okrug, Nenets Autonomous Okrug and Yamal-Nenets Autonomous Okrug; and parts of Karelia, Komi Republic, Sakha Republic, Arkhangelsk, and Krasnoyarsk.
2. Land area and population (2016) of Nunavut, Yukon Territory and North West Territories from Statistics Canada (https://www150.statcan.gc.ca/n1/en/geo?MM=1&geotext='Territories%20%5BRegion%5D&geocode=A00016).
3. Population (2019) and land area (2010) from US Census Bureau (https://www.census.gov/quickfacts/AK).
4. Population (2019) from Statistics Greenland http://bank.stat.gl/pxweb/en/Greenland/Greenland__BE__BE01/BEXSAT1.PX/table/tableViewLayout1/?rxid=d79595f7-ab76-46ed-b911-a9af683c093f; land area (2018, excluding ice sheet) from World Bank (https://databank.worldbank.org/views/reports/reportwidget.aspx?Report_Name=CountryProfile&Id=b450fd57&tbar=y&dd=y&inf=n&zm=n&country=GRL).
5. Population and land area (2020) for Lapland, Kainuu and Oulu regions from Statistics Finland (http://pxnet2.stat.fi/PXWeb/pxweb/en/StatFin/StatFin__vrm__vamuu/statfin_vamuu_pxt_11lj.px/table/tableViewLayout1/); land areas for Lapland and Oulu from East North Finland (http://www.eastnorth.fi/regions/) and for Kainuu from Invest in Kainuu (https://investinkainuu.com/working-with-us/about-kainuu/).
6. Population and land area (2019) for Svalbard, Nordland, and Troms and Finnmark from Statistics Norway (https://www.ssb.no/en/).

7. Population (2019) and land area (2020) for Västerbotten and Norrbotten from Statistics Sweden (http://www.statistikdatabasen.scb.se).
8. Population and land area (2019) from Statistics Island (https://px.hagstofa.is).
9. Population and land area (2019) from the Government of the Faroe Islands (https://www.faroeislands.fo/the-big-picture/facts-and-figures/).
10. Population (2018) and land area (2014) for Argyll & Bute, Highland, Moray, Na h-Eileanan Siar, Orkney Islands and Shetland Islands from the Scottish Government (https://statistics.gov.scot/).

The AR is warming, and is likely to continue to warm, more rapidly than other parts of the world (IPCC 2014, 10). This will probably result in improved accessibility by sea as summer sea ice coverage declines: the IPCC (2014, 12) predicts that the Arctic Ocean may be nearly ice-free in summer by the middle of the century. This will facilitate the exploitation of natural resources which, in turn, could intensify 'enclosure': the reserving of access and use rights to land and maritime resources in the AR to specific parties (e.g. corporations awarded extraction rights) to the detriment of indigenous peoples and others who live in the AR.

It is not surprising, therefore, that AR states have begun to publish Arctic 'strategy' documents in recent years (Bailes and Heininen 2012). These tend to define their governments' approach to the Arctic's protection, utilisation and strategic position. Three emphasises recur (Bailes and Heininen 2012). Some states, such as The Russian Federation and the USA, tend to focus on the economic development of the Arctic's natural resources. Others, such as Sweden and Iceland, emphasise climate change research, mitigation and adaptation. There is also attention to socio-cultural issues. Canada, for example, prioritises the protection of First Nations' languages and traditions.

There are also international bodies devoted in whole or part to the AR. Chief among these is the Arctic Council, an intergovernmental forum that addresses issues faced by Arctic governments and the AR's indigenous peoples. Its core membership comprises states with sovereignty over land and sea in the Arctic Circle: Canada, Denmark, Finland, Iceland, Norway, Russia, Sweden, and the United States. The Arctic Council has funded several working groups and projects on specific topics and these, in some cases, are open to partners from non-member states. The underpinning research for the development of the AFIC was funded by the Arctic Council's Sustainable Development Working Group.

Also important in the present context is the Arctic Economic Council (AEC), which "facilitates Arctic business-to-business activities and responsible economic development". The AEC's five 'overarching themes' are:

1. Fostering strong market connections in the Arctic as a vital part of international value chains;
2. Encouraging public-private partnerships for infrastructure investments;
3. Promoting stable and predictable regulatory frameworks;
4. Facilitating knowledge and data exchange between industry and academia;
5. Embracing traditional indigenous knowledge, stewardship and small business[2].

The AEC is an important source of data and insights concerning the Arctic economy (e.g. Glomsrød et al. 2017; Middleton et al. 2020) which are important in helping to build understanding of the potential opportunities and scope of Scotland's participation in the AR.

[2] https://arcticeconomiccouncil.com/about-us/; accessed 24/5/20.

Collaboration in the AR is also facilitated by Arctic Frontiers, a scientific and political forum held in Tromsø (Norway) every January. Arctic Frontiers established a Strategic Science Committee in 2016 to bring together research in the social sciences, humanities, physical and life sciences that addresses the challenges and requirements of the AR. Scottish Government delegations attended Arctic Frontiers in 2019 and 2020.

The Scottish Government also attended the last three Assemblies of the Arctic Circle. This is probably the largest Arctic policy forum, in terms of geographical scope, bringing together stakeholders from about sixty countries with a view to fostering international dialogue and cooperation on the future of the AR. Other networks tend to have more limited scope. The Barents Euro-Arctic Council (BEAC), for instance, brings together regional governments in 13 member states and contains representatives of the indigenous peoples in the northernmost parts of Finland, Norway, Sweden and North-West Russia. The BEAC acknowledges of the importance of local knowledge and seeks to identify the most urgent common priorities and the capacity to carry out cross-border projects and cooperate on implementation of common programmes[3].

To provide a sense of the priorities of such bodies, Appendix 1 lists a selection of recent reports on AR governance. Similarly, Appendix 2 lists selected food and drink networks and projects with links to the AR. To these must be added the growing emphasis on food security and food sovereignty emerging from social scientific research with those who live in the AR[4]. The following sub-sections describe some of the priorities adopted in the AR which may provide opportunities for interchange and collaboration with Scotland's Highlands and Islands.

2.1 The Russian Federation

The Federal Government changed the definition of Arctic Russia in 2014, though it retained existing administrative borders. There are currently nine federal zones fully or partly included in the Arctic Zone, including the islands under Russian jurisdiction in the Arctic Ocean (Blakkisrud 2019); though Russian media has reported on a proposal to merge the Arkhangelsk Region and the Nenets Autonomous Area into a new region[5]. Its Arctic Zone covers almost 29 per cent of the territory of the Russian Federation and houses almost 45 per cent of the entire population of the AR. Arctic Russia is also home to the AR's most populous city, Murmansk (population ca 300,000), known historically as the Arctic Hub. Russia's Arctic Coastline stretches 24,140km, accounting for 53 per cent of the Arctic Ocean coastline[6].

The Russian Federation "has undergone a fundamental and far-reaching re-centralization of politics" (Blakkisrud 2019, 193). Due to the importance of Arctic mineral resources to the Russian economy, a State Commission for Arctic Development was established by decree in 2015, chaired by the Deputy Prime Minister (Blakkisrud 2019, 197), on which the Federal Government is well-represented and in which it takes a keen interest (ibid. 199). The Commission is responsible for coordinating the work of all bodies engaged with the Arctic, including the National Security Council and the ministries of Natural Resources, Energy, Economic Development, and Transport. According to the 2015 decree, the Commission's mandate ranges from adopting measures to

[3] https://www.barentsinfo.fi/beac/docs/Barents_Regional_Council_Vasterbotten_Chairmanship_Program_2019-2021.pdf; accessed 5/5/20.
[4] See, for example: Delormier et a. 2017; Delormier et al. 2018; Dudarev et al. 2013; Egeland 2011; Elliott et al. 2012; Loring and Gerlach 2009; Nilsson et al. 2013; Nilsson et al. 2015; Power 2008; Ready 2016; Shukla et al. 2019.
[5] https://arctic.ru/news/20200520/944268.html; accessed 24/5/20.
[6] https://www.thearcticinstitute.org/countries/russia/

improve the living standard of the Arctic's indigenous population, to enabling "a favourable operational regime" for the armed forces and facilitating bilateral and multilateral cooperation with the other Arctic states.

Blakkisrud (2019) indicates that the State Commission for Arctic Development's main priorities appear to concern the development of the "maritime cluster" – focusing on the exploitation of gas fields in the Yamal Peninsula, the development of port infrastructure (e.g. at Sabetta) and issues related to the development of the Northern Sea Route (NSR) as a national and international transport corridor. This emphasis on resource exploitation is not surprising, given its importance to the Russian economy. Blakkisrud (2019) estimates that more than 80 per cent of Russian gas extraction takes place in the Arctic Zone, along with 90 per cent of its nickel and cobalt mining, 60 per cent of copper and 96 per cent of platinum extraction. However, the warming that may facilitate such developments is also threatening existing infrastructure and the Arctic environment. For example, the leak of more than 20,000 tonnes of diesel from a storage tank near Norilsk (in Krasnoyarsk) in June 2020 is thought to have been caused by melting permafrost weakening the tank's supports[7].

An additional priority for the State Commission for Arctic Development is the social domain. For, while there are areas of growth and prosperity, Russia's Arctic zone is characterised by out-migration and below-average living standards.

These priorities are reflected in the *Executive Order on Basic Principles of Russian Federation State Policy in the Arctic to 2035* signed by the President in March 2020[8]. The principles are to:

- Ensure Russia's sovereignty and territorial integrity;
- Preserve the Arctic as a territory of peace and stable mutually beneficial partnership;
- Guarantee high living standards and prosperity for the population of the Russian Arctic;
- Develop the Russian Arctic as a strategic resource base and use it rationally to speed up national economic growth;
- Develop the Northern Sea Route as a globally competitive national transport corridor;
- Protect the Arctic environment, the primordial homeland and the traditional way of life of the indigenous minorities in the Russian Arctic[9].

For Klimenko (2020), the basic principles of Russian Arctic policy to 2035 share many similarities with those of 2008-20. However, the new basic principles make explicit reference to political and social goals – ensuring Russia's territorial integrity, providing high living standards for its Arctic population and protecting its indigenous peoples – as well as to the economic and environmental matters that dominated those in force from 2008 to 2020. Some of these policy principles may take many years to realise. The NSR (linking the Atlantic and Pacific oceans via the Arctic Ocean), for example, while it is predicted to yield significant time and cost savings for shipping between east Asia and Europe, is considered unlikely to be a practical proposition before the 2030s (Tseng and Pilcher 2017). Action on others, such as the Arctic economy and the way of life of indigenous peoples, may be more amenable to short-term action. Given the Russian Federation's Arctic

[7] See, for example, reports by the BBC (https://www.bbc.co.uk/news/world-europe-52977740) and CNN (https://edition.cnn.com/2020/06/03/europe/russia-putin-oil-spill-norilsk-intl/index.html); accessed 2/7/20.
[8] https://arctic.ru/infrastructure/20200306/931543.html; accessed 24/5/20.
[9] https://arctic.ru/infrastructure/20200306/931543.html; accessed 24/5/20. See also Klimenko (2020).

'footprint', and the fact that will chair the Arctic Council from 2021 to 2023[10], these principles may have a significant impact on the direction of Arctic policy.

2.2 Canada

The Canadian Arctic comprises the territories of Nunavut, Yukon and Northwest Territories, plus Nunavik (part of Québec province) and Labrador (Newfoundland and Labrador province). Their combined population is approximately 150,000, more than half of whom are indigenous[11]. Each of the three territories has a legislative assembly and executive council, to which a range of powers has been devolved from the Parliament of Canada[12]. Nunavik and Labrador are located within provinces, which exercise their own constitutional powers. However, Nunatsiavut (in north-west Labrador) and Nunavik are Inuit regions and, as such, exercise a degree of autonomy. For example, Nunavik's Makivik Corporation has a mandate to promote socio-economic development and improved housing conditions, and to protect Inuit language and culture and the natural environment[13]. In addition, the Government of Québec has developed Plan Nord, to promote mining, energy, tourism, and social and cultural development in the north of the province.

In September 2019, the Government of Canada published the Arctic and Northern Policy Framework, setting the direction of its priorities, activities and investments in the Arctic to 2030 and beyond[14]. The Framework was co-developed with territorial and provincial governments, First Nations, Inuit, and Métis People. It replaces the 2009 Northern Strategy and 2010 Statement on Arctic Foreign Policy[15]. The framework builds on eight overarching and interconnected goals, including: sustainable, diversified and inclusive local and regional economies; strengthened infrastructure; that Canadian Arctic and northern Indigenous peoples are resilient and healthy; and mutually-respectful relationships between Indigenous and non-Indigenous peoples[16]. Canada chaired the Arctic Council 1996-98 and 2013-15.

2.3 The USA

Alaska is the largest US state by area and the least densely populated, with more than half of its residents living in the cities of Anchorage and Fairbanks. With one of the highest fertility rates in the AR, Alaska has one of the region's youngest and fastest-growing populations. Alaska has been subject to a number of high profile media stories over recent decades, particularly concerning tensions between natural resource management and environmental protection. In addition to state and federal laws, Alaska contains boroughs and regions with sub-state government powers.

In 2015, Alaska's Governor signed an Arctic Policy Bill into law, prioritizing economic and resource development. The policy was created by the Alaska Arctic Policy Commission, which is committed to "producing a policy for Alaska's Arctic that reflects the values of Alaskans, provides a suite of options to capitalize on the opportunities and safeguard against risk"[17]. In 2016, the Arctic Executive Steering Committee released a progress report on the implementation of the

[10] https://arctic-council.org/en/about/; accessed 24/5/20.
[11] https://arctic-council.org/en/about/states/canada/; accessed 24/5/20.
[12] https://www.canada.ca/en/intergovernmental-affairs/services/provinces-territories.html; accessed 24/5/20.
[13] https://www.makivik.org/corporate/makivik-mandate/; accessed 24/4/20.
[14] https://www.thearcticinstitute.org/countries/canada/
[15] https://www.rcaanc-cirnac.gc.ca/eng/1560523306861/1560523330587
[16] https://www.rcaanc-cirnac.gc.ca/eng/1567697304035/1567697319793
[17] https://www.thearcticinstitute.org/countries/united-states/.

strategy[18] and an appendix, the 2016 Implementation Framework for the National Strategy for the Arctic Region. The newest iteration of the Strategy incorporates new initiatives, emphasises community sustainability and resilience, and heightens the importance of Arctic science and research. The US Administration invested in Alaska – through development funding, policy action, and scientific endeavours – during the USA's tenure as chair of the Arctic Council 2015-17. However, interest seems to have languished subsequently: the USA currently has no Arctic Ambassador and no plans to appointment one.

2.4 The Kingdom of Denmark (Denmark, Greenland and the Faroe Islands)

Greenland and the Faroe Islands are self-governing nations of the Kingdom of Denmark. All have been active participants in the Arctic Council since the late 1990s and participated in its predecessor, the Arctic Environmental Protection Strategy. In 2008, Denmark was one of the first countries to implement an Arctic strategy, and this was updated in 2011 (Bailes and Jákupsstovu 2013). The 2011-20 Arctic strategy is an equal partnership between the Kingdom's three countries (Denmark, Greenland and the Faroe Islands 2011, 10). Its strategic priorities are: a peaceful, secure and safe Arctic; with self-sustaining growth and development; with respect for the Arctic's fragile climate, environment and nature; in close cooperation with our international partners (*ibid.* 11).

In addition, the Government of the Faroe Islands commissioned a dedicated national assessment of its role in the AR (Prime Minister's Office, 2013). This appears to have been prompted, at least in part, by the Faroe Islands' location in relation to both the NSR and the North-Eastern Sea Route, which the Faroese Government expects to become increasingly significant as maritime trade expands[19]. The assessment describes the existing role of the Faroe Islands as an active participant in international cooperation in the Arctic and across the North Atlantic, and sets out how this role can be strengthened. It highlights the fact that the Faroe Islands have the knowledge and experience necessary for the further development of fisheries, shipping and research, as well as the conservation and management of natural resources. The assessment includes a set of recommendations for each of these topics.

The Faroese Government's assessment also contradicts the view of some observers that Arctic governance is inadequate and should be covered by an Antarctic-type general treaty. "The people in the Arctic do not agree that the Arctic needs a similar international treaty. There is a fundamental difference between the Arctic and Antarctica…. The Arctic countries are perfectly capable of managing development and cooperation in the Arctic area in a sensible and peaceful manner and in accordance with relevant international treaties and principles" (Prime Minister's Office 2013, 9).

2.5 Finland

Finland's largest Arctic region is Lapland, which contains the Sámi Homeland. This comprises the municipalities of Utsjoki, Inari and Enontekiö, along with parts of Sodankylä and Savukoski[20]. The indigenous Sámi people exercise self-government in the Homeland in the spheres of language and culture through the Sámi Parliament; though it is estimated that about sixty per cent of Finland's Sámi population of about 10,000 live outside the Sámi Homeland[21].

[18] https://www.hsdl.org/?view&did=794023
[19] https://www.government.fo/en/foreign-relations/the-arctic/. Accessed 20/4/20.
[20] https://www.samediggi.fi/task/?lang=en; accessed 25/5/20.
[21] https://www.samediggi.fi/sami-info/?lang=en; accessed 25/5/20.

Finland's first Arctic strategy was published in 2010. It was updated in 2013, with the revised strategy being more business-orientated. This defined a number of objectives for Finland's Arctic policy and explored ways of promoting them. The strategy addressed local residents, education, research, the economy, infrastructure, the environment, stability and international cooperation in the Arctic[22]. While the main elements of the 2013 Arctic Strategy, as updated in 2016, remain valid, the Finnish Government recently announced that it will seek to strengthen Arctic cooperation by strengthening EU Arctic policy, and by promoting a stronger Arctic Council and the work of the AEC[23].

This is embodied in objective six of the strategic themes announced in the Finnish Government's programme. This commits the Finnish Government to strengthen Arctic cooperation. However, and in keeping with an outlook that appears to retain a leaning towards the 'social democratic' welfare state model[24], it does so on a basis that might set it at variance with states whose Arctic strategies emphasise resource-driven economic development. For the Finnish Government's programme states that:

> "All activity in the Arctic region must be tied in with the capacity of nature to withstand it, the need to protect the climate, the importance of sustainable development principles, and respect for the rights of indigenous peoples"[25].

2.6 Norway

The Norwegian government distinguishes between the extreme Arctic, which includes the North Pole and other uninhabited areas, and the populated nordområdene (high north). Almost 487,000 people live in Norway's nordområdene: about 484,000 in the mainland counties of Nordland and the recently-merged Troms and Finnmark; and about 2,700 on the Svalbard archipelago.

A major commitment from the Norwegian Government to the Arctic came in 2011, with the publication of *The High North: Visions and Strategies* (Norwegian Ministry of Foreign Affairs, 2011). This presents Norway's long-term plan to address the challenges and capitalise on opportunities emerging in the Arctic. The foci of this strategy included: deepening cooperation with Russia; knowledge and continued research on climate change; integrated marine management; potential new oil and gas discoveries; acceptance of the Law of the Sea; and adding value.

The Norwegian Government published a new Arctic Strategy in April 2017, which incorporated its foreign and domestic policies on the region. This reaffirmed its 2011commitments to:

- Peace, stability and predictability;
- Integrated, ecosystem-based management;
- International cooperation and the international legal order;
- A stronger basis for employment, value creation and welfare (Norwegian Ministries 2017, 15).

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[22] https://vnk.fi/documents/10616/334509/Arktinen+strategia+2013+en.pdf/6b6fb723-40ec-4c17-b286-5b5910fbecf4

[23] https://vnk.fi/en/article/-/asset_publisher/suomi-on-aktiivinen-ja-vastuullinen-toimija-arktisella-alueella; accessed 25/5/20.

[24] The Finnish Government's introduction to its new Programme states: "In a Nordic welfare state, the economy is managed for the people, not the other way round" (https://valtioneuvosto.fi/en/rinne/government-programme/introduction; accessed 25/5/20). For more detail on the 'social democratic' welfare state model outlined see Esping-Andersen (1990).

[25] https://valtioneuvosto.fi/en/rinne/government-programme/globally-influential-finland; accessed 25/5/20.

About 40,000 Sámi people live in Norway[26]. The 2017 Arctic Strategy notes that the "Sámi and the Kven people have an important cultural and linguistic heritage that is crucial to preserve" (Norwegian Ministries 2017, 10) and that the Sámediggi (Sámi Parliament) was consulted on the Strategy's development (ibid. 11). However, the limitations of Sámi autonomy are apparent:

> "The Government attaches importance to safeguarding Sami [*sic*] interests. As an indigenous people, the Sami have a right to be consulted in matters that could affect them directly. These consultations are to take place in good faith with the aim of reaching agreement on any proposed measures" (Norwegian Ministries 2017, 23).

The Strategy also states that the "Government will seek to limit any negative impacts on the environment or on Sami interests when planning and developing infrastructure" (ibid. 33).

2.7 Sweden

Although sparsely populated, 15 per cent of Sweden's land area is within the Arctic Circle. Kiruna, its northernmost town, had 23,116 inhabitants in 2017[27] and is the location of Sweden's Sámediggi (Sámi Parliament). Sweden is member of the Arctic Council and chaired it 2011-13.

Sweden was the last of the eight Arctic states to develop an Arctic strategy (Arctic Secretariat 2011, 8). The current Arctic Strategy, updated in 2015, focuses on multilateral cooperation, primarily through bodies such as the Arctic Council and BEAC, and outlines Swedish priorities in: climate and environment; economic development (including education); and the 'human dimension' (Arctic Secretariat 2011, 3).

Under the latter heading, Sweden's Arctic Strategy makes one of the more explicit statements concerning the tensions inherent to development in the AR. It observes that when, in addition to the consequences of climate change,

> "socioeconomic development, in terms of intensified forestry activities, expanded infrastructure and more tourism [are added] to the equation, the risk of conflicts of interest between reindeer herding and other land use becomes even greater. The Arctic peoples' ability to preserve their culture, identity and way of life will come under pressure. This is why Sweden is taking a clear stance in favour of socially and culturally sustainable development for Arctic indigenous peoples with technological development to ensure ethically and biologically sustainable resource use" (Arctic Secretariat 2011, 45).

Thus, the Swedish Government appears to regard the protection of the Arctic environment and the way of life of its indigenous people as closely linked. As a 2016 memorandum from the Ministry of the Environment and Energy put it: "The Arctic needs sustainable management that safeguards both the region's important ecosystem services and the traditional trades of indigenous peoples"[28]. The memorandum goes on to note that the Swedish Government intends to support efforts to ensure that all projects and activities undertaken as part of the work of the Arctic Council incorporate ecosystem-based management.

[26] https://www.lifeinnorway.net/sami-people/; accessed 25/5/20.
[27] https://www.thearcticinstitute.org/countries/sweden/
[28] https://www.government.se/4901d4/globalassets/regeringen/dokument/miljodepartementet/pdf/160125-environmental-policy-for-the-arctic.pdf, p. 4; accessed 25/5/20.

2.8 Iceland

Although only a tiny proportion of the Icelandic population lives in the Arctic, the mainland lying just outside it, the Government of Iceland considers that "Arctic issues touch nearly every aspect of Icelandic society and are a key foreign policy priority"[29]. Indeed, former President Ólafur Ragnar Grímsson was a prime mover behind the creation of the Arctic Circle, which holds its annual assembly in Reykjavík, where its secretariat is based[30].

In 2011, the Icelandic Parliament published a "Parliamentary Resolution on Iceland's Arctic Policy", which contained twelve priority areas[31]. These include: Iceland's position in the AR; the importance of the Arctic Council and the United Nations Convention on the Law of the Sea; climate change; sustainable use of natural resources; and security and commercial interests. They also emphasise collaboration with the Faroe Islands and Greenland, as well as the rights of indigenous peoples. These priorities continue to inform Icelandic Arctic policy and, as the Government's website makes clear, it regards the Arctic Council as the most important multinational forum for Arctic issues[32].

Iceland chairs the Arctic Council until 2021. The theme of its chairmanship "reflects Iceland's commitment to the principle of sustainable development and refers to the necessity of close cooperation between the states and peoples of the region and beyond" (Ministry for Foreign Affairs 2019, 2). Its four priority areas are: the Arctic marine environment; climate and green energy; people and communities of the Arctic; and a stronger Arctic Council (Ministry for Foreign Affairs 2019, 3).

2.9 The European Union

Although not a state, the European Union (EU) has influence over the governance of parts of the AR. This takes three main forms[33]:

- Internal - referring to the Arctic territory that is part of Member States, such as Finland and Sweden, and that is therefore subject to EU policy, e.g. on agriculture.
- Close Association – referring to EU influence on countries that belong to the European Economic Area, such as Iceland and Norway (excluding Svalbard).
- External – referring to participation in treaty regimes and international organisations that have regulatory functions in the AR: including economic, scientific and diplomatic relations with Canada, Russia and the USA.

The EU also provides funding, through Interreg, for cooperation on economic and community development across regions that share similar challenges and opportunities. Interreg's Northern Periphery and Arctic Programme (NPA) 2014-20 covers the Faroe Islands, Greenland, Iceland, Northern Ireland and Svalbard, along with peripheral and northern regions in Finland, the Republic of Ireland, Norway, Scotland and Sweden. The Programme has a budget of approximately 55 million euros, provided by the European Regional Development Fund and contributions from non-EU countries, with funded projects expected to provide 50 per cent match

[29] https://www.government.is/topics/foreign-affairs/arctic-region/; accessed 25/5/20.
[30] http://www.arcticcircle.org/; accessed 25/5/20.
[31] https://www.government.is/topics/foreign-affairs/arctic-region/; accessed 25/5/20.
[32] https://www.government.is/topics/foreign-affairs/arctic-region/; accessed 25/5/20.
[33] https://www.thearcticinstitute.org/wp-content/uploads/2020/03/TAI-Infographic-EU-Arctic.pdf

funding. To date, the 2014-20 Northern Periphery and Arctic Programme has funded 118 projects[34]. Some of these are described in section 8.

While the EU's longer-term relationships with Scotland and the UK remain uncertain, it remains likely that the UK (and perhaps Scotland) and the EU will continue to be involved in negotiations with AR states over fisheries policy. This is likely to assume increasing importance for pelagic and demersal fisheries, as key economic stocks, such as cod and haddock, become less abundant as sea temperatures rise[35]. For example, in 2009 Iceland and the Faroe Islands unilaterally increased their annual mackerel quotas by 6,500 and 340 per cent respectively, arguing that warmer waters further south had caused mackerel to move north in greater numbers[36].

2.10 The Arctic Region and COVID-19

The writing of this report coincided with the COVID-19 pandemic. As countries went into 'lockdown', disruptions in domestic food supply chains, alongside other shocks affecting food production and affordability, were forecast to increase the risk of food insecurity for many (World Bank 2020). Summaries of responses to this pandemic in the AR have been published online[37]. This section summarises some key aspects of responses from Arctic countries in relation to food supply chains.

The small and remote communities of the AR often have health planning efforts hampered by distance and limited resources, compared to larger cities. Moreover, the lack of testing facilities and the difficulties associated with handling infected people are exacerbated in remote communities (Arctic Council 2020).

Interruptions in food supply chains as a result of 'lockdown' are primarily related to logistical challenges associated with border closures and quarantine (Southey 2020). Food Security in the AR depends largely on imports and the region is therefore particularly vulnerable to supply-chain disruption (Middleton 2020). However, there is evidence across the Arctic circle of fishery activity continuing (e.g. Nunavut fisheries[38]).

The full economic consequences of the COVID-19 pandemic are yet to be understood, but changes and implications for trade are significant. For example, China is one of the world's largest consumers of seafood, and the virus has reduced the demand for seafood produce, including those from Arctic fisheries (Polar Research and Policy Initiative 2020). Declining exports of fish and shellfish are also reported to be having a serious impact on the Scottish and UK fishing sectors[39]. However, there is anecdotal evidence, for example from Norway, of increased domestic demand[40].

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[34] http://www.interreg-npa.eu/projects/funded-projects/; accessed 4/9/20.
[35] https://www.eea.europa.eu/data-and-maps/indicators/northward-movement-of-marine-species-2/assessment; accessed 25/5/20.
[36] https://www.fni.no/getfile.php/139434-1553590846/Filer/Publikasjoner/A%C3%98-The%20Geographer-2018.pdf
[37] https://thebarentsobserver.com/en/node/6581; http://polarconnection.org/coronavirus-and-the-polar-regions/.
[38] https://www.arctictoday.com/nunavut-fisheries-to-forge-ahead-despite-COVID-19/.
[39] https://www.theguardian.com/environment/2020/apr/10/scottish-fishermen-turn-to-food-banks-as-COVID-19-devastates-industry; accessed 25/5/20.
[40] Personal communication with a member of the Fellowship's advisory board.

It has been reported that internet usage has soared during the COVID-19 'lockdown'[41]. However, in many parts of the AR internet connectivity is suboptimal and digital solutions can't always be easily implemented (UArctic 2020). With food businesses expanding their online offer (see, for example, *Sip, Scran, Support* in Scotland[42]), it is important that governments and policy makers take into consideration the limitations of digital infrastructure in smaller and remote communities. Offering succinct and detailed guidance for producers is also extremely important, whilst also ensuring it is accessible to those who need it. An example of this is the Government of Canada's COVID-19 dedicated pages for agriculture and agri-food industry[43].

One of the important factors that the COVID-19 pandemic has highlighted is the lack of comparable data and understanding of food security across the AR. COVID-19 has offered an opportunity to open discussions on how Arctic countries can prepare for the next pandemic and start taking the food security in the region more seriously (Middleton 2020). Sindico and Ellsmoor's (2020) survey of island-dwellers' responses to the pandemic also emphasised the importance of ensuring food security in the event of a second wave of infection, noting that some islands are reported to have enough food to last only two or three months in the event of the cessation of normal trade. Of particular concern was continuity of ferry transport, were crews to fall ill (Sindico and Ellsmoor 2020, 2). Such concerns are likely to be shared in the AR, especially given that many of its non-island areas are poorly accessible by land.

[41] See, for example, https://www.bbc.co.uk/news/technology-53149268; accessed 2/7/20.
[42] https://www.sipscransupport.co.uk/; accessed 2/7/20.
[43] http://www.agr.gc.ca/eng/COVID-19-information-for-the-agriculture-and-agri-food-industry/?id=1584732749543.

3 The Arctic Foods Innovation Cluster

The Arctic Region covers almost eight per cent of the world's surface but houses 0.1 per cent of its population (Glomsrød et al. 2017, 28). It contains some sizable cities (e.g. Murmansk, Anchorage) but the general pattern is of small, remote settlements (Schoolmeester et al. 2019, 9). Geographical remoteness is often accompanied by economic peripherality. One recent study summarises the circumstances of such areas as follows:

> "Their relatively small, dispersed populations mean that they: lack easy and cheap access to markets; suffer from 'thin institutional structures, narrow business networks, limited local embeddedness' (Jauhiainen and Moilanen, 2012: 119); and have comparatively low levels of investment in research and development (Ramsey et al. 2013, 341)" (Watts et al. 2017, 256).

To help overcome the economic disadvantages associated with peripherality, "an approach emphasising local responsibility has gained currency, with a strong focus on the regenerative powers of capital" (Conradson and Pawson 2009, 77). This approach has frequently been manifested in policies and research that encourage and support the commercialisation of material and cultural resources to create branded commodities unique to an area, the aim being to sell them in distant markets at a premium compared with generic, mass-produced products. The combination of a price premium and a greater share of the added value being retained in the area of production will, it is argued, generate endogenous economic development.

Such thinking appears to have informed the proposal to create an Arctic Foods Innovation Cluster (AFIC). As Natcher et al. (2019a, 3) put it:

> "we set out to identify potential pathways for Arctic food production and distribution. The aim was to identify conditions for increased production, both to improve food security in northern regions, and to increase the added value of food originating in the Arctic both for local and southern markets. The aim was therefore twofold: 1) to enhance commercial food production 'in the North and for the North' and 2) to develop North to South food production linkages".

That report identified three particular problems with Arctic food value chains:

1. General over-reliance on unprocessed food exports;
2. Bottlenecking of distribution points;
3. Limited innovation in primary and secondary product development.

Based on the report's findings, a consortium containing members from seven Arctic states (Sweden was not involved) sought to create an AFIC by bringing "together relevant people in the Arctic foods value chain for a cluster-based approach to food production and regional economic development" (Natcher et al. 2019b, 4). The objective of the AFIC is to create "added value for Arctic Communities by connecting northern entrepreneurs, southern-based investors, research centers, businesses and bio-technology developers that have knowledge and interest in the Arctic food industries" (ibid.).

The intention is that, under the umbrella of the AFIC, participating countries will develop hubs, focusing on:

- Business incubation
- Networking

- Consulting services
- Research in areas of economics, logistics, biotech development;
- By-product utilization (Natcher et al. 2019b, 5).

The AFIC will facilitate communication and the coordination of activities between national hubs and other interested parties, and provide a framework for capacity-building.

A logical starting point for efforts to create an economic cluster is to examine what economic activities are already present in the area where the cluster is intended to be developed. Natcher et al. (2019a) did this for the AR, focusing on Canada, Norway and Iceland. The main food-related activities identified were: the harvesting and farming of aquatic fauna, such as fish, crustaceans and seals; livestock farming and hunting; dairy production (e.g. skyr in Iceland); and horticultural production.

4 Scotland and the Arctic Region

It has been argued that Scotland is "strategically positioned…to serve as a link between the Arctic region and the wider world" (Scottish Government 2019, 9). Shetland is about 320 km from the Faroe Islands and is well placed to service the Northern and North-Eastern Sea Routes. Shetland's relative proximity to Norway was exploited during World War Two, when the 'Shetland Bus' helped to supply the Norwegian resistance and evacuate refugees[44]. Scotland's Highlands and Islands are also characterised, though to a much lesser extent than the AR (excepting the Faroe Islands), by remoteness: they account for more than half of Scotland's land area but less than nine per cent of its population[45].

There are additional historical and cultural links between Scotland and Arctic states. From about the late ninth century, Norwegians began to settle in Scotland's north and islands, giving rise to the Norse Earldom of Orkney, which exercised power over Shetland, Caithness and Sutherland (Mackie 1978, 28-9). Although Orkney and Shetland passed to the Scottish Crown in 1472 (Mackie 1978, 100), archaeological, place-name and even genetic evidence demonstrate the extent of Norse influence on the northern isles (and to a lesser extent the northern mainland), and this is a celebrated part of their cultural heritage[46]. There are also strong links with Canada and the USA, both of which were favoured destinations of Scottish emigrants in the nineteenth and early-twentieth centuries; though as Devine (2006, ch. 20) points out, emigration was from across Scotland, not just the Highlands and Islands.

It is also argued that there are similarities between Scotland's Highlands and Islands and parts of the AR. For example, MacKinnon (2008) draws parallels between the cultures and experiences, at the hands of states that subjected them to 'internal colonisation', of crofters in north and west Scotland[47] and the Sámi people of Norway, Sweden, Finland and north-west Russia. While detailed comparisons are beyond the scope of this report, several commonalities can be mentioned. For example, crofters and indigenous peoples of the AR: are involved in forms of subsistence agriculture and small-scale commodity production (as opposed to large-scale industry); tend to live in areas that have long been rendered economically peripheral and subject to out-migration, especially of young people; have experienced cultural and linguistic marginalisation by central government agencies; have been the recipients of central government funding and policies aimed at stabilising their populations and boosting their economies; and have started to demand and, in some cases have secured, increasing levels of autonomy. Although such matters might seem, at first glance, to fall outside the ambit of an AFIC, it will be noted later that they might instead form a possible means of building mutual understanding and strategies for social and economic development.

Jafry et al.'s (2019) recent mapping report found economic links between Scotland and the AR in energy (oil and gas, decommissioning and renewables), fishing and tourism. However, the

[44] http://www.shetlandbus.com/; accessed 26/5/20.
[45] https://www.hie.co.uk/research-and-reports/our-region-in-detail/. Accessed 20/4/20.
[46] See, e.g.: https://www.orkney.com/things/history/viking-heritage; https://www.shetland.org/about/culture; https://www.uphellyaa.org/; accessed 25/5/20.
[47] Crofts, which are usually defined as small agricultural units covered by specific legislation (the Crofting Acts), are located primarily in the former counties of Argyll (now part of Argyll & Bute), Caithness, Inverness, Ross & Cromarty, Sutherland (all now part of Highland), Orkney and Shetland (https://www.crofting.org/faqs/67; accessed 25/5/20).

economic structures of the AR and Scotland are distinct (Table 2). Extractive industries accounted for 29.3 per cent of value added in the AR in 2012, most of which was generated by mineral extraction. This is much larger than is typically encountered in 'post-industrial' economies such as Scotland's. There, as Table 2 shows, extractive industries generated just 2.9% of Gross Value Added (GVA) in 2016. However, the figures in column 3 of Table 2 are for Scotland as a whole. The economy of the Highlands and Islands is likely to derive a greater proportion of its added value from extractive industries, and less from manufacturing, than shown there. Indeed, some of the economic challenges faced by the AR and Scotland's Highlands and Islands are similar. As noted above, these include low population densities and remoteness from large urban centres.

Economic sector	Arctic Region percentages of value added in 2012	Scotland percentages of gross value added in 2016
Agriculture, forestry and fishing	7.9	1.4
Mining and quarrying	21.4	1.5
Manufacturing	5.9	10.7
Utilities	3.7	4.8
Construction	6.8	5.9
Services (incl. transport)	63.1	69.3
Public administration and defence	11.4	6.3

Table 2 Percentage summaries of value added in the Arctic Region and Scotland
Sources: Glomsrød et al. (2017); O'Connor (2018, 24).

The Scottish Government is keen to forge closer links with the AR. In September 2019 it published an Arctic Policy Framework (Scottish Government 2019). Significantly, the Scottish Government sees this relationship as being about 'human connections', rather than solely economic linkages. This is reflected in the arenas where the Scottish Government (2019, 42-3) intends to take action: education, research and innovation; cultural ties; rural connections; climate change, environment and clean energy; and sustainable economic development. Food and drink feature in the framework but the emphasis is restricted primarily to sea fisheries and aquaculture (Scottish Government 2019, 39). There are few 'action points' related specifically to food and drink, though the 'prospectus' (p. 43) contains several priority areas for collaboration that are of relevance here:

- The promotion and protection of indigenous and minority languages;
- Community regeneration in rural areas and islands, with a particular focus on female empowerment and participative place-making;
- The empowerment of island communities;
- Wellbeing economy and sustainable economic development;
- Marine planning, so as to promote the protection of species and habitats.

Although the Arctic Policy Framework introduces no new policy instruments, there is a range of policy documents that are relevant to Scotland's food and drink sectors. Table 3 summarises some of the most important.

Title	Sector	Key points
Scotland: A Trading Nation	All	Objective is to understand how best to grow Scotland's exports and then focus resources and policies to deliver that growth. The plan sets out the scope and scale of the exporting opportunity available to Scottish businesses. It strives to find answers to: what are the export strengths we should promote; where and when should we step up our presence; who should we work with more intensively; how do we best configure government and wider support to deliver export goals? Top priority markets/future opportunities noted in 15 countries which includes Arctic countries/regions: USA, Norway, Denmark, Sweden and Canada.
Scotland's National Performance Framework	All	National Performance Framework, Indicators and Outcomes which aims to get everyone in Scotland working together, including national and local governments, business, volunteers and the general public. The key indicators for Arctic collaboration are: • Environment • Fair work and Businesses • Economy • International • Poverty • Communities
National Islands Plan	All sectors, island specific	The National Islands Plan (a requirement of the Islands (Scotland) Act 2019) works to improve island communities. The plan has 13 strategic objectives, the following are particularly relevant for collaboration with the AR: 2. Sustainable Economic Development 8. Environmental Wellbeing and Biosecurity 9. Climate Change and Energy
National Planning Framework 4	All	The National Planning Framework sets out where development and infrastructure are needed to support sustainable and inclusive growth.
A Land use Strategy for Scotland: 2016-2021	All	The Land Use Strategy 2016-21 builds on the framework set out in 2011. The strategy has the goal of long-term, integrated, sustainable land use delivering multiple benefits for all in society.
Good Food Nation Bill	All	Tabling of the proposed Good Food Nation Bill in the Scottish Parliament has been delayed due to the need to pass emergency COVID-19 legislation.
Biodiversity Strategy	Agriculture	Of particular relevance for land use and agri-food systems. Proposes protected nature sites that help preserve terrestrial and marine habitats and the species supported by them.
The Government's programme for Scotland 2019-2020	All	Scotland on the Global Stage: "taking part in the Arctic Circle Assembly and hosting the Nordic Council Forum"

Aquaculture Growth to 2030	Blue economy	6 strategic areas of focus: • Industry leadership and ambition • Enabling and proportionate regulation • Accelerating innovation • Skills development • Finance • Infrastructure 20 specific recommendations, three critical actions of: • Formation of an Industry Leadership Group to drive sector growth and ensure alignment between industry and government • Examination of the role of Marine Scotland as both regulator and policy advocate for development. There is an opportunity to align with other food and drink sectors in Scotland by moving the development role into the Scottish Government's Food, Drink and Rural Communities Division • Introduction of Innovation Sites, to allow controlled trials and development of innovative equipment, technologies, disease control measures, and regulation
Crop Production sector plan	Agriculture	Vision: a prosperous and resilient sector that produces high quality crops to feed Scotland and beyond and recognises that protecting and improving the environment is fundamental to its future success and where partnership and open communication are the norm. The objectives of the Crop Production Sector Plan are to: • Ensure that all businesses fully meet their environmental compliance obligations • Help as many businesses as possible move beyond their environmental compliance obligations
Dairy processing sector plan	Agriculture, dairy sector	Vision for the dairy processing sector recognises that protecting the environment is fundamental to its success. This means that all resources are used carefully: energy comes from low carbon sources, waste is minimised and innovation is embraced, to ensure that maximum value is extracted from all inputs and by-products. Within their supply chain, dairy processors select milk and other ingredients, transport mechanisms and packaging materials that have minimal environmental impact. Dairy processors are valued members of, and contributors to, their local communities and they are resilient to the challenges of climate change. Consumers actively select dairy products based on their environmental credentials.

Scottish Dairy Growth Board strategy	Agriculture, dairy sector	Vision: the dairy sector will be worth £1.4 billion to the Scottish food and drink industry by 2030; significant growth in exports; expansion and diversification of production; securing a sustainable milk price for farmers; carbon reduction in line with Scottish Government goals; aligning policy to support the sector; understanding and influencing consumption choices
Finfish Aquaculture sector plan	Aquaculture /blue economy	Strategic plan for the finfish aquaculture sector. It covers all aspects of fish farming in Scotland, including: supply chain; feed; hatcheries; freshwater fish pens; marine pen fish farms; and processing facilities. The sector plan and the accompanying regulatory framework outline how SEPA will regulate the sector and how it will work with it and other stakeholders to protect and improve Scotland's environment.
Scotch Whisky Sector Plan	Whisky	Aims to ensure that: all operators in the sector are fully compliant with environmental regulations; they are actively involved in supporting their local communities and that negative impacts on the environment are minimised; the sector operates using only low carbon energy sources; all by-products are in use for as long as possible and maximum value is extracted from them while in use; the sector influences its supply chain to drive improvements to the sustainability of cereal production, transport, bottle manufacturing and packaging; consumers actively select brands that demonstrate strong commitment to high environmental performance.

Table 3 Selected Scottish Government policies, frameworks and consultations with potential relevance to the Arctic Region

5 Food and drink sector clusters in Scotland's Highlands and Islands

When seeking to ascertain the potential for enterprises in Scotland's Highlands and Islands to engage with the food and drink sectors in the AR, it is logical to start by understanding what is already happening. Thus, important tasks for this Fellowship were to: identify the scale of food harvesting, production and processing in the Highlands and Islands; and to examine the available data for prima facie evidence of clustering.

The European Observatory for Clusters and Industrial Change defines clusters "as groups of firms, related economic actors and institutions that are located near each other and have reached a sufficient scale to develop specialised expertise, services, resources, suppliers and skills" (Naumanen 2019, 10). It has been argued that clusters are spatial manifestations of agglomeration economies, such as: "input-output linkages, labor market pooling, knowledge spillovers, sophisticated local demand, specialized institutions, and the organizational structure of business and social networks" (Delgado et al. 2014, 6). However, while the influence of such factors is well established, geographical characteristics are often critical in their establishment and longevity. For example: the length of the Atlantic crossing was pivotal in the development of Glasgow as a one of the UK's major ports and as a centre of shipbuilding (Pacione 1995); natural resource endowments were crucial to the development of many industrial regions (e.g. Pollard 1981); while government and university investment have played a vital role in the development of others, such as Silicon Valley (Etzkowitz 2019). Such characteristics are, however, insufficient to explain the development and survival of clusters. Instead, what seems to be critical is what Myrdal (1957) called 'cumulative causation', whereby economic development leads to agglomeration economies which give rise to clustering which in turn creates further agglomeration economies that drive further clustering. The longevity of some clusters, such as that of financial services industries centred on the City of London (q.v. Thrift 1994), highlights the important role that geographical factors, agglomeration economies and government policy play in their development and survival.

While the precise mix of agglomeration economies, government policies and spatial characteristics that develop and sustain specific clusters will tend to vary, it is clear that a cluster is more than simply a concentration of employment in one industry in one place. One type of enterprise or factory, no matter how large, is not a cluster. Instead, Naumanen (2019, 10) argues that clusters should "be considered as regional ecosystems of related industries with a broad array of inter-industry interdependencies". Thus, a defining characteristic of a cluster is a spatial concentration of economic activity in related industries.

This begs the question of how spatial concentration is measured. A summary of the more popular measures used by economists can be found in Delgado et al. (2014), one of whose co-authors is Michael Porter, perhaps the most influential researcher in this field. The European Observatory for Clusters and Industrial Change uses a suite of measures to create a 'regional ecosystem' scorecard[48]. Notwithstanding the methodological sophistication of the approaches outlined by both sources, a good place to start remains the location quotient (LQ), a straightforward and robust measure of the relative spatial concentrations of particular phenomena.

[48] https://interactivetool.eu/EASME/RES/RES_2.html. Accessed 20/4/20.

The LQ can be used to compare the distribution of a particular business type with the distribution of all businesses within the region of interest (e.g. Watts et al. 2011). It is computed as follows:

$$\text{LQ} = \frac{\left(\frac{\text{Number of enterprises of type 'a' in a given place 'y'}}{\text{Number of enterprises of type 'a' in the region containing place 'y'}}\right)}{\left(\frac{\text{Number of enterprises in a given place 'y'}}{\text{Number of enterprises in the region containing place 'y'}}\right)}$$

An LQ of 1.0 indicates that a given place ('y') has neither more nor less of its share of enterprises of type 'a' than it would have if they were distributed evenly throughout the region. An LQ greater than 1.0 indicates that place 'y' has more than its share of enterprises of type 'a' relative to the region as a whole. An LQ less than 1.0 indicates that place 'y' has less than its share of enterprises of type 'a' relative to the region as a whole.

When applied to a particular type of enterprise, an LQ greater than one for a given place indicates that there may be a degree of spatial concentration in that place of the enterprise type concerned. However, there are three factors that need to be borne in mind when using LQs. First, their usefulness is limited when measuring the spatial concentration of industries, such as farming, whose location is linked to the distribution of natural resources, such as arable land and precipitation (cf. Delgardo et al. 2014, 8). Nevertheless, while natural resource endowments parameterise economic behaviour, they do not dictate it. Thus, LQs can still provide useful information about, for example, the distribution of different types of farming activity while taking account of the fact that such activities will not be evenly distributed.

The second factor concerns the definition of a 'significant' spatial concentration of a certain type of economic activity. There is, as Crawley et al. (2013) found, no consensus on what LQ value counts as a significant concentration. The former DTI (2001) set a cut-off at 1.25, meaning that an LQ of 1.25 or higher indicated the possible existence of a cluster. Others, however, set the cut-off at a more conservative 1.5 (e.g. Naumanen 2019, 85). For present purposes, an LQ of 1.5 or higher will be taken to indicate a stronger spatial concentration of a certain type of economic activity, while an LQ between 1.25 and 1.49 will be taken to indicate a weaker spatial concentration of a certain type of economic activity.

The third factor that needs to be borne in mind is that an individual LQ of 1.5 or higher indicates spatial concentration of a particular type of enterprise. It does not indicate a cluster. A cluster can only be posited where high LQs exist in the same place for distinct but related types of enterprise.

Table 4 (next page) uses publicly-available data to examine the spatial distribution of types of food and drink and allied enterprises in Scotland's Highlands and Islands. The sources used are the Business Register and Employment Survey (via Nomis[49]) and, for farms, the Scottish Government's agricultural statistics[50]. The geographies selected for the Business Register and Employment Survey data are local authorities, as these provide a reasonable intermediate spatial resolution. Agricultural statistics, however, were available only at the scale of agricultural regions.

[49] https://www.nomisweb.co.uk/query/select/getdatasetbytheme.asp?theme=27. Accessed 20/4/20
[50] https://www.gov.scot/statistics/. Accessed 20/4/20.

Industry (SIC)	Local authority	Location quotients 2009	2012	2015	2018
Fishing (031xx)	Argyll and Bute	3.79	3.05	3.6	3.69
	Na h-Eileanan Siar	6.17	8.17	6.48	5.32
	Highland	3.37	2.63	3.85	3.64
	Moray	5.98	5.73	4.02	3.74
	Orkney	2.66	6.53	3.43	3.59
	Shetland	11.66	15.32	19.11	22.68
Aquaculture (032xx)	Argyll and Bute	12.28	9.3	13.43	12.99
	Na h-Eileanan Siar	24.39	27.32	22.64	20.94
	Highland	6.8	7.46	5.06	5.36
	Orkney	12.31	3.83	36.86	35.38
	Shetland	25.94	42.19	32.45	31.89
Processing and preserving of fish, crustaceans and molluscs (10200)	Argyll and Bute	2.51	3.44	3.48	1.97
	Na h-Eileanan Siar	3.57	4.49	5.95	6.43
	Highland	1.8	2.18	2.03	2.2
	Moray	1.84	1.87	1.62	1.94
	Shetland	9.71	9.77	7.67	7.71
Building of ships etc. (30110)	Shetland	1.89	2.31	1.9	2.19
Repair and maintenance of ships and boats (33150)	Argyll and Bute	6.02	6.56	6.07	7.16
	Shetland	10.36	18.61	20.38	24.91
Agriculture (01000)	Argyll and Bute	2.31	2.3	2.25	2.3
	Na h-Eileanan Siar	3.55	3.2	3.41	3.76
	Highland	2.07	2.07	2.08	2.21
	Moray	1.78	1.75	2.12	1.81
	Orkney	4.24	4.27	4.51	4.57
	Shetland	2.09	1.96	1.89	2.41
(Specialist) dairy	*Argyll and Bute*	*1.44*	*1.44*	*1.41*	*1.05*
Cattle and sheep (all)	*Argyll and Bute*	*1.48*	*1.49*	*1.43*	*1.37*
Note: data for farm types in	*Na h-Eileanan Siar*	*1.27*	*1.24*	*1.1*	*1.06*
the 2018 column are for 2017	*Shetland*	*2.11*	*2.11*	*1.91*	*1.8*
Horticulture	*Na h-Eileanan Siar*	*1.29*	*1.27*	*0.96*	*1.02*
	Highland	*1.35*	*1.36*	*0.96*	*1.21*
Farming-related (016xx)	Highland	0.88	1.57	1.3	1.2
	Moray	1.55	2.5	4.45	2.02
	Orkney	5.18	5.69	2.16	0.57
Manufacture of agricultural and forestry machinery (excl. tractors) (28302)	Highland	1.62	1.28	0.98	0.8
	Moray	0	0	0	7.43
Processing fruit and vegetables (103xx)	Moray	4.24	3.77	3.73	4.86
Manufacture of oils & fats (10410)	Na h-Eileanan Siar	0	221.4	126.8	188.21
Manufacture of dairy produce (105xx)	Argyll and Bute	1.26	0.93	1.23	1.25
	Orkney	4.64	5.74	8.85	5.53
Manufacture of bakery and farinaceous products (107xx)	Na h-Eileanan Siar	0.98	1.01	0.99	2.03
	Moray	9.64	9.73	9.57	9.37
	Orkney	1.05	1.08	1.26	1.24
Distilling, rectifying and blending of spirits (11010)	Argyll and Bute	2.38	2.73	2.96	3.32
	Moray	8.75	8.89	8.98	9.06
	Orkney	1.17	0	1.22	1.83
Manufacture of malt (11060)	Argyll and Bute	1.79	2.23	4.31	4.13
	Highland	3.2	4.03	2.87	2.64
	Moray	14.78	18.18	22.85	25.41
Manufacture of non-distilled alcoholic drinks (11020-11050)	Highland	2.49	2.92	2.14	2.03
	Orkney	3.19	4	3.73	2.8

Table 4 Stronger and weaker spatial concentrations of food & drink activity in Scotland's Highlands and Islands, 2009-18

Note: Figures for types of farm refer to holdings (*in italics*); all other figures relate to employment.

In much of the Highlands and Islands these are coterminous with local authority areas; however, Moray is defined part of the North East region, so has been omitted as Aberdeenshire dominates that region's agricultural area.

The LQ in Table 4 conform to expectations concerning the main concentrations of food production, processing and related activities. Moreover, several of the stronger LQ, such as that for SIC 10390 (Other processing and preserving of fruit and vegetables) in Moray, may relate to the presence of a single enterprise. This emphasises that the numbers are vulnerable to the effect of small shifts in employment.

Notwithstanding that caveat, Table 4 shows changing spatial concentrations in the food and drink sectors in Scotland's Highlands and Islands between 2009 and 2018 (2017 in the case of the agricultural data). In fishing and fish processing, for example, Shetland has consolidated its dominance (in employment), with mostly moderate declines or increases elsewhere (the exception being the apparent loss of all fish processing employment in Orkney). In aquaculture, employment in Orkney has grown rapidly and is now higher, proportionately, than in Shetland; while elsewhere it has declined. The concentration of employment in the building (in Shetland) and repair (Argyll and Bute, Highland and Shetland) of sea-going vessels have also increased; though, as actual employment has changed little, this may reflect consolidation rather than growth. Overall, Table 4 suggests stronger spatial concentrations of at least two types of food-related employment in the marine sector in all six local authority areas, with Shetland predominant (LQ above 2 for five types of enterprise).

The situation with regard to terrestrial agriculture is mixed. While LQs for employment changed relatively little 2009-18, the degree of agricultural specialisation, as measured by the LQs for farm holdings of different types, appears to have declined. This does not necessarily mean that agricultural production has changed much. The classification of farms into types for statistical purposes refers to the preponderance of activities on individual farms. Thus, relatively modest changes in production on an individual holding may result in its recorded farm type being altered in the statistics. Nevertheless, there does seem to be a shift away from certain specialised types of farming, at least at the scale of individual holdings, in the Highlands and Islands. This merits further investigation.

Such changes problematize attempts to identify clusters of land-based food and drink production and processing enterprises. For example, Orkney and, to a much lesser extent, Argyll and Bute retain concentrations of dairy processing. While both can, in general terms, be related to historical concentrations of dairy farming in Orkney and south-west Scotland, it is difficult to speak of diary clusters in the areas concerned. Moreover, in both areas the number of people employed in the manufacturing of dairy products has declined since 2008. This is reflected in the declining LQ for Argyll and Bute. The increasing LQ for Orkney indicates that employment in dairy manufacturing there has declined more slowly than it has elsewhere.

Another difficulty is created by the limited spatial resolution in publicly-available data for Highland local authority. Highland covers almost a third of the Scottish landmass and the available data suggest that economic activity differs markedly in different areas. For example, levels of employment in agriculture and fisheries in Lochaber, Skye and Wester Ross, Caithness and Sutherland, and around the Inner Moray Firth are well below those for the Highlands and Islands

as a whole and, in Caithness and Sutherland and around the Inner Moray Firth, are also below the level of Scottish employment in those sectors (Highlands and Islands Enterprise 2019a, 2019b, 2019c).

With the exception of Shetland, the concentration of employment in the distilling and blending of spirits increased between 2009 and 2018 throughout the Highlands and Islands. Moreover, in all cases this was accompanied by increased employment. There may be an element of clustering here (though perhaps not in Na h-Eileanan Siar (the Western Isles)), with gin production benefitting from spillovers from the whisky industry. However, further research would be required to test this hypothesis. The LQs for the production of malt suggest a degree of clustering with distilling in Argyll and Bute, Highland and Moray. However, although employment in malt production rose in Argyll and Bute, it has declined overall in the other two local authority areas. There are also concentrations in the production of non-distilled alcoholic drinks in Highland and Orkney, both of which have seen rises in employment.

Lastly, there appear to be concentrations of production of baked farinaceous products in Na h-Eileanan Siar and Moray, and of fruit and vegetable processing in Moray. It seems likely that these relate to small numbers of enterprises that produce in considerable volumes. It also seems likely that they owe their origins to the utilisation of locally-grown produce, such as vegetables and grains (e.g. oats). However, whether the growth of such crops is concentrated in those local authority areas must await further examination of the agricultural statistics. It is also possible that the high LQs for baked farinaceous products and the production of oils and fats in Na h-Eileanan Siar may be related.

Overall, these figures display continuities with the findings of Izsak et al.'s (2016) Scottish cluster analysis of 2015. That report identified three main food and drink clusters – marine fishing, beverages, and bread and pastry – with the first two predominantly oriented internationally and the third geared more towards Scottish and UK markets (Izsak et al. 2016, 41). They further note that beverages (presumably whisky) are important internationally and that the food and drink sector had shown moderate growth (ibid. 42).

However, in the context of the Highlands and Islands, a focus on economic clusters, as these tend to be defined in the literature and from the statistics, is arguably too narrow. For, even in sectors where Table 4 shows some evidence of clustering, notably whisky production and salmon aquaculture, there has been considerable consolidation of ownership. This matters because, although these sectors remain important employers in the region, much of the decision-making and higher-paid employment associated with their executive functions is located elsewhere. Interestingly, Laurence et al. (2019) make the case for a 'social enterprise cluster' in their report on, and recommendations for, food innovation in northern Canada. This chimes with the declared purposes of Highlands and Islands Enterprise (HIE), "the economic *and* community development agency for the Highlands and Islands of Scotland"[51]. But caution is needed here as well. Similar visions for local community development have been around for decades (cf. Eisenschitz and Gough 1993, 10-11) and they face substantial challenges in trying to retain and increase the population of, the economic activity generated in, and the economic value retained by the areas they are enacted in; areas which have tended to suffer the loss of all three to those (frequently metropolitan) areas that benefit from 'cumulative causation'. Moreover, and as Watts et al. (2017)

[51] https://www.hie.co.uk/; accessed 29/4/20. Emphasis added.

argue, the social and economic peripherality of remote rural areas is often actively maintained by interests that seek to use them as spaces of consumption (e.g. hunting and escapism). Thus, local communities and enterprises in such peripheral areas are likely to require long-term support for whatever form of clustering they decide to develop, because the forces that generate and perpetuate economic peripherality will not cease to operate, even if some of them are tempered by the devolution of political powers.

6 Place-based food and drink sector value generation in Scotland's Highlands and Islands: the case of EU protected names schemes

One of the ways in which social and economic development in remote and peripheral areas has been sought is through the development of 'placed-based value'. An exemplar for this approach in the food and drink sectors is the EU's creation, in 1993, of three schemes which aim to protect "the names of specific products to promote their unique characteristics, linked to their geographical origin as well as traditional know-how"[52]: Protected Designation of Origin (PDO); Protected Geographical Indication (PGI); and Traditional Speciality Guaranteed (TSG). Although described as 'quality' schemes, these are in effect geographical trademarks: they protect from imitation the name of products from specific areas that are produced according to specific traditional production processes. The three schemes differ primarily according to how much of the raw materials originate from, and how much of the production process takes place in, a specific area[53].

In an early study of EU protected name schemes, Parrott et al. (2002, 243) found that the distributions of PDO and PGI awards "tend to be associated with agriculturally peripheral regions", being concentrated in agriculturally Less Favoured Areas in France, Italy, Portugal, Germany and Spain (ibid. 252). The EU's *e*Ambrosia database[54] shows that this national pattern persists, with registrations tending to concentrate in the 'southern' Member States of France, Italy, Greece, Portugal and Spain.

The first twelve bars in Figure 2 (next page) show products registered as having PDO, PGI or TSG protection, as of 28 April 2020, per million inhabitants of states that were EU members when the schemes were introduced. The last two bars in Figure 2 show the products registered in Scotland and the Highlands and Islands. These were assigned on the basis of the product name or, where this was ambiguous, the description of the production area and process held in the *e*Ambrosia database. The figure for Scotland includes two cheeses whose production area straddles the border with England. Eight products were judged to come wholly or predominantly from the Highlands and Islands: Native Shetland Wool; Orkney lamb; Orkney beef; Orkney Scottish Island Cheddar; Scotch Whisky; Scottish Farmed Salmon; Shetland Lamb; and Stornoway Black Pudding. It is also likely that producers in the Highlands and Islands use the Scottish Wild Salmon, Scotch Beef and Scotch Lamb designations, but the bulk of production for each is likely to take place elsewhere in Scotland.

As Figure 2 shows, the Highlands and Islands hosts a large share, relative to population, of food and drink products registered under EU protected names schemes. Although the comparison with registrations in Scotland, the UK and EU Member States is inexact, as it does not compare like geographical units, it is consistent with Parrott et al.'s (2002) finding that such designations tend to cluster in peripheral regions. More importantly, in the present context, it demonstrates a

[52] https://ec.europa.eu/info/food-farming-fisheries/food-safety-and-quality/certification/quality-labels/quality-schemes-explained_en; accessed 29/4/20.
[53] https://ec.europa.eu/info/food-farming-fisheries/food-safety-and-quality/certification/quality-labels/quality-schemes-explained_en; accessed 29/4/20.
[54] https://ec.europa.eu/info/food-farming-fisheries/food-safety-and-quality/certification/quality-labels/geographical-indications-register/; accessed 30/4/20.

commitment to the development and retention of 'placed-based value' by food and drink producers and policy-makers in Scotland's Highlands and Islands.

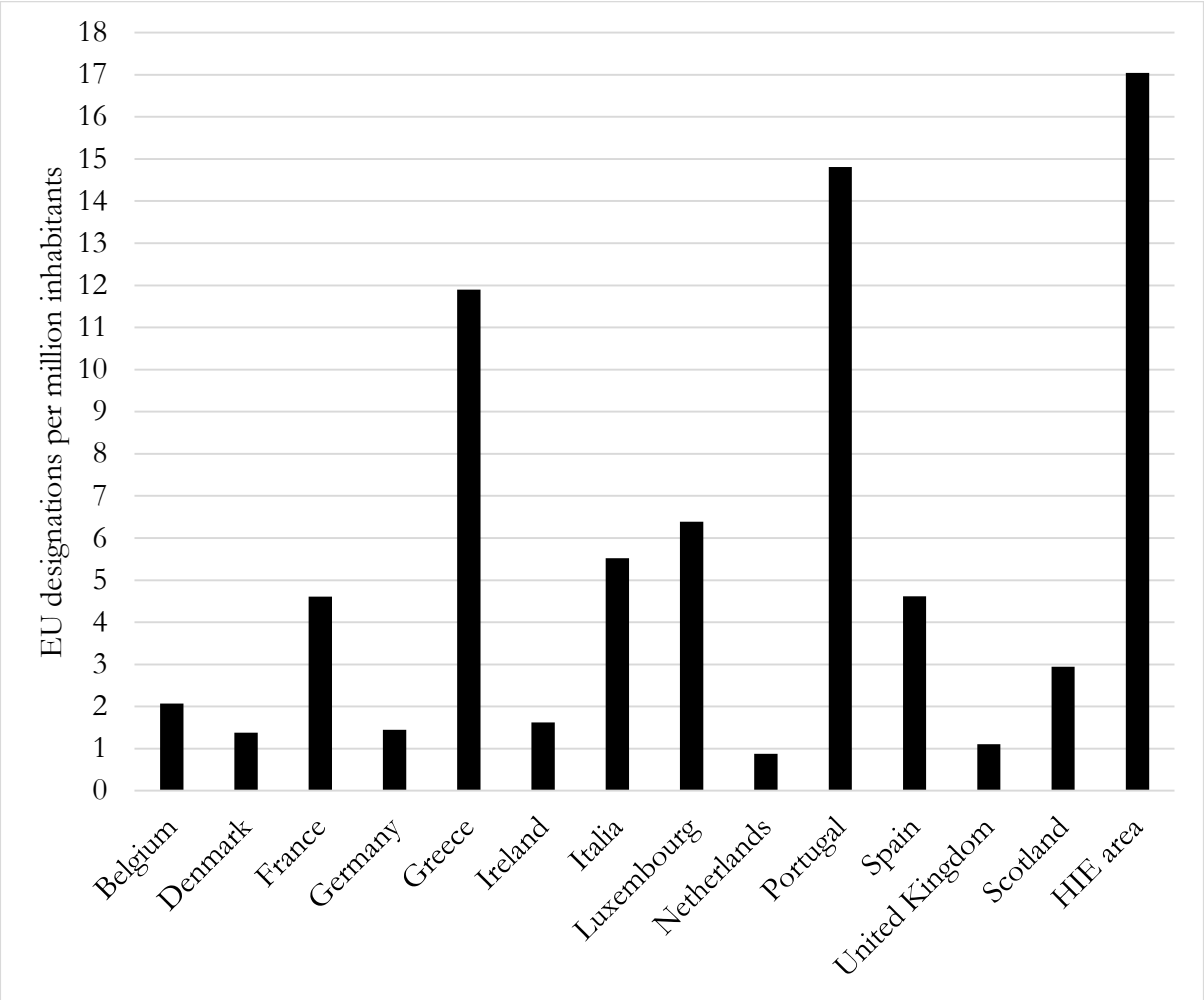

Figure 2 EU geographical indications (PDO, PGI and TSG) per million inhabitants, for selected states, Scotland and the Highlands and Islands

Sources: PDO, PGI and TSG registrations were downloaded (28/4/20) from https://ec.europa.eu/info/food-farming-fisheries/food-safety-and-quality/certification/quality-labels/geographical-indications-register/. Registrations for Scotland and the Highlands and Islands a were inferred from the product name and registration address; where products could not be associated exclusively with the Highlands and Islands they were associated with it only where it could reasonably be inferred that most production takes place there: thus Scotch Whisky and Scottish Farmed Salmon were associated with the Highlands and Islands, but Scottish Wild Salmon, Scotch Beef and Scotch Lamb were not.
Population estimates from https://population.un.org/wpp/Download/Standard/Population/; except those for Scotland (from https://www.nrscotland.gov.uk/files//statistics/population-estimates/mid-18/mid-year-pop-est-18-pub.pdf) and the Highlands and Islands (from https://www.hie.co.uk/research-and-reports/our-region-in-detail/); accessed 28/4/20.

However, Figure 2 can tell us little about the breadth and depth of that commitment, nor about whether and to what extent it could be applied to the future development of geographical indications. As noted in section 1, given the dislocation caused by the COVID-19 'lockdown' it was not judged appropriate to consult stakeholders about such issues at this time. However, a recent survey conducted by the author, while it does not address these issues directly, provides relevant data on the attitudes and stated behaviours of micro, small and medium-sized food and drink producers in Scotland. Moreover, data on enterprise location permits responses from food

and drink entrepreneurs in the Highlands and Islands to be discussed and compared with responses from elsewhere in Scotland. The next section presents a preliminary analysis of that survey data, focusing on attitudes and stated behaviours of relevance to the objectives of this SEFARI Fellowship.

7 Results from a recent survey of Scottish food and drink enterprises

The author conducted a representative survey of MSMEs in Scotland, as part of a larger research project funded by the Scottish Government, which received 644 responses. Although the data are still being analysed and responses have yet to be weighted to make them more representative, some findings from the survey are relevant here. Thirty-two per cent of responses (n=206) were from the six local authority areas that cover almost the entire Highlands and Islands region[55]. However, as few respondents were involved in the farming or harvesting of fish, their responses will not be considered separately. Unless otherwise stated, all data in this section are from the survey.

Just over 47 per cent of all respondents (n=304) declared their main enterprise to be land-based. However, more than 60 per cent (n=126) of those located in the Highlands and Islands did so, compared to just over 40 per cent (n=178) elsewhere in Scotland. This disparity may be accounted for by the fact that almost two-thirds of land-based enterprises (n=83) from the Highlands and Islands declared themselves to be crofters[56]. Crofts are generally considered too small to provide a living[57] and this would appear to be borne out by the fact that four-fifths of these respondents (n=70[58]) declared their annual revenue from crofting to be less than £10,000. This suggests, in turn, that land-based food enterprises in the Highlands and Islands may tend to be smaller than elsewhere in Scotland.

Farm location	Number of farms	Annual revenue				
		Less than £20,000	£20,001 to £50,000	£50,001 to £100,000	£100,001 to £200,000	More than £200,000
Highlands & Islands	Actual	8	12	7	5	6
	Expected	*11.5*	*5.7*	*4.9*	*5.7*	*10.1*
Rest of Scotland	Actual	50	17	18	24	45
	Expected	*46.5*	*23.3*	*20.1*	*23.3*	*40.9*

Table 5 Surveyed farmers' annual revenue by region

As Table 5 shows, this is corroborated by those who declared themselves to be farmers. More farmers in the Highlands and Islands declared their annual revenue to be between £20,001 and £100,000 than would be expected on the basis of the overall distribution of responses to this question. Conversely, more farmers outside the Highlands and Islands declared their annual revenue to exceed £100,000 than would be expected on the same basis. A non-parametric test of association yielded a statistically significant ($p<0.05$) value of χ^2 (13.08)[59]. Thus, farm-based

[55] These are: Argyll & Bute, Highland, Moray, Na h-Eileanan Siar, Orkney Islands and Shetland Islands. The islands of Arran and Cumbrae are excluded here as they are, administratively, part of North Ayrshire. However, the number of survey respondents incorrectly excluded on this basis is very small (n<5) and is unlikely to have a significant impact on the findings presented here.

[56] Many crofters farm but they tend to be distinguished from farmers by a combination of two factors: land tenure (crofting tenancies exist only in the 'crofting counties', which are located almost entirely within the Highlands and Islands); and by the size of holding, which tends to preclude crofters from earning enough from farming alone to make a living.

[57] https://www.crofting.org/faqs/67; accessed 1/5/20.

[58] 91 respondents declared themselves to be crofters, of whom 8 were located outside the six local authority areas taken here to represent the Highlands and Islands.

[59] The test used here (chi-square, notated as χ^2) compares the observed and expected frequencies in the distribution of the grouped values of given variables (in this case, annual revenue) for different groups (in this case, survey respondents' farms located inside and outwith the Highlands and Islands) and determines whether any difference between them is statistically significant. The null hypothesis is that the observed distribution matches the expected

respondents from the Highlands and Islands tended to declare a smaller annual revenue that those in the rest of Scotland.
However, the same cannot be said of food processing and manufacturing enterprises. There was little difference in the reported revenue of such enterprises between respondents from within or without the Highlands and Islands.

Similar patterns can be seen in levels of employment. Forty-five per cent of farmer respondents from the Highlands and Islands declared that they have no paid employees (n=51), compared to 13 per cent elsewhere in Scotland (n=43). A non-parametric test of association shows this to be a statistically significant ($p<0.01$) observation ($\chi^2=8.68$). Looking at paid employment[60] across the primary (production) and secondary (processing) sectors, Table 6 shows that the great majority of survey respondents were micro-enterprises (fewer than 10 employees). There were fewer small enterprises (10-50 employees), relative to expectations, in the Highlands and Islands than elsewhere in Scotland, but the difference in the overall distribution of enterprise sizes was not statistically significant.

Region	Type of employment	Enterprises	Number of employees			
			1	2 to 5	6 to 10	>10
Highlands	Full time	Count	46	55	10	5
& Islands		*Percentage*	*39.7*	*47.4*	*8.6*	*4.3*
Highlands	Part time	Count	41	54	7	5
& Islands		*Percentage*	*38.3*	*50.5*	*6.5*	*4.7*
Rest of	Full time	Count	105	127	26	30
Scotland		*Percentage*	*36.5*	*44.1*	*9.0*	*10.4*
Rest of	Part time	Count	107	119	22	30
Scotland		*Percentage*	*38.5*	*42.8*	*7.9*	*10.8*

Table 6 Number of paid employees for surveyed enterprises by region

In other respects, the characteristics of surveyed food and drink MSMEs tended to vary little between the Highlands and Islands and the rest of Scotland. Nevertheless, some are worth commenting on as they shed further light on the sector. Among the more striking findings is the proportion of female respondents who declared that they owned and/or were a director or partner in the enterprise: 20.2 per cent (n=22) for enterprises with no employees; 30.2% (n=110) for enterprises with one or more employees. The corresponding proportions from the Longitudinal Small Business Survey for 2018 are 20 and 17 per cent respectively (Department for Business, Energy and Industrial Strategy (2019a, 2019b). The overall proportion of female owners and/or directors from the author's survey was 27.9 per cent (n=132); which compares with 20-22 per cent of UK small and medium sized enterprises (SMEs) being owned or run by women (FSB 2018, 8). A possible explanation for these disparities is that the author's survey over-reports the proportion of female-run food and drink enterprises with employees in Scotland. Responses have yet to be weighted and the business reported on by female survey respondents may not be female-owned or female-run[61]. For example, female survey respondents may not have a controlling interest in their enterprise, but may be minority owners or non-managing directors. Nevertheless, the present

distribution for farms in both areas. However, when the test returns a value of χ^2 above a certain critical value (which will vary according to the number of groups of values, 5 in this case) one can be confident that there is a statistically significant difference between two sets of distributions.

[60] This category includes the paid employment of family members.

[61] See FSB (2018, 8) for the definitions of these terms.

survey suggests that the level of female entrepreneurship in the food and drink sector in the Highlands and Islands (and in Scotland more generally) may be higher than previously thought.

The age profile of surveyed entrepreneurs is perhaps less encouraging: overall 51.7 per cent (n=291) declared themselves to be 55 or older, with the percentage in the Highlands and Islands being slightly higher, at 53.2 (n=109). The equivalent figure for UK entrepreneurs as a whole is reportedly 33 per cent[62]. This is not unexpected, as the average age of farmers tends to be relatively high[63]. However, while 57.2 per cent of agriculturally-active survey respondents (n=174) declared themselves to be 55 or older, so too did 45.17 per cent of other respondents (n=117). Such figures appear to raise policy concerns over the long-term future of MSMEs in Scotland's food and drink sector, given that about half of those surveyed might be expected to retire in the next decade or so. At the very least, it points up the need for further research into issues surrounding business continuity and succession planning. However, the issue of succession planning has long been a concern in agriculture, so there may be tried and tested policy tools to address any difficulties that are revealed. On the positive side, this age profile suggests that there may be increasing levels of opportunity for young entrepreneurs to enter the food and drink sector in the coming years; though investment capital is likely to be a significant issue in sectors (such as agriculture) that have large and lumpy up-front costs (e.g. for land) for new entrants.

The relatively high average age of survey respondents was not reflected in low average levels of educational attainment (which have risen in the UK in recent decades). OECD data for the UK show that, in 2018, 45.8 per cent of 25-64 year-olds were educated to tertiary level, with 33.5 per cent being educated to upper secondary level[64]. Among survey respondents the equivalent figures were 48.21 (n=269) and 32.97 (n=184) per cent respectively. Thus, on the basis of the survey, it would seem that food and drink entrepreneurs in the Highlands and Islands and Scotland more generally are at least as well-qualified as the population overall.

		Local attachment: 1 (not at all attached) - 6 (very attached)			
Region	**Enterprises**	**Weak (1-2)**	**Medium (3-4)**	**Strong (5-6)**	**Totals**
Highlands	Count	4	24	178	206
& Islands	*Expected*	*7.7*	*39.8*	*158.5*	
Rest of	Count	18	90	276	384
Scotland	*Expected*	*14.3*	*74.2*	*295.5*	
Totals		22	114	454	590

Table 7 Survey respondents' strength of local attachment by region

Turning to attitudinal variables, the survey found significant differences in the 'local attachment' espoused by food and drink entrepreneurs in the Highlands and Islands compared to the rest of Scotland. Respondents were asked to rate their attachment to their local area on a scale of 1 (not at all attached) to 6 (very attached). Responses, which were compressed into three groups to facilitate analysis, are given in Table 7. Over three-quarters of respondents felt a strong sense of attachment to their local area. However, the distribution of responses to this question from respondents located in the Highlands and Islands is significantly different from the distribution of responses from respondents located elsewhere in Scotland ($\chi^2=16.03$, $p<0.001$). On this basis, it

[62] https://startups.co.uk/the-average-entrepreneur/; accessed 3/5/20.
[63] https://www.fas.scot/faq/age-structure-scottish-farming/; accessed 29/5/20.
[64] https://data.oecd.org/eduatt/adult-education-level.htm; accessed 3/5/20.

is reasonable to argue that respondents based in the Highlands and Islands have a stronger sense of local attachment than those based elsewhere in Scotland.

When asked about the importance they ascribe to certain characteristics of their main suppliers, there was little overall difference between survey respondents located within and outwith the Highlands and Islands. Responses for respondents in the Highlands and Islands are shown in Table 8. Competitive pricing was considered the most important attribute of a main supplier, but nearly as many respondents thought it very important that their main suppliers were located as locally to them as reasonably possible. High levels of animal welfare were considered important by almost sixty per cent of respondents (answering '5' or '6'), with employee welfare and fair trade being considered important by more than forty per cent. Organic certification, by contrast, was considered not at all important by more than half of respondents.

How important is it that your main suppliers:		**Importance: 1 (not at all) - 6 (very)**						
		1	**2**	**3**	**4**	**5**	**6**	**Total**
Are competitively priced	Count	4	2	7	15	30	100	158
	%age	*2.53*	*1.27*	*4.43*	*9.49*	*18.99*	*63.29*	
Are local to you (as reasonably possible)	Count	7	5	13	15	26	95	161
	%age	*4.35*	*3.11*	*8.07*	*9.32*	*16.15*	*59.01*	
Have high levels of animal welfare	Count	22	7	14	14	19	64	140
	%age	*15.71*	*5.00*	*10.00*	*10.00*	*13.57*	*45.71*	
Have high levels of employee welfare	Count	20	16	26	17	25	39	143
	%age	*13.99*	*11.19*	*18.18*	*11.89*	*17.48*	*27.27*	
Adhere to fair trade principles	Count	24	10	20	30	18	41	143
	%age	*16.78*	*6.99*	*13.99*	*20.98*	*12.59*	*28.67*	
Are registered organic	Count	74	16	22	12	5	12	141
	%age	*52.48*	*11.35*	*15.60*	*8.51*	*3.55*	*8.51*	

Table 8 Attitude statements for main suppliers from survey respondents in the Highlands and Islands

Region	**Distance from main:**	**Enterprises**	**Distance (miles[65])**				
			< 11	**11 - 30**	**31 - 50**	**51 - 100**	**> 100**
Highlands	Supplier	Count	56	40	19	16	37
& Islands		*Expected*	*65.3*	*37.7*	*23.4*	*17.8*	*23.8*
Rest of	Supplier	Count	131	68	48	35	31
Scotland		*Expected*	*121.7*	*70.3*	*43.6*	*33.2*	*44.2*
Highlands	Customer	Count	35	30	14	10	30
& Islands		*Expected*	*47.1*	*27.9*	*11.5*	*11.5*	*20.9*
Rest of	Customer	Count	100	50	19	23	30
Scotland		*Expected*	*87.9*	*52.1*	*21.5*	*21.5*	*39.1*

Table 9 Respondents' distance from their main supplier and customer by region

The high level of importance attached by three-quarters of respondents to their main suppliers being located as locally to them as reasonably possible (75.16% answered '5' or '6' to this question), when set against the distances between them and their main suppliers and customers

[65] Miles were used in the survey in preference to kilometres as they remain the main unit in which distances by road are measured in Scotland (e.g. they are used on road signs). 1 mile ≈ 1.6 kilometres.

(Table 9), reveals something about the challenges of remoteness faced by enterprises in the Highlands and Islands. There are statistically significant differences between responses from those located in the Highlands and Islands and those located elsewhere in Scotland, with reference to the declared distances from their main suppliers ($\chi^2 = 15.17$, $p<0.01$) and customers ($\chi^2 = 12.17$, $p<0.01$). When comparing the actual and expected counts in Table 9, it emerges that 'local' links between respondents in the Highlands and Islands and their main suppliers and customers appear to involve greater distances than for respondents elsewhere in Scotland. Respondents in the Highlands and Islands have higher than expected counts in the 11-30 miles column and those elsewhere have higher than expected counts in the under 11 miles column.

However, and as might be predicted from the discussion in section 6, it may be that entrepreneurs in the Highlands and Islands turn their remoteness to account by engaging more with physically distant suppliers and customers. It is notable, for example, that actual counts exceed expected counts for respondents from the Highlands and Islands whose main suppliers and customers are located more than 100 miles away; the opposite being the case for those located elsewhere in Scotland. Thus, it may be that MSME food and drink entrepreneurs based in the Highlands and Islands are more open to working with enterprises located at considerable distances from their own. Therefore, while respondents from the Highlands and Islands have a stronger attachment to their local area than respondents from elsewhere in Scotland (Table 7), it is clear that they are far from parochial in their business dealings.

Nevertheless, the survey data reveal a statistically significant correlation between the strength of respondents' local attachment and the importance they attach to their main supplier being as local as reasonably possible ($r_s=.23$, $p<0.01$)[66]. Thus, the stronger a respondent's sense of local attachment, the higher the importance they assign to their main supplier being as local to them as reasonably possible. However, while statistically significant, the relationship is not particularly strong: 23 per cent of the variance of one of the variables can be predicted by variances in the other; and of course it can tell us little about the direction of causality. This suggests that, although respondents from the Highlands and Islands tend to have a strong local attachment (demonstrated by Table 7) and are more likely to want their main supplier to be as local as reasonably possible, their support for other local enterprises is conditional on other factors as well. This makes sense, as an entrepreneur would be unlikely to support another local business for any length of time if doing so had a negative impact on the quality or competitiveness of their own produce (cf. Morgan et al. 2006, 189).

This, in turn, suggests that other factors influence the importance that survey respondents attached to the localness of their main suppliers. One such factor may be the ease of face-to-face contact, as unmediated interaction appears to play a role in helping to build and maintain trust among food and drink entrepreneurs (Watts et al. 2007). Survey respondents were asked which methods they use to keep in touch with their main supplier: 43.7 per cent (n=170) use

[66] The test used here (r_s) is Spearman's rank correlation, a non-parametric measure of association. It produces a value between 1 (strongest positive association) and -1 (strongest negative association). In this instance, the value of r_s is 0.23, which means that for every change of 1 in the ranking of local attachment, there is a change of 0.23 in the perceived importance attached to their main supplier being as local as reasonably possible (or vice versa). Thus, between a fifth and a quarter of the variance in the one variable is associated with variance in the other.

face-to-face as their main means of communication and an additional 9.8 per cent (n=38) communicate face-to-face at least some of the time. These responses were ranked: respondents indicating the use of face-to-face as the main or only method of communication with their main supplier were ranked 1; those indicating the use of face-to-face as one communication method among others with their main supplier were ranked 2; respondents indicating that direct mediated communication is their main means of contact with their main supplier (e.g. telephone or online calls) were ranked 3; and those indicating the use of mainly written communication with their main supplier (e.g. e-mail, fax or post) were ranked 4. These ranks were correlated with the declared distance from their main supplier (the categories in columns 4-8 of Table 9 being ranked 1-5 respectively): this yielded $r_s = .34$ ($p<0.01$). This suggests a moderately strong 'distance decay' effect: the further away a respondent is from their main supplier the less they communicate face-to-face.

However, it should not be inferred from this that respondents based in the Highlands and Islands use face-to-face communication with suppliers less than respondents elsewhere in Scotland. For there is a weak negative correlation between the importance respondents ascribe to their main supplier being as local to them as reasonably possible and the ranked methods of communication with them outlined in the previous paragraph ($r_s=-.15$, $p<0.01$). Indeed, there is no statistically significant difference between the propensities of respondents located in the Highlands and Islands and the rest of Scotland to use face-to-face communication with their main suppliers. This suggests that there is something about face-to-face communication with main suppliers that cannot easily be replicated electronically. It will be interesting to see what improved connectivity in remote rural areas does to alter this. The evidence presented above suggests that it may not, on its own, have a significant impact on the propensity for face-to-face communication between food and drink entrepreneurs and their main suppliers.

When the above tests of association were run for respondents' main customers, some similar findings emerged. For instance, there is a moderately strong statistically significant correlation between the methods respondents use to keep in touch with, and their distance from, their main customer ($r_s=.32$, $p<0.01$). There is again a statistically significant, weak negative correlation between the importance that respondents ascribe to their main customer being as local to them as reasonably possible and the ranked methods of communication with them outlined above ($r_s=-.11$, $p<0.05$). However, there is no meaningful correlation between the strength of respondents' local attachment and the importance that they attach to their main customer being as local as reasonably possible ($r_s=.05$, $p>0.38$).

This last finding is consistent with the observation, on the basis of the data concerning relationships with main customers in Table 9, that food and drink enterprises in the Highlands and Islands appear to be more willing than their counterparts elsewhere in Scotland to build and maintain relationships with important customers located more than 100 miles away. This, in turn, is consistent with the evidence from section 6, that producers based in the Highlands and Islands have displayed a relatively high level of participation in EU food labelling schemes. Taken together, these factors suggest that food and drink entrepreneurs in the Highlands and Islands may have a stronger orientation towards sales at a distance than their counterparts elsewhere in Scotland. While this would, to some extent, be making a virtue of necessity, their relatively high level of engagement with EU food labelling schemes suggests a willingness to

work together to produce distinctive food and drink products for sale outside the region. However, the Highlands and Islands' association with eight EU protected origin labels is small in absolute terms and the scale of production associated with them is unclear. Thus, they may tell us little about the food and drink sector in the Highlands and Islands as a whole.

Such caution is reinforced by data from the survey. For example, when asked whether they used any form of geographical branding on their products[67], while 27.4 per cent of respondents from the Highlands and Islands (n=48) answered 'yes', this was slightly smaller than the proportion of respondents from elsewhere in Scotland that did so (31.8%, n=103). Similarly, when asked whether they had won any prizes or awards for their food or drink products over the previous five years, 17 per cent of respondents from outside the Highlands and Islands (n=55) responded that they had, compared to 13.1 per cent of respondents from within it (n=23). Such figures suggest that, in the cases of award-winning and geographically-branded products, food and drink producers in the Highlands and Islands may be slightly behind their peers elsewhere in Scotland. Survey data also suggest that respondents from the Highlands and Islands are no more likely than respondents elsewhere in Scotland to participate in joint ventures (6% (n=11) compared to 5.2% (n=17)) or to join co-operatives (10.9% (n=19) compared to 13.3% (n=43)).

Change of revenue		Decrease	Stay the same	Increase	Total
Previous 5	Count	35	84	74	206
years	*%age*	*18.1%*	*43.5%*	*38.3%*	*100.0%*
Next 5	Count	46	86	61	206
years	*%age*	*23.8%*	*44.6%*	*31.6%*	*100.0%*

Table 10 Changes in enterprise revenue over the previous and next five years, as estimated by survey respondents located in the Highlands and Islands

Table 10 summarises Highlands and Islands-based respondents' estimates of how their revenues have changed over the previous five years and how they are likely to change over the next five[68]. The proportion of entrepreneurs who expect their revenue to decline is larger than the proportion for whom it has declined, while the proportion who expect their revenue to increase is smaller than the proportion for whom it has increased.

However, Table 11 (next page) shows that more than half of respondents in the Highlands and Islands who use some form of geographical branding expect their revenue to rise over the next five years, compared to fewer than a quarter of those who do not. A non-parametric test of association shows this to be a statistically significant difference ($\chi^2=17.56$, $p<0.001$). Thus, food and drink entrepreneurs in the Highlands and Islands who use some form of geographical branding are more confident about their future growth than those who do not. This suggests, in turn, that food and drink entrepreneurs in the Highlands and Islands may be well disposed to policy approaches to sector development that seek to foster the generation of place-based value.

[67] The question asked was: "Do any of your food or drink products display where they come from using pictures and/or words?"

[68] There being no significant difference between the figures for respondents in the Highlands and Islands and the rest of Scotland, figures for the latter are not given here.

Change of revenue		Decrease	Stay the same	Increase	Total
Use geographical branding	Count	4	18	26	48
	%age	*8.3*	*37.5*	*54.2*	
No geographical branding	Count	38	59	30	127
	%age	*29.9*	*46.5*	*23.6*	

Table 11 Changes in enterprise revenue over the previous and next five years, as estimated by survey respondents located in the Highlands and Islands, according to whether or not they use some form of geographical branding[69]

The survey presented respondents with a list of possible barriers to growth and asked them to rank the importance of each one on a scale of 1 (not at all important) to 6 (very important). As Table 12 shows, the most important barrier, with 49.5 per cent of respondents ranking it '6', is the availability of capital. The second most important barrier, with 38.1 per cent of respondents ranking it '6', is the availability of time.

		Barriers to growth in the form of the availability of					
Region	Enterprises	Capital	Time	Access to public funding[70]	Public funding	Reliable labour	Finance
Highlands	Count	36	26	23	20	24	16
& Islands	*%age*	*55.4*	*41.9*	*39.7*	*31.7*	*38.1*	*25.0*
Rest of	Count	54	38	33	32	29	27
Scotland	*%age*	*46.2*	*35.8*	*34.7*	*33.0*	*28.7*	*26.0*
Overall	Count	90	64	56	52	53	43
	%age	*49.5*	*38.1*	*36.6*	*32.5*	*32.3*	*25.6*

Table 12 Respondents answering '6' (very important) to the importance of selected barriers to future growth, by region

		Source of finance used			
		Own profits / savings		High street banks	
Region	Enterprises	No	Yes	No	Yes
Highlands	Count	40	115	75	80
& Islands	*%age*	*25.81*	*74.19*	*48.39*	*51.61*
Rest of	Count	118	186	113	191
Scotland	*%age*	*38.82*	*61.18*	*37.17*	*62.83*
Overall	Count	158	301	188	271
	%age	*24.5*	*46.7*	*29.2*	*42.1*

Table 13 Respondents' sources of finance in the previous five years, by region

The final column in Table 12 indicates that the proportion of respondents' awarding the highest difficulty ranking ('6') to the availability of capital is about the same in both regions. However, there appears to be a regional difference in the sources of investment capital. Table 13 shows that respondents in the Highlands and Islands were more likely to use their profits and/or savings (χ^2 =7.70, p<0.01) and less likely to obtain investment capital from a high street bank (χ^2 =5.34,

[69] As there was no significant difference between the figures for respondents in the Highlands and Islands and the rest of Scotland, figures for the latter are not given here.

[70] This refers not to the availability of public funding per se (which appears on the column immediately to the right, but to its relative availability to the respondent (e.g. the ease with which they can access it).

$p<0.05$), than respondents based elsewhere in Scotland. As the probability (p) values are less than 0.05, these differences are statistically significant.

Concerns about the availability and skill of the labour force were not significantly more prevalent among respondents from the Highlands and Islands than from elsewhere in Scotland. Those who viewed reliable labour as a very important barrier were more numerous in the Highlands and Islands (Table 12, column 7), but the proportions of respondents across Scotland who ranked this barrier as '5' or '6' are almost identical. Moreover, a much larger proportion of Highlands and Islands respondents (31.7%) than rest of Scotland respondents (17.8%) regarded this issue as not at all important. Just under a quarter of respondents (24.4% of the 160 who answered the question) viewed skilled labour as a very important barrier to future growth, and again there was very little difference in responses from within and outwith the Highlands and Islands. Notably, more than a quarter of respondents overall (26.9%) answered '1' (not at all important) to this question. This implies that more respondents think that the skills of the labour force are not at all important as a barrier to future growth than think that they are a very important barrier.

Columns five and six of Table 12 show that almost a third of respondents perceive the accessibility and availability of public funding to be important barriers to their future growth. However, the bases for these views are unclear. The perception that there is insufficient public funding available is consistent with the opinion, expressed by three-quarters of those who answered the question (n=488), that there is a need for more public funding to support the development of MSMEs[71]. Why they take the view that there needs to be more public funding is uncertain, but it may be related to the perception that the availability of capital is considered the most important barrier to future growth by the most respondents.

Respondents were asked whether they had received public funding to develop their enterprise within the last five years: 92 (18%) of those who answered stated that they had and, when asked whether they would apply for public funding again, 68 of the 76 who answered ticked 'yes'. Thus, among those who had been successful in their efforts to obtain public funding, the great majority would consider doing so again. Within the Highlands and Islands, 37 respondents stated that they had received public funding to develop their business[72]. For the majority (n=23) this came through the Scotland Rural Development Programme, among whom were six recipients of funding targeted at crofters. Six had received funding from HIE; five from fisheries or coastal communities funds; and three from other sources. The funding was for a wide variety of activities, which cannot be summarised here because the small numbers and level of specificity might enable individual respondents to be identified.

[71] There were different levels of agreement from Highlands and Islands (78.7%) and rest of Scotland (73.9%) respondents, but this is not statistically significant.
[72] This excludes funding from the Basic Payments Scheme (EU-funded income support for farmer and crofters).

8 Food and drink innovation in Scotland's Highlands and Islands: towards a gap analysis

It was argued in section 5 that the term cluster may need to be redefined when exploring the development potential of 'peripheral' regions such as Scotland's Highlands and Islands. There are also grounds, based on the analysis in sections 6 and 7, for adopting a broad definition of innovation. This section reflects on some of the implications of doing so and identifies some 'gaps' that future work could start to address.

8.1 Innovation and clustering

Geographical branding, which has formed an important part of efforts to generate place-based value in the food and drink sector, can seem antithetical to innovation, as it is often predicated on the historical characteristics of particular products, production and places. This is explicit in the EU's protected names schemes (q.v. section 6) and is used in the marketing of other food and drink products produced in the Highlands and Islands for consumption elsewhere, such as single-malt Scotch whiskies (Gordon 2015, 379-80). In such cases, innovation may not be applied to the production process to any significant extent. Indeed, in the case of protected name schemes such as those operated by the EU it cannot be, as these must continue to be produced by the traditional methods specified in their application for protected name status. In such cases, the innovation is primarily in branding, through the association of the product with traditional techniques and places associated historically with their production.

Another form of marketing-related innovation in food and drink products, which has been much-discussed in the academic literature, is what one recent review has termed 'innovation from below' (Berti 2020, 7). Here the innovation is centred on the creation and maintenance of 'alternative' networks through which food and drink products move between producers and consumers. 'Alternative' here refers to food and drink networks that are constructed outside or at the margins of the dominant 'conventional' forms of the organisation of food and drink supply which have multiple retailers at their heart[73]. Such 'alternative' food and drink networks seek to differ from their 'conventional' counterparts by emphasising and implementing values – e.g. concerning environmental sustainability, the valorisation of local economic relationships, commitments to higher levels of human and/or animal welfare – which, while not necessarily incompatible with capitalist enterprise, are often subsumed by the drives to generate high profits and maximise shareholder value that characterise, in particular, many Anglophone economies. However, such 'alternative' networks are, almost by definition, likely to be relatively small in scale and vulnerable to disruption.

Nevertheless, and perhaps especially in economically peripheral areas such as the AR and Scotland's Highlands and Islands, widening the focus to include an exploration of such networking and marketing innovations, some of which can be considered as 'retro-innovation' (e.g. the re-purposing or re-invigoration of what are regarded as traditional ways of doing things), may provide useful insights and case studies. For, as Sum and Jessop (2013) argue, it is often from such marginal social spaces that new ways of thinking and performing economic activity emerge.

[73] They manifest what Sum and Jessop (2013) refer to as 'subaltern economic imaginaries'.

Project title	Summary of objectives	NPA funds (€)	From & to	Partner countries
Industrial Symbiosis for Valorisation of Waste Biomass from Food and Beverage Industries	Establish and operate Circular Economy Technology Innovation Platform; develop service portfolio from Technology Innovation Platform for MSMEs to explore circular economy opportunities; train stakeholders to promote circular economy opportunities and Technology Innovation Platform services.	958,364	6/19 to 5/22	Finland, Sweden, Ireland, Norway
Disruptive Technologies in the Arctic Seafood Sector	Evaluate blockchain-based systems for the food supply chain to create and defend market share and add value to the sector and businesses.	85,000	5/20 to 10/21	Scotland (HIE), Iceland, Norway
Tackling constraints on local value food and beverage chains in northern regions	Develop innovative and viable food chains that demonstrate economic, ecological, political and cultural sustainability.	28,992	7/18 to 12/18	Finland, Greenland, Norway, Scotland (UHI)
Regional Innovation in the Nordic Arctic and Scotland with a Special Focus on Regions with Large-Scale Projects	Help local authorities become less vulnerable to large-scale industrial projects; increase knowledge about green technologies for exploitation and reclamation; and identify growth potential for new MSME's in CleanTech bioeconomy sector.	1,220,198	10/15 to 9/18	Sweden, Norway, Greenland, Scotland (UHI), Finland
Northern Cereals – New Markets for a Changing Environment	Increase value of products from the cereal production chain; expand cereal production to new locations; increase the income of farmers and MSMEs.	464,484	6/15 to 5/18	Iceland, Canada, Faroe Islands, Norway, Scotland (UHI)
Smart Labels for High-quality Products	Develop an electronic device printed onto a label that will help all parties involved to verify storage conditions and to improve and ensure the quality of seafood.	647,896	5/15 to 4/18	Iceland, Scotland (Ardtoe), Finland, Norway
Utilisation of the Arctic Sea Urchin Resource	Implement methods of measuring stock biomass; identify and implement sea urchin fisheries management and legislation; establish market needs and methods of getting products to market.	448,046	5/15 to 4/18	Norway, Ireland, Iceland
Opportunities for biorefining of biowastes	Demonstrate opportunities for newly-developed biorefinery mobile pilot plant to refine biowastes.	28,424	3/16 to 11/16	Finland, Iceland, Northern Ireland, Ireland

Table 14 Selected Northern Periphery and Arctic Programme 2014-20 projects relevant to the food and drink sector

Source: http://www.interreg-npa.eu/; accessed 5/9/20

The EU's Northern Periphery and Arctic Programme (see section 2.9) has been a significant provider of (match) funding for such work. A selection of projects relevant to the food and drink sector that were funded by the 2016-20 NPA Programme are listed in Table 14. These tend to be of three main types. First, increasing the volume of, and the value retained in northern peripheral areas from, food and drink production. Second, new ways of ensuring the traceability and provenance of food and drink products from northern peripheral regions. Thirdly, efforts to move towards a circular economy through new uses for, and innovative processes for the transformation of, materials currently treated as waste.

Similar emphases can be found in HIE's Highland Food and Drink Innovation Network, which "aims to raise awareness and adoption of new technologies and innovations specific to the food and drink sector"[74]. However, due to the limitations placed on the work underpinning this report by the COVID-19 'lockdown', it was only possible to produce a preliminary survey of food and drink innovation in Scotland's Highlands and Islands. This is based on figures kindly provided by Interface, which seeks to bring companies and further and higher education institutes together to promote technological innovation. Data from Interface show that, between May 2014 and April 2020, they conducted 467 searches on behalf of Scottish food and drink companies seeking academic expertise to deliver collaborative research and development. Of these, 105 (22.5%) came from food and drink companies located in the Highlands and Islands. The number of Scottish food and drink enterprises classified as 'innovating for the first time through Interface' during this period was 311, of which 69 (22.2%) were based in the Highlands and Islands.

	Innovation Vouchers, led by		
	Interface's Business Engagement Team	**Higher Education Institutions**	**Consultancy projects**
Highlands & Islands[75]	28	10	6
Rest of Scotland	62	89	20

Table 15 Innovation Vouchers and consultancy projects awarded from May 2014 to April 2020 by region

Source: Interface

The chief means by which Interface promotes collaboration between industry and researchers at higher education institutions is by issuing Innovation Vouchers[76]. Table 15 shows the number of Innovation Vouchers issued to, and consultancy projects conducted for, Scotland's food and drink sector from May 2014 to April 2020. As can be seen, the Highlands and Islands accounts for about a quarter of the Innovation Vouchers issued to food and drink enterprises; which is consistent with the proportion of expert searches. Other figures provided by Interface show that the share of collaborative projects won by the Highlands and Islands food and drink sector is the highest of all sectors; though their share of the total funds awarded is less than twenty per cent. This, in turn, suggests that the collaborative funding awarded by Interface to food and drink enterprises in the Highlands and Islands tends to be for smaller projects than elsewhere in Scotland.

[74] https://www.hie.co.uk/support/browse-all-support-services/hfdin/; accessed 29/5/20.
[75] These figures are actually for the region covered by HIE. The HIE region is almost coterminous with the local authority areas of Argyll & Bute, Highland, Moray, Na h-Eileanan Siar, Orkney Islands and Shetland Islands which, for the purposes of this report, constitute the Highlands and Islands. However, a small part of Argyll & Bute lies outside the HIE region and the islands of Arran and Cumbrae (administratively part of North Ayrshire) lie within it.
[76] https://interface-online.org.uk/how-we-can-help/funding/; accessed 31/5/20.

Work conducted as a result of the issuing of Innovation Vouchers not only provides a sense of how food and drink MSMEs are seeking to innovate, it can also be of direct relevance to producers in the AR. For example, Dr Silvia Gratz of the Rowett Institute has conducted research, funded by Interface, to investigate mycotoxin contamination of Scottish oats and the risk for Scottish production[77]. Oats are hardy and are grown extensively in northern countries such as The Russian Federation, Canada and Finland. Such work, therefore, opens up the possibility of further collaboration and innovation in the production of such 'northern' grains.

Research into food and drink is conducted at many Scottish universities outwith the Highlands and Islands. For example: Stirling University's Institute of Aquaculture[78]; the International Centre for Brewing and Distilling at Heriot Watt University[79]; the Scottish Centre for Food Development and Innovation at Queen Margaret University[80]; and the Rowett Institute for Nutrition and Health at the University of Aberdeen[81]. In addition, there are specialised institutes providing research and teaching related to food and drink. These include: The James Hutton Institute, which undertakes fundamental and applied research to promote the sustainable use of land and natural resources[82]; the Moredun Research Institute, which researches livestock diseases and works to translate its findings for use in the farming industry[83]; and Scotland's Rural College, which conducts research in animal and veterinary science, crop and soil systems, farming and the rural economy[84]. HIE has extensive links with these and more. Indeed, information from Interface shows that 51 projects awarded in 2018-19 and now completed were conducted with 16 higher and further education institutes, most of which are outwith the Highlands and Islands.

HIE has identified economic sectors and activities as priorities for innovation and investment in the Highlands and Islands[85]. Those of direct relevance to the food and drink sector include:

- The marine or blue economy, including aquaculture (especially salmon) and marine biotechnology (energy, human health, and food production);
- Seaweed harvesting and cultivation, primarily for bioremediation but with potential for human health and pharmaceuticals, food supply, cosmetics and biomass;
- The utilisation of fish waste, primarily as biomass but with potential for chemical extraction;
- Exports to China;
- Agri-tourism.

Concerning the first three of these[86], HIE recently led a science and innovation audit of the marine or blue economy, MAXiMAR. This envisages a "regional cluster model for marine innovation, technology and skills" (Highlands and Islands Enterprise 2019d, 8) based on: workforce development; an infrastructure investment plan; and better alignment of science, research and industry. The report summarises market trends in three sectors – aquaculture, marine

[77] https://www.abdn.ac.uk/rowett/research/profiles/s.gratz; accessed 31/5/20.
[78] https://www.stir.ac.uk/about/faculties/natural-sciences/aquaculture/; accessed 31/5/20.
[79] https://icbd.hw.ac.uk/; accessed 31/5/20.
[80] https://www.qmu.ac.uk/research-and-knowledge-exchange/research-centres-institutes-and-knowledge-exchange-centres/scottish-centre-for-food-development-and-innovation/; accessed 31/5/20.
[81] https://www.abdn.ac.uk/rowett/; accessed 31/5/20.
[82] https://www.hutton.ac.uk/; accessed 31/5/20.
[83] https://www.moredun.org.uk; accessed 31/5/20.
[84] https://www.sruc.ac.uk/info/120035/research; accessed 31/5/20.
[85] See, for example, Highlands and Islands Enterprise (2019d, 2019e).
[86] The last two will not be discussed here, as they are beyond the remit of this report.

biotechnology and wave and tidal energy – and audits scientific research and innovation in seven local authority areas: Argyll and Bute; Comhairle nan Eilean Siar; Highland; Moray; North Ayrshire; Orkney and Shetland. The audit's gap analysis (Highlands and Islands Enterprise 2019d, 50) identifies six potential benefits of the proposed regional cluster model:

- Innovation and research and development that meet the needs of the marine economy industry;
- A skilled available workforce;
- Increased inward investment in the Highlands and Islands;
- Contribution to improved productivity in Scotland;
- The value to the UK economy is maximised;
- Scotland is a global leader in the marine economy and home to world class science and innovation.

The regional cluster model proposed by the MAXiMAR audit is of a type that could be described as economically 'orthodox'. It is about harnessing the region's natural resource endowments and creating conditions in which innovative companies that make use of them – in this case aquaculture, marine biotechnology and wave and tidal energy – can thrive, thereby generating inward investment, a skilled labour force and, through collaboration with research institutes and universities, further innovation and improved productivity. Moreover, by focusing on seeking to build regional linkages to create an 'innovative milieu'[87], the MAXiMAR approach appears to have learned lessons from previous spatial economic policy in Scotland by seeking to foster what Dimitratos et al. (2009) termed 'entrepreneurial subsidiaries'. The emphasis is on attracting and then, by creating complex and high-value linkages based on continuous innovation, 'locking-in' inward investment that will provide longer-term economic benefits for the regional, Scottish and UK economies. In other words, this approach seeks, by fostering economic development *in* the region, to foster development *of* the region.

Policy initiatives such as those advocated by MAXiMAR's regional cluster model have a long lineage and can have significant economic benefits. However, in the present context, what is of primary interest is the 'gaps' that they reveal. Two are of particular importance here. First, such area-based economic development policies run the risk of ending up serving the interests of powerful and footloose economic actors while doing relatively little for the development of the region. By seeking to support future economic 'winners', they tend to overlook long-established sectors and enterprises that remain important in the region but that are economically disadvantaged or do not present known opportunities for technological or process innovation. It is significant that the fishing industry, which is present in coastal communities across the Highlands and Islands, is largely absent from MAXiMAR's regional cluster model for the development of the region's marine economy.

Secondly, such approaches face particular challenges in trying to foster development in economically peripheral regions. Such challenges are particularly significant in Scotland's Highlands and Islands, which "is characterised by dispersed, fragile communities" (Highlands and Islands Enterprise 2019d, 49). They arise, in part, because the market forces that such approaches seek to harness in order to attract inward investment have also contributed to the economic marginality that they seek to address. This may seem paradoxical, but it reflects the fact that

[87] For a review of this approach, see Crevoisier (2004).

economic activity occurs neither in isolation nor on a frictionless plane. Economic clusters, by definition, are a manifestation of geographically uneven economic development. As Myrdal (1957) pointed out, clustering attracts investment and people from elsewhere and this creates a 'backwash effect', manifested in dis-investment and out-migration from other places. Thus, the social and economic disadvantages of peripheral areas are not simply a result of their somehow 'failing to keep up': they are a corollary of economic clustering elsewhere.

The clustering of economic activities tends, therefore, to create large 'gaps' into which the economically and geographically marginalised can fall. This means that enterprises in economically peripheral areas, and those that do not operate in sectors where innovation and clustering are being actively pursued and funded, are unlikely to be helped by 'orthodox' regional cluster models. In addition, the investment of funds in helping to generate innovative economic 'winners' can result in there being less funding available to provide support elsewhere. That said, investment in research and development in Scotland by governments, universities and charities is higher (on a pounds per resident basis) than in all other UK nations and regions outside London (Forth and Jones 2020, 18). Conversely, business spending on research and development in Scotland (on the same basis) is fourth lowest among the UK nations and regions (ibid.).

There is an instructive parallel to be drawn here with urban regeneration policy. For example, McCarthy (2010) found that area-based urban regeneration policies in Scotland have done little to deliver improved social justice. Of course, MAXiMAR's regional cluster model for the blue economy is not primarily intended to promote regional economic development, let alone social justice, so it would not be reasonable to criticise it for not doing so. However, it can be argued that HIE, as "the economic and community development agency for the north and west of Scotland"[88], should promote the development *of* the region, not just development *in* the region.

8.2 Clustering and regional development

The 'gaps' exposed by the limitations of 'orthodox' innovation and cluster-based economic development policies beg the question of whether, and how, they might be filled. On the basis of the discussion in this report, and in the context of developing links with food and drink enterprises and networks in the AR, two avenues suggest themselves. The first is to focus on those parts of the food and drink sector where there is potential for the exchange of information and learning from one another's experiences and for the development of mutually beneficial trade links and joint working. The second is to broaden the focus from strictly economic enterprises to include those that have a more social or community focus. These two avenues are explored below, and suggestions made as to where evidence may be found to fill the knowledge 'gaps' identified.

An obvious starting point is sea fishing, which was identified by Jafry et al. (2019) as providing potential for economic links between Scotland and the AR. In 2018 about 40 per cent of the total tonnage of fish and shellfish landed in Scotland went through ports in the Highlands and Islands (Marine Scotland 2019, 24). The total value of these landings was about £236 million, just over 45 per cent of the Scottish total and slightly higher than the combined value of landings in Peterhead, Fraserburgh and Aberdeen (Marine Scotland 2019, 25). Although Scottish and regional control over fishing is limited, with negotiations over quotas being conducted by the UK Government,

[88] https://www.hie.co.uk/about-us/; accessed 30/5/20.

such figures demonstrate the sector's significance in the Highlands and Islands. Moreover, it has been growing, at least in relative terms. For example, in 2002 demersal fish[89] landings in Shetland and Fraserburgh were comparable (RSE 2004, 23); in 2018 Shetland's demersal landings exceed Fraserburgh's by a considerable margin (Marine Scotland 2019, 24). In addition, while almost half the total tonnage of fish and shellfish landed in the Highlands and Islands comes ashore in Shetland, the rest comes into ports throughout the region, with demersal landings dominant in Scrabster, Kinlochbervie, Lochinver and Ullapool on the north and north-west mainland, and shellfish landings dominant in Campbeltown, Stornoway, Oban, Mallaig, Buckie and Portree (Marine Scotland 2019, 24).

Thus, it seems sensible to explore the potential for building links between the sea fishers and fishing ports of the Highlands and Islands with similar enterprises in the AR. Table 16 lists, from public sources, of some of the key organisations that manage quotas, represent and provide support for Scotland's diverse fishing and fish processing sectors, and which would be key stakeholders in such explorations.

Organisation	Website	Main purpose(s)
Aberdeen Fish Producer's Organisation	https://www.afpo.co.uk/	Quota management, representation and marketing for member fishermen and their produce; members from Aberdeen to Buckie
Anglo Scottish Fishermen's Association	https://www.sff.co.uk/our-members/asfa/	Represents fishermen, skippers and boat owners from the Rivers Aln to Forth; member of SFF
Communities Inshore Fisheries Alliance	https://www.cifascot.com/	Policy and action group which aims to address the economic and physical needs of Scottish inshore fisheries and their associated communities and businesses
Fishermen's Mutual Association (Pittenweem) Ltd	https://www.pittenweem.co.uk/	Fishermen's supply and marketing cooperative; member of SFF
Fishing Vessel Agents & Owners Association (Scotland) Limited	https://www.sff.co.uk/our-members/fva/	Membership organisation for those who agent and own fishing vessels; member of SFF
Lunar FPO	http://www.lunarfreezing.co.uk/lfpo.html	Manages fish quota for its own fleet of vessels; cutting, storage and transport
Mallaig and North - West Fishermen's Association	http://www.mnwfa.co.uk/	Represents the political, commercial and pastoral interests of members; provides financial assistance and services for members; member of SFF
North East of Scotland Fishermen's Organisation	https://www.nesfo.co.uk/	Producers' (Catchers') Organisation allocating quota to members between Peterhead and Avoch; aims to secure sustainable and profitable fisheries and a high degree of industry involvement in all fisheries' management decisions

[89] Demersal species live and feed at or near the sea bed. They include cod, haddock, monkfish, sand eels etc.

Northern Producers Organisation	http://www.northernpo.co.uk/	Managing quotas for and markets the produce of members based in Scotland, Spain, England and Northern Ireland
Orkney Fish Producers Organisation		Manages Common Fisheries Policy quotas for Orkney [inferred]
Orkney Fisheries Association	https://www.orkneyfisheries.com/	Represents the interests of Orkney's fishing fleet; seeks to improve on-board safety, ensure the sustainability of Orkney's inshore fisheries and increase knowledge and understanding of fishing stocks and the Orcadian environment; member of SFF
Scottish Creel Fishermen's Federation	http://scottishcreelfishermensfederation.co.uk/about.htm	Works to promote the creel fishing industry, sells its products and ensures Scotland's inshore fisheries are well managed economically and environmentally sustainable
Scottish Fisheries Sustainable Accreditation Group	http://scottishfsag.org/	Supports sustainable management and exploitation of the demersal fisheries in which members operate; seeks to maintain Marine Stewardship Council certification
Scottish Fishermen's Federation (SFF)	https://sff.co.uk/	Represents the interests of Scottish fishermen at national and international levels by lobbying government officials in Edinburgh, London and Brussels; helps to inform fisheries science, the management of the marine environment, inshore fisheries management, marine spatial planning, marine safety regulations and industry recruitment and training programmes
Scottish Fishermen's Organisation	https://www.scottishfishermen.co.uk/	Fish Producer Organisation; has one third of the Scottish fishing fleet in its membership; manages Common Fisheries Policy quotas; operates two onshore processing facilities in Scotland; markets fish products
Scottish Pelagic Fishermen's Association Ltd	https://scottishpelagic.co.uk/	Represents 22 member vessels at political and fisheries management levels; seeks to ensure a sustainable future for pelagic fisheries; member of SFF
Scottish Pelagic Sustainability Group	https://www.spsg.co.uk/	Represents Scotland's pelagic industry; established to oversee the certification of its main fisheries to the Marine Stewardship Council eco-label standard; aims to ensure that the Scottish pelagic industry is sustainable

Scottish Seafood Association	https://www.scottishseafoodassociation.com/	Representative body for Scottish seafood processors; provides business services; seeks to raise awareness of their products
Scottish White Fish Producers Association	https://swfpa.com/	Represents around 200 vessels and 1,400 fishermen; relays their experiences, concerns, and insights to policymakers and other relevant industry figures; member of SFF
Seafish	https://www.seafish.org/article/scotland	UK-wide non-departmental public body, with a Scottish regional office; works with all parts of the seafood industry; provides marketing, responsible sourcing advice, training and research
Seafood Scotland	https://www.seafoodscotland.org/	National trade and marketing body for the Scottish seafood industry
Shetland Fishermen's Association	www.shetlandfishermen.com/shetland-fishermens-association	Promotes the interests of around 90 members, mainly in the political arena, in Scotland, the UK & EU; member of SFF
Shetland Fish Producers' Organisation	https://www.shetlandfishermen.com/about/sfpo	Manages Common Fisheries Policy quotas; markets Shetland fish internationally
Shetland Shellfish Management Organisation	https://www.ssmo.co.uk/	Manages the commercial shellfish fisheries between tide line and the 6 mile limit around the coast of Shetland; run by a board of directors half of whom are active fishermen

Table 16 Organisations representing and providing support for Scotland's fishing and fish processing sectors

There would also be merit in exploring the potential for the Highlands and Islands' terrestrial food producers and processors to be involved with food and drink sector networks in the AR. As noted in section 4, there are potential commonalities between the indigenous peoples of the AR and crofters, which could give rise to fruitful dialogue and knowledge exchange on cultural, social, political and economic matters. With regard to potential economic commonalities, sections 6 and 7 noted the use of geographical branding by food and drink producers in the Highlands and Islands, something that is being explored in the context of seeking to generate a placed-based premium brand for food from the AR (Yang et al. 2020). In addition, anecdotal evidence from Canada suggests that residents in the AR are developing small-scale innovations, such as combined greenhouses and root cellars in Labrador[90], which, while not at the cutting-edge of technology, may be both effective and affordable for smaller-scale producers and communities. Similar initiatives, some involving technological innovation, are underway in other parts of the AR, such as Iceland, Norway and the Faroe Islands. In addition, researchers at the University of Saskatchewan are examining the trading of meat and other country foods by indigenous peoples in the AR and are exploring with them the possibilities for their expansion and commercialisation[91].

[90] Personal communication with Sheila Downer, Strategic Northern Liaison, Office of Public Engagement, Memorial University of Newfoundland, 19/3/20.
[91] Personal communication with Professor David Natcher, Director of the Indigenous Land Management Institute, University of Saskatchewan, 5/5/20.

There appears to be potential for constructive engagement between such innovators in the AR and those in the Highlands and Islands that seek to diversify their production and to create and sustain 'alternative' food and drink distribution networks. Table 17 lists, from public sources, some of the organisations that represent, provide support for and market produce from Scotland's terrestrial food and drink sectors, and which would be stakeholders in such engagement.

Organisation	Website	Main purpose(s)
Agriculture and Horticulture Development Board	https://ahdb.org.uk/	British statutory levy board providing and brokering research, knowledge exchange, marketing and training for farmers and growers of beef and lamb, cereals and oil seeds, dairy, horticulture, pork and potatoes
Angus Growers	https://www.angusgrowers.co.uk/	Soft fruit producer organisation owned and managed by 19 growers; oversees the collection, packing and marketing of members' produce
Big Barn	www.bigbarn.co.uk	UK-wide local food map and directory
British Game Alliance	https://www.britishgamealliance.co.uk	Official marketing board for British game meat; runs assurance scheme for shoots and game meat; maintains a list of game stockists
British Growers	https://britishgrowers.org/	Grower-owned and led umbrella group for the UK horticulture industry and fresh produce sector; membership includes crop associations, marketing groups and producer organisations
Connect Local	https://connectlocal.scot/	Scotland's local food and drink marketing advisory service
Dairy UK	https://www.dairyuk.org	Promotes the interests of the diary sector with policy-makers; promotes the nutrition and health benefits of dairy produce; runs the Dairy Transport Assurance scheme
Farm Retail Association	https://farmretail.co.uk/	Provides UK-wide support, networking, training and services to farm-based retail; maintains directories of farm retailers and suppliers
Food and Drink Federation Scotland	http://www.fdfscotland.org.uk/sfdf/	Industry-funded trade association engaging with politicians, policy-makers and the media; open to food and drink manufacturers of all sizes; a division of the Food and Drink Federation
Game & Wildlife Conservation Trust Scotland	https://www.gwct.org.uk/scotland/	Produces and promotes scientifically-informed game and wildlife management; supports best practice for field sports; runs the annual Scottish Game Fair
National Farmers Union Scotland	https://www.nfus.org.uk/	Agricultural lobbying organisation; promotes the interests of farming and

		crofting; supports and promotes its members
National Sheep Association Scotland	https://www.nationalsheep.org.uk/nsa-scotland/	Aims to complement the work of its parent British Association by promoting and protecting the interests of sheep farmers in Scotland
Orkney Food & Drink	https://www.orkneyfoodanddrink.com/	Maintains a list of, and supports, food enterprises in Orkney
Quality Meat Scotland	https://www.qmscotland.co.uk	Licences Scotch Beef PGI, Scotch Lamb PGI and Specially Selected Pork brands
Scotch Whisky Association	https://www.scotch-whisky.org.uk/	Supports whisky producers; maintains a list of members
Scotland Food and Drink	https://www.foodanddrink.scot https://foodanddrink.scot/support-local/	Membership organisation, supported by the Scottish Government, and set up help deliver its industry strategy; seeks to build a collaborative partnership of key industry organisations and sector agencies; hosts the Support Local directory of Scottish food and drink businesses
Scottish Agricultural Organisation Society	https://saos.coop/	Member-owned development organisation providing information, development and consultancy services to food and farming businesses
Scottish Beef Association	https://www.scottishbeefassociation.co.uk/	Scottish beef producers' group seeking to influence and shape the structure and business environment in which the industry operates; promotion of the beef industry in Scotland, the UK and Europe
Scottish Crofting Federation	https://www.crofting.org/ and https://www.scottishcroftingenterprise.co.uk/index.html	Campaigns for crofters and crofting; runs the Scottish Crofting Produce Mark to certify crofters' produce; maintains a directory of active crofters selling food, crafts and holiday accommodation
Scottish Food Guide	https://scottishfoodguide.com/places/producers/	Independent guide to "showcase and promote the finest food enterprises in Scotland"
Scottish Gamekeepers Association	https://www.scottishgamekeepers.co.uk/	Represents gamekeepers, stalkers, ghillies, wildlife managers and rangers; promotes education and best practice in gamekeeping
Scottish Land and Estates	https://scottishlandandestates.co.uk/	Represents land-owners' views to politicians and other decision-makers; identifies future opportunities and risks for land-based businesses; supports those with a stake in rural land and property
Scottish Organic Producers Association	http://www.sopa.org.uk/	Protects and upholds the organic integrity of products produced by its members and certified to its organic standards; supports members in building financially and environmentally sustainable businesses

Scottish Tenant Farmers Association	http://www.tfascotland.org.uk/	Works to support and enhance the position of agricultural tenants; aims to improve members' professional and technical knowledge
Scottish Venison Association	https://www.scottish-venison.info/	Non-profit body bringing together private and public sector, wild and farmed venison producer and processor interests; oversees delivery of the Scottish Venison Strategy; promotes demand for venison
Soil Association Scotland	https://www.soilassociation.org/our-work-in-scotland/	Promotes production and consumption of organic produce; certifies organic food production; supports 'Food for Life' school meal provision; maintains a directory of organic food and drink retailers; a division of the Soil Association
Taste of Scotland	https://www.taste-of-scotland.com/	Online directory of Scottish restaurants and food producers
Taste of Shetland	https://www.tasteofshetland.com/	Maintains a list of, and supports, food enterprises in Shetland
Wild About Argyll	https://www.wildaboutargyll.co.uk/	Maintains a list of businesses; marketing and tourism activities

Table 17 Organisations representing and providing support for Scotland's terrestrial food and drink production and processing sectors

A further avenue worth exploring, in the context of understanding more fully the potential contribution that Scotland's Highlands and Islands could make to the development of economic links with the AR, would be to consider the potential involvement and contribution of social and community enterprises. One justification for this is the role that such enterprises have played in urban regeneration. For example, one review found that:

> "A major advantage of community enterprises is that they can innovate in policy making and identify new ways of delivering services and make the most of assets which other sectors may not be in a position to do. They do this by having a clear understanding of the needs of their local communities whilst also being pragmatic in taking advantage of assets and funding opportunities. Delivery may also involve harnessing the skills and enthusiasm of the local community through indirect means, such as encouraging volunteering and involving local schools and sports clubs" (Bailey 2012, 33).

However, it should be noted that such approaches share, along with area-based economic development approaches (such as cluster development policies), a requirement for long-term public investment and support in order to succeed. Local communities and economies do not exist in isolation and an approach that expects local initiatives to generate local development using only local resources is unlikely to succeed[92]. However, in a political environment geared towards the electoral cycle, and characterised since 2010 at the UK level by reductions in public spending, such commitments can be difficult to defend and sustain.

[92] See, for example, Eisenschitz and Gough's (1993) analysis of the 'Bootstraps' strategy for local economic development that was popular among policy-makers in the 1980s and 1990s.

The suggestion that social and community enterprises might help to fill a 'gap' in economic and community development policy raises further questions, such as: how they can do so; under what circumstances can they make a positive contribution; and what policy support might they need. One means of addressing these evidence gaps is to build a more complete picture of which social and community enterprises operate in the Highlands and Islands, how they work and what their priorities and difficulties are. As a first step in this process, Table 18 lists organisations providing support for and listings of, *inter alia*, social and community enterprises in the Highlands and Islands.

Organisation	Website	Main purpose(s)
British Council	https://www.britishcouncil.org/society/social-enterprise	List of websites, programmes and organisations offering support to social enterprises
CEIS	https://www.ceis.org.uk/	Support for enterprises and communities
UK Cooperatives	https://www.uk.coop/directory	UK umbrella body to encourage and support cooperation and cooperative societies
FCA Mutuals register	https://mutuals.fca.org.uk/	List of mutual and community benefit societies
inspiralba	http://www.inspiralba.org.uk/rural-social-enterprise-hub/	Support for social enterprises
SENSCOT	https://senscot.net/networks/	Supports and facilitates Social Enterprise Networks across Scotland
Social Enterprise Academy	https://www.socialenterprise.academy/scot/about	Personal and organisational growth in Scotland for social entrepreneurs, 3 Hubs
Social Enterprise Scotland	https://socialenterprise.scot/	Provides support for, and maintains a directory of, social enterprises
Social firms Scotland	https://socialfirms.org.uk/	National support body for social firms, a type of social enterprise which creates employment and meaningful work for people who face significant barriers to employment

Table 18 Organisations providing support for and listings of social enterprises etc. active in the Highlands and Islands

Although the organisations listed in Table 18 offer scope for identifying social enterprises in the Highlands and Islands that are involved with the production of food and drink, examination of their websites yielded only eight social enterprises that are devoted exclusively to such activities. Of these, most were cafes. It is likely that there will be many more that are involved with, but not devoted solely to, food and drink, but identifying and classifying them will take time.

However, there is growing research interest in this area. For example, The James Hutton Institute is examining the role of innovation in food production and the potential for community

involvement[93]. Technical innovations (such as controlled environment agriculture and vertical farming) are seen as potential ways to address systemic challenges in food systems, including food security and the degradation of soils and water. While the science informing technical agricultural innovations is developing rapidly, for example through The James Hutton Institute's Advanced Plant Growth Centre[94], the social and political implications of these innovations are more uncertain, particularly in remote and rural areas. Questions include: who has access to such technology; who benefits and in what ways; and how do such innovations affect existing food systems and help to address food insecurity. Of particular interest is the potential for such innovations to be adopted by local and community-based groups to address food insecurity or to provide an income stream for local development. Such potential may be limited: technical food innovations such as indoor farming provide only a few highly skilled and specialised jobs and provide little support for community interaction in the way that community gardening and urban agriculture do. However, they may also provide opportunities for communities to develop innovative food technologies that can provide community benefits and contribute to resilience and wellbeing. For example, some communities have abundant renewable energy (e.g. in Orkney) which could be used to provide the significant power requirements of indoor growing. Such research is in its early stages, but opportunities to develop partnerships with potential innovative food-growing projects in the AR, with a view to understanding the social, political and environmental impacts of food innovations on remote and rural communities, would be welcome.

8.3 Using social media analysis to examine stakeholders' views

It has already been noted that it was not deemed appropriate to engage actively with stakeholders during the COVID-19 'lockdown', and that this imposed limitations on the scope of this report. However, it may be possible to gauge stakeholders' views in other ways. One is by analysing posts on social media. There are ethical issues to be considered when analysing data from the internet, one being the extent to which informed consent can be deemed to have been provided to use data posted on social media for research[95]. However, on the basis of work being undertaken by colleagues at Scotland's Rural College[96], the methods for which they have kindly shared, it was possible, using the COVID-19 pandemic as a focus, to conduct a preliminary analysis of posts (tweets) to Twitter from selected users. While these are not necessarily of direct relevance to the aims and objectives of this report, the methods and results provide an example of how the technique could be used in future work.

The first step involves the identification of a set of 'starter' stakeholders who are judged to be key network nodes. The types of Twitter user that work best for this include food industry bodies, food marketing organisations and food advocacy groups. For this analysis, the following were chosen as starter stakeholders:

- Highland Food and Drink Club - @HighFoodDrink
- Orkney food and Drink - @OrkneyFood
- Isle20 - @Isle20shop
- Scottish Grocers Federation - @ScotGrocerFed
- Nibble Scotland - @NibbleScotland

[93] The author is indebted to Dr Liz Dinnie, of The James Hutton Institute, for the information in this paragraph.
[94] https://www.hutton.ac.uk/about/facilities/advanced-plant-growth-centre-0; accessed 31/5/20.
[95] For a fuller discussion see Eynon et al. (2017).
[96] The author is indebted to Elliot Meador for help with the method and primary data collection.

- Lantra - @LantraScotland

Using R studio software, tweets from these users were downloaded and compiled in a database (which can be downloaded as an excel spreadsheet). Tweets were collected for 28 and 29 April 2020. The data obtained includes Twitter name, information from the user's Twitter biography, tweets, whom they tweeted and their location (if tagged). The software also locates and downloads tweets from users that the 'starter' users interact with, in order to get a sense of network interactions. These connections can then be mapped, and clusters and interactions visualised. There are some limitations to this method. The first is that only tweets from the previous 24 hours are collected. The code has to be run manually so, if tweets for more than one 24-hour period are required, the process must be repeated at the same time each day.

The main output from this method is the content of the selected tweets. 709 tweets were collated from the starter stakeholders, from 60 different users. Table 19 lists the frequency of key words.

Word/phrase	Frequency
Business	93
COVID-19	75
Food	58
Local	37
Lockdown	32
Dairy	18
Seafood/fish	10
Highlands	8
Beef	6

Table 19 Frequency of key words from the data set of tweets

Key words can also be filtered in the data to extract specific tweets of interest. Table 20 highlights some of these of interest for this report, including: the importance of local supplies now and in future; food producers; sector specific issues (related to COVID-19); and businesses. The data presented in Table 20 can also be cross-referenced with the individual or organisation that tweeted, so inferences of viewpoints from different categories of stakeholder could potentially be made.

Key word	Tweet
Food	"We would like to build on this to provide up-to-date information on food outlets who are still open for business and offering any of the following services to the public: - Deliveries of groceries, fruit and veg, store cupboard essentials, or fresh meat and fish. https://t.co/rkIfw8Wq4J" "People, place and production are deeply interconnected and co-dependent - the WAY we produce our food and interact with our landscape can regenerate and do good, or it can cause enormous harm https://t.co/uycMVI1Rkq" "Fancy getting your old fashioned, 100% grass fed milk delivered by horses this weekend??? If you live in Cumnock you're in luck!!! We're supporting our pals at @Clydesdale_Fun in their crowdfunding campaign… bringing old fashioned food back in a new way! Check Facebook for more https://t.co/f4qFbxal9x"

Value	"Hard-pressed consumers might either stop buying high-value products, cut back on purchases, or trade down to more value-oriented options." Supply chain insights from #TeamPromar's @johngiles1871 https://t.co/cNb8a8qYqf"
Local	"Please use local butchers, veg shops, dairy, and other local producers- and please continue to do so after the lockdown ends." "Why we should all buy local to support Scotland's food industry #BuyLocal #EatScottish https://t.co/gHTm9C18Gb" "QMS are encouraging consumers to make the most from their leftovers... Head to your local Scotch Butchers Club member to pick one up #MakeIt https://t.co/XIJQ9TDw0Q" "And we need farming and local food production now more than ever. #eatlocal @NFUStweets https://t.co/YdgRxDobh4"
Dairy	"Fingers crossed that it doesn't come to it but just in case, the guidance document for dairy farmers in relation to spreading of uncollected milk as a consequence of the coronavirus crisis https://t.co/wkOlOFUBpo https://t.co/W85ceimKYC" "Good to see @BBCCountryfile tonight covering the ongoing dairy crisis, featuring some of our amazing British dairy farmers to articulate the challenges currently being faced by so many farmers and the issues to come, if urgent action isn't taken to support our sector. https://t.co/XkHMo2jK5l"
Business	"We are working with partners on the impacts of the #coronavirus (#COVID19) outbreak. To date, 86 applications have been processed for payment as part of the Scottish Seafood Business Resilience Fund, totalling £4 million. Read more https://t.co/ZW0SL9uKSv https://t.co/l8KCCx2BUq" "Support for tourism, hospitality needs to be extended, says Ed Milliband https://t.co/8wZxFp1HMr via @https://twitter.com/smallbusinessuk" "This is an excellent report - well worth reading for food & drink businesses thinking about starting to sell online, or improving their online retail presence https://t.co/QnThPS4CqD"

Table 20 Key tweets of interest from the data set

9 Summary and concluding reflections

There were three areas of interest for this Fellowship, which formed the objectives for this report. These, and the sections that discussed them, are:

1. The Highlands and Islands as a food producing region (i.e. regional attributes shared with northern countries, e.g. provenance, slow maturing, depth of flavour, more sustainable, pristine environment, traditional methods; the opportunities and challenges facing the Highlands and Islands as a food producing region; and synergies with Arctic and near Arctic regions); discussed in sections 6 & 7;
2. Cluster models (i.e. identification and comparison of clusters operating at local, regional, national and international levels); discussed in sections 5, 7 & 8;
3. Research and Innovation (i.e. Scottish and northern countries' food research strengths and innovation); discussed in section 8.

The dislocation caused by the COVID-19 pandemic precluded the intelligence-gathering from stakeholders that was envisaged for this work. This has been offset, in the case of objective 1 and to a lesser extent objective 2, by analysis of evidence from a survey of Scottish food and drink enterprises, which allowed a comparative exploration of certain aspects of food and drink production in the Highlands and Islands. Data were also made available by Interface on research and innovation, and vignettes added of research known by the author to be underway, but more detailed exploration of objective 3 was not possible.

The first summary observation to make in this context concerns the tensions revealed between objective 1 and objectives 2 and 3. An important characteristic shared, to varying degrees, by the AR and Scotland's Highlands and Islands is peripherality. In socio-economic terms this is manifested in: a predominance of small, dispersed and economically fragile communities; limited employment opportunities, particularly in professional and managerial occupations; suboptimal transport and communications infrastructures; and remoteness from centres of economic and political power. The crucial point here is that, in socio-economic terms, peripherality is relational: it is a product of the operation of economic, political and socio-cultural forces which, in general, are controlled or 'steered' by powerful agents based in core metropolitan areas. Therefore, places and regions are peripheral not because they are remote from the main currents of economic, political and social change but because they have been and remain subject to them. Climate and the availability of certain resources are natural phenomena, though mediated and influenced by human activity. Peripherality is socially and economically constructed and maintained. It is a product of connectedness, not isolation.

This has significant implications for approaches that encourage economic and community development through economic clustering, research and innovation. Such approaches seek to use, for the purposes of regional development, the very forces that help to maintain the peripherality of those regions. Moreover, such 'orthodox' economic and community development policies, which tend to emanate, and be predicated on funding, from core regions, can be insensitive to geographical context. This issue has particular salience in those Arctic states that exercise sovereignty over the homelands of indigenous peoples. It is also relevant in the Highlands and Islands, homeland of the crofting way of life and the Gàidhealtachd.

Such considerations lead this report to recommend widening attention from 'orthodox' cluster-formation and innovation policies. This is not to dispute their importance in fostering economic development and innovation. Instead, it is to acknowledge their limitations. The market forces that

drive and sustain economic clusters, which are often encouraged by national and international economic policies, cannot easily be made to serve the interests of areas whose economic peripherality they help to maintain. There is tacit acknowledgement of this in much economic development policy for peripheral regions, which often focuses on securing to the region a greater share of the value added to natural resources that are exported from it. Here, then, the focus could be broadened to include those types of enterprise that are already present but that may not be identified as being particularly innovative or having high growth potential. In the present context, fishing (for shellfish, pelagic and demersal species) and agriculture would repay further scrutiny.

So, too, would a broader definition of innovation. Again, this is not to argue against the proven ability of technological innovation to drive economic growth and development. But, the evidence discussed in this report suggests that marketing innovations could also be important. Perhaps the best-known of these are in the development of geographical branding, as exemplified in the development of the market for single-malt Scotch whiskies and relatively high levels of engagement with the EU's protected names schemes. There may well be similarities between, and opportunities for, a pooling of ideas and experiences from these and other branding innovations, such as the Scottish Crofting Produce Mark and the proposal to establish a brand identity for produce from the Canadian Arctic (Yang et al. 2020). In parallel with such efforts, but not reducible to them, are attempts to create and sustain so-called 'alternative' food networks, through which producers and consumers are linked in ways that are independent of the handful of multiple retailers that dominate the sector. Such efforts have led, for example, to the development of farmers' markets and the revivification of farm retailing in recent decades. They received an unanticipated boost during the COVID-19 'lockdown', seemingly from the confluence of two sets of developments: people seeking alternative retail outlets because of perceived shortages of certain foods in supermarkets; and local delivery services expanding to deliver to consumers' homes, especially those prevented from going out. In response, Scotland Food & Drink launched an online directory which aims to connect consumers with food and drink businesses in their local area[97]. Such innovations are unlikely to drive large-scale economic development and productivity growth. However, those are not the only economic yardsticks that matter. For example, Finland's Arctic Smart Rural Community cluster is seeking to stem the outflow of capital from rural areas by capturing more of the value added to rural products and developing decentralised renewable energy capacity[98]. Thus, promoting the economic sustainability of MSMEs that are associated with an area by enabling them to secure a greater share of the retail price of their products should remain an aim of policy.

Such a focus may also help to secure wider community benefits. Inhabitants of peripheral areas, for example Scottish crofters and indigenous peoples living in the Arctic regions of Canada and the Russian Federation[99], frequently engage in small-scale processing and trading activities which, while not necessarily their main source of income, can contribute to their and their communities' sustainability. In this context, it would be worth exploring broadening the policy focus from strictly economic enterprises to include social and community enterprise. Such thinking would appear to inform Laurence et al.'s (2019) argument for a focus on social enterprise when setting policy for food innovation in northern Canada. To do this would not be to devalue economic activity: all enterprises, if they are to be economically sustainable over the medium to long term, must generate a surplus for reinvestment. Instead, it is to consider the ends that economic activity serves. If sustainable development of the AR and of Scotland's Highlands and Islands is the goal, then the development of their communities, in ways that are acceptable to those communities, should be a

[97] The directory is called Support Local: see https://foodanddrink.scot/support-local/; accessed 6/8/20.
[98] See https://arcticsmartness.eu/arctic-smart-rural-community/; accessed 6/8/20.
[99] Personal communications, from Professor David Natcher of the University of Saskatchewan (concerning Canada) and Professor David Anderson of the University of Aberdeen (concerning The Russian Federation).

policy priority. A prerequisite for this is knowing what kind of development that communities want and how they propose, with appropriate support, to bring it about.

The consultations, which would need to take on board the views of policy stakeholders as well, that would be required in order to come to a view on these issues will also need to engage with UN Sustainable Development Goals, within the context of a global climate emergency. The foregoing discussion suggests possible alignment with up to eight[100]:

Goal 5: Gender Equality;
Goal 8: Decent Work and Economic Growth;
Goal 9: Industry, Innovation, and Infrastructure;
Goal 12: Responsible Consumption and Production;
Goal 13: Climate Action;
Goal 14: Life Below Water;
Goal 15: Life on Land;
Goal 17: Partnerships for the Goals.

Goal 8 might seem to be the closest fit, given that a key aim of regional economic policy is to promote economic development. There is also a strong link to Goal 5, given: the focus on female empowerment in the Scottish Government's (2019) Arctic Policy Framework (Scottish Government 2019); recent policy emphasis on empowering female entrepreneurs in sparely-populated northern communities[101]; and the fact that, as noted in section 7, there may be more female-run food and drink enterprises in the Highlands and Islands that would have been predicted from national figures on female business ownership.

An 'orthodox' cluster-based approach would seem to emphasise Goals 8 and 9. However, broader conceptions of enterprise and innovation are important here. This is because Goals 13-15, which are critical for the food and drink sectors, can conflict with Goals 8 and 9. Enterprises, Government and researchers must manage such conflicts, and doing so requires more than technological innovation for economic growth and efficiency. There is progress on this. For example, the 2019 MAXiMAR audit (Highlands and Islands Enterprise 2019d, 22-23) noted the scale and scope of investment in aquaculture science and innovation in the Highlands and Islands, as the industry seeks to expand production *and* to manage the environmental and animal welfare challenges of large-scale fish farming. In additional, and as noted in Table 16, a number of fishing bodies see the value in securing and maintaining third-party certification, for example through the Marine Stewardship Council, to demonstrate the environmental sustainability of their catch.

There is a particular tension between livestock farming, which is one of the few possible agricultural uses of much of the poorer-quality land in the Highlands and Islands and plays an important role in sustaining crofting communities[102], and climate action (Goal 13), given that ruminants produce large quantities of methane, a potent greenhouse gas. However, there are signs that some producers are starting to market meat from traditional breeds reared extensively in a manner that supports crofting and minimises (to the extent that this is possible) their environmental impact[103]. This can be called 'retro-innovation', as it seeks to market the combination of relatively low-impact livestock farming, making extensive use of moorland grazing, producing high-quality meat from traditional breeds that helps to sustain crofting communities. This, in turn, suggests the importance of focusing on partnerships (Goal 17) to achieve gender

[100] Q.v. https://www.un.org/sustainabledevelopment/sustainable-development-goals/; accessed 10/6/20.
[101] See, for example, the W-Power project, funded by the EU's 2014-20 Northern Periphery and Arctic Programme (http://w-power.interreg-npa.eu/; accessed 8/6/20).
[102] See, for example, https://www.crofting.org/faqs/67; accessed 8/6/20.
[103] See, for example, the marketing material produced by Hebridean Mutton and Highland Beef, based in Na h-Eileanan Siar: see https://www.hebrideanmutton.co.uk/about/; accessed 8/6/20.

equality (Goal 5) and responsible production and consumption (Goal 12) as a means of seeking to balance Goals 8 and 9 with Goals 13-15.

However, it is not for this report to produce firm recommendations as to which of the UN's sustainable development goals food and drink sector development policies should align. That choice, as with the choice of the extent to which the food and drink sectors of the Highlands and Islands might seek to engage with their peers in the AR, rests elsewhere. Nevertheless, this report could form the basis for open and informed dialogue with the communities and enterprises that, while they may have the most to gain from such engagement, will be the ones who will, with the support of policy, have to build and sustain it.

In the short term, dialogue could focus on four sets of issues. First, it is necessary to build a better understanding of what stakeholders need to do to in order to work more closely with the food and drink sectors in the Arctic region. This could be approached by setting up a 'task and finish' group of policy and business stakeholders to work through the issues raised by this report and by recent development work in the Arctic region, such as on the AFIC. Secondly, the work of such a group could be informed by analysing the experiences of producers that have developed and worked with geographical branding. Food and drink enterprises in the Highlands and Islands have demonstrated a relatively high level of engagement with such branding schemes. Given that policy proposals emanating from the Arctic region, such as the AFIC, appear to favour geographical branding, such knowledge would be invaluable in helping to gauge the potential benefits and limitations of engagement. Thirdly, it will be necessary to understand the amount and types of investment that engagement in food and drink networks in the Arctic region will require and where this could come from. Lastly, consideration will need to be given to the governance arrangements for any engagement with the Arctic region. For example, it is the UK, not Scotland, which has observer status at the Arctic Council. Any engagement with initiatives developed under its auspices, such as the AFIC, may therefore require UK authorisation. It will also be vital to ensure that any such engagement, should it go ahead, empowers communities and enterprises in the Highlands and Islands to engage effectively.

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Appendix 1 – Selected recent reports on Arctic governance and policy

Report	Sector	Details
Developing the Nordic Food Partnership	All	The Nordic Food Partnership aims to build on the work of FoodNexus (see below) to re-shape its purpose and extend the collaboration to all Nordic countries. The Nordic Food Partnership links key stakeholders of the Nordic Food System that can have an influencing as well as initiating role. It will take initiatives in food system innovation and education at Nordic and EU levels and act as an information hub for collaboration.
Arctic Fisheries and International Cooperation	Aquaculture	Report on the importance of cooperation in the Arctic. As fisheries are likely to continue to change in tandem with the climate, understanding how countries adapt and can continue to cooperate on shared stocks is critical.
Market analysis of organic Foods	Farming	Provides a summary of the organic food and beverage market in Nordic and Baltic countries. This includes a review of historical developments within the sales of organic foods and beverages across the main sales channels, imports/exports and organic agricultural production. It includes insights into how to grow and tap into the organic market.
The future of Arctic Farming	Farming	Vegetable production is on the rise in the Arctic, especially in places like Alaska, Canada, and Norway. Increases in Greenhouse & Hydroponic Farming Projects. Contains case studies.
Food innovation in Canada's North: the case for a Social enterprise Cluster		After conducting 30 key informant interviews, the project team found that the main obstacles facing Canada's northern food chain were: • money (e.g. the accessibility of public and availability of private financing); • people (e.g. limited labour pools, a lack of communication and strong relationships between stakeholders throughout the food value chain); and • place (e.g., insufficient transportation, infrastructure and distribution, regulatory barriers). However, a number of strengths were also highlighted: • the North's strong community and social capital; specialized local knowledge; • some communities' experience in selling unique northern food products; and • the particularity of the northern brand. There is now a blueprint for an AFIC in Canada.
The Importance of the Ocean Cluster for the Icelandic Economy.	Blue economy	This paper seeks to describe the economic importance of the ocean cluster, i.e. the fishing industry and related sectors, in Iceland. The basis of the research is two-fold: base industries that are basis/prerequisite for other industries in the region; and cluster formations in the economic sector, where a number of companies in a particular field are economically interrelated and base their

		activities on each other and possibly a common base industry. There are indications that such a cluster, which may be called the ocean cluster, has already formed around the traditional fisheries sector in Iceland. One of the main goals of this report is to explain how a dynamic base industry, in this case the fishing industry, can form the foundation for a diverse range of other industries (e.g. related industries to fishing or new technology start-ups connected to fishing) that may subsequently become considerably larger than the initial base industry.
Blue Growth in the North East Atlantic and Arctic – Nordic Marine Think Tank	Blue Economy	This report deals with the blue bio-economy in the Nordic Sea, a part of the North East Atlantic, and especially the EEZs of Norway and the three West Nordic Coastal States, the Faroe Islands, Iceland and Greenland and the relevant ABNJ areas.
Educating Arctic Entrepreneurs: The next generation of sustainable pioneers	Environment, economy	The project focused on building capacity for sustainable student entrepreneurship in institutions of higher education in the West Nordic region of the Arctic in Greenland and the Faroe Islands.

Appendix 2 – Selected food and drink networks and projects with links to the Arctic Circle

- AlaskaNor – AlaskaNor's key objective is to improve knowledge concerning the blue economy in Alaska and North Norway and in turn enhancing related knowledge among relevant stakeholders and amongst decisions-makers. This will be done by:
  - Developing knowledge in four work packages dealing with various aspects of the blue economy (Phase I)
  - Synthesising these findings in collaboration with stakeholders in Alaska and North Norway (Phase II)
  - Targeting decision-makers in Washington, D.C. and Oslo with policy recommendations (Phase III)
- Arctic Smart Industry and Circular Economy cluster - an interregional cluster focusing on the sustainable utilisation of the arctic natural resources. The cluster is focusing on the development of the eco-system for the SMEs providing industrial services for utilisation of side streams of steel, forest, energy, mining, vehicle and wood product industries. The cluster is combination of 80 SMEs, large scale industries, innovation intermediaries, universities and research institutions.
- Arctic Smart Rural Community Its mission is to stop capital outflow from rural areas. Cluster is a modern regional development model where are combining traditional cluster ideology and regional development. Strategic choices are: food, decentralized renewable energy and coordination of regional development funding in rural areas.
- Danish Food Cluster - "We work to maximise innovation within the Danish food industry by building a world-class community of knowledge providers, talent, investors, and companies".
- Food Nexus Nordic - consortium of companies and educational & research institutions in Europe, which together were applying for EU funds to create a pan-European innovation alliance (a food-KIC) with partners from excellent public and private players in the European food system. Strong portfolio of activities to strengthen the innovation eco-system across DK-SE borders and to generate growth, including alignment of agendas at regional, national and Nordic level (see *Developing the Nordic Food Partnership* report for more info on the background).
- Iceland's Innovative Blue economy it is thought that the true driver of Iceland's technological future, is their focus on the sea, a blue economy that is vibrant and growing.
- Iceland Ocean cluster - mission is to create value by connecting together entrepreneurs, businesses and knowledge in the marine industries. To serve this mission we provide a range of services and invest our resources in new marine spin-offs and projects.
- Inuvik (Canada) - The community developed an old hockey arena into a multi-level greenhouse that has been growing vegetables since 1998 (From the Future of Arctic Farming report).
- Kotzebue (Alaska) - Kikiktagruk Inupiat Corporation delivered their first greens to the supermarkets in 2016. The production is based on a system of portable high-tech hydroponic containers (source: Future of Arctic Farming report).
- Kuusamo Lapland Wild food badge – Finland.
- Moss Maritime – Norwegian based company working to develop an innovative floating solar project that could power oil and gas operations as well as other projects, including fish farms, with "cleaner options". Read more here
- Nofima - The aim of the "Arctic Food" project has been to assess the potential for increased production and value creation of food produced in the Arctic areas of Norway.

- Ocean Supercluster (Canada). A cluster model that is driving cross-sectoral collaboration, accelerating innovation, and growing Canada's ocean economy in a way that has never been done before. Some assets of importance are located in the AR.
- Polar Permaculture Organization (Norway). Founded in 2015, they use a mini-geodesic dome which combines permaculture with ecological design to create a resource efficient circular economy (source: Future of Arctic Farming report).
- Slow Food: a global, grassroots organization, founded in 1989 to prevent the disappearance of local food cultures and traditions, counteract the rise of fast life and combat people's dwindling interest in the food they eat, where it comes from and how our food choices affect the world around us. Present in: Canada, Faroe Islands, Iceland.
- Iceland Innovators taking waste out of the blue economy – Seafood industry in Iceland is combatting issues with blue economy waste through innovation – e.g. fish skins being used for alternative leather produce.