

Fish as Food:

A review of developments in UK seafood consumption, implications, and practical responses

APPENDICES



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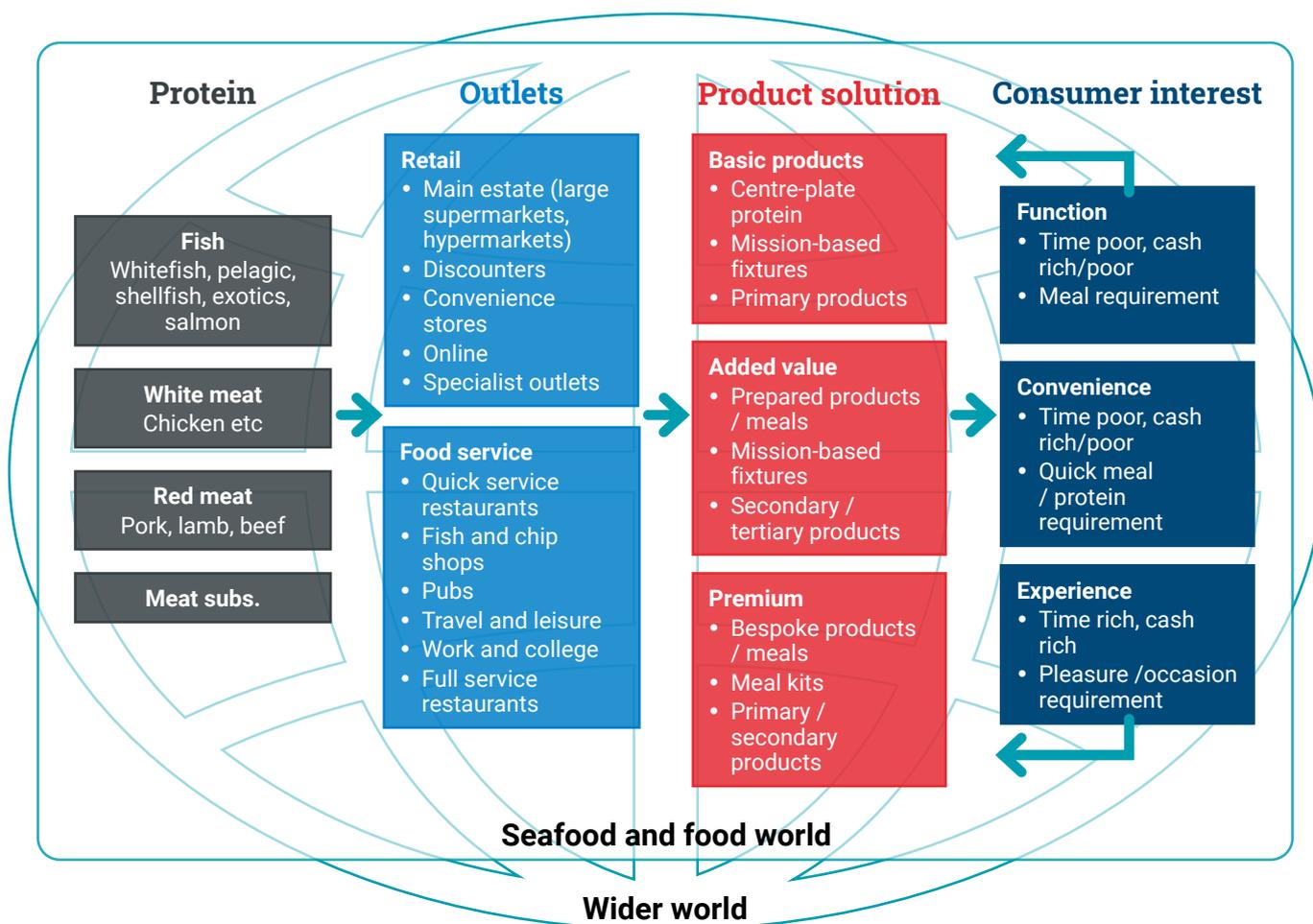
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A1. UK seafood consumption and production – an overview

This section provides an introductory description of UK seafood consumption in the context of the ‘food world’ and the ‘wider world’. This frames the investigation and discussion on industry changes, impacts and responses (see figure A1.1).

Figure A1.1 UK seafood and protein landscape, showing the relationships between consumer interest, product solutions and outlets



A1.1 UK seafood consumption

Compared to other proteins, seafood consumption is relatively low. On average, 1.15 portions of seafood per person per week were consumed in the UK in 2019. This is equivalent to 161g of seafood consumed per person per week, a level somewhat below UK Government dietary recommendations (280g of fish per person per week).

Seafood is not consumed evenly across the population. Whether ‘eating in’ or ‘eating out of home’, seafood is typically bought by an older and more affluent consumer. In retail, the seafood shopper is more likely to be over 45 years old, affluent and living in a two-person household without children¹.

¹ According to NielsenIQ (2021) the typical seafood shopper was in the higher socio-economic group (AB/C) and aged 45+ years.

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Seafood is relatively unique in the eyes of the consumer, being a more complex option compared to other protein categories. Although it can be a healthy option, seafood can also be relatively expensive, show greater variation in quality, and be less versatile/convenient.

Barriers still exist in choosing seafood with a high freshness quality, a reluctance around handling and preparing, a lack of recipe inspiration, and wastage. Unsurprisingly, seafood is the only protein category seen as 'scary' by many consumers.

Several factors influence the seafood purchasing decision. As shown in figure A1.2, the trigger to purchase seafood is about a 'value for money' combination of quality, price, convenience, and health rather than price overall.

Importance of different attributes in shoppers' purchase decisions - fresh fish and seafood

Mean score out of 10, where 1 is low importance and 10 is high importance

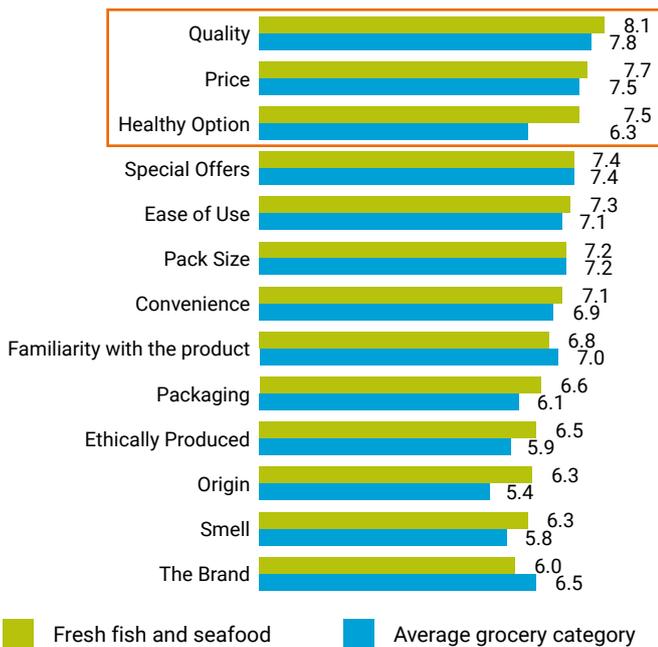


Figure A1.2 Seafood shoppers purchasing decision (IGD, 2019)

In contrast to other protein categories, most seafood shoppers put taste and quality above price. Shoppers claim to be prepared to pay more for better product quality, strongly valuing the health benefits of seafood.

As shown in figure A1.3, around two thirds of total UK seafood purchases are made through retail with the remaining third sold through food service. Multiple retailers dominate retail sales. Food service sales are dominated by fast food outlets and fish and chip shops.

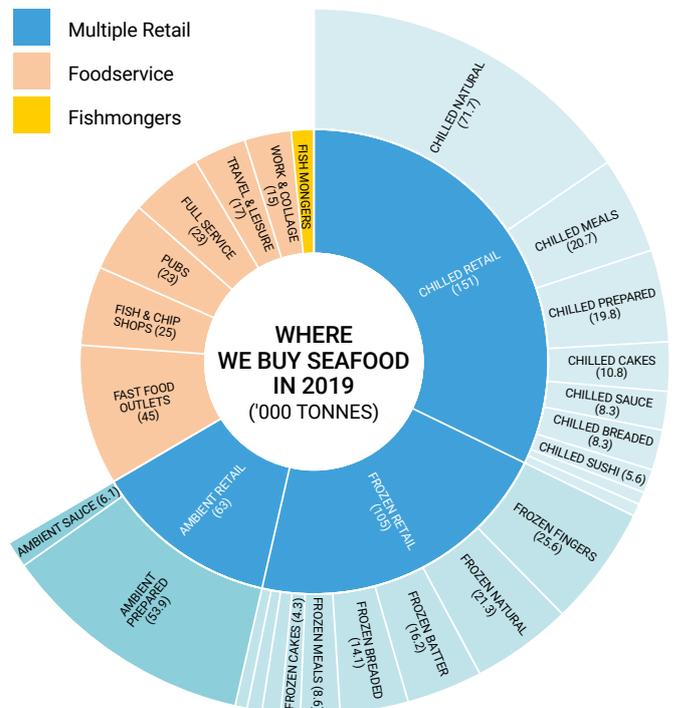


Figure A1.3 Where we buy seafood in the UK

Retail sales

In UK retail, seafood is a high value, but relatively low volume, protein category. In 2021, 440,000 tonnes of seafood was sold, worth £4.4billion. Due to its high average price, the seafood category is worth more than total meat or total poultry by value (Nielsen IQ 2021).

A small number of 'core' species play a leading role in retail seafood sales. In 2021 the 'core' species sold in UK retail continues to be salmon, tuna, cod, warm water prawn and haddock.

The retail category is dominated by sales of chilled seafood. Within chilled, natural seafood remains the most popular seafood format.

Of the most popular chilled seafood species, farmed seafood makes up the majority by value: salmon dominates seafood sales, for example. In 2019, farmed seafood made up nearly 70% of the top five most popular chilled seafood species by value. Currently salmon dominates seafood sales with sales worth double that of cod, its nearest competitor.

Food service sales

In food service sales, seafood has a higher share of value and lower share of volume. In 2021, total food service sales in Great Britain were worth £47billion. This was made up of 19 billion servings. Seafood took a £3.5billion share of this with 855 million servings, this is estimated to be around 163,000 tonnes in volume.

Fish makes up nearly 75% of seafood servings. Fried fish remains the main format for seafood in foodservice with around a 35% share.

Food service plays an important role in seafood consumption. Consumers who consider seafood to be 'scary', can rely on food service to explore new seafood species, flavours, and formats. Having explored new seafood products in this way, consumers may then look to purchase these products in retail. In this way food service plays an influential role in retail product development.

A1.2 UK seafood production

The UK seafood industry is diverse, complex, and dynamic. It relies on both aquaculture and wild capture produced raw material. As shown in figure A1.4, the seafood industry operates as many subsystems (local, regional, sectoral), of varying degrees of interdependence, nested within one overarching global seafood system.

When looked at globally, the orientation of the UK seafood industry is domestic (where seafood is sourced and manufactured in this country) as well as international (where seafood is sourced and/or manufactured elsewhere and brought to the UK). That is, UK seafood supply chains fall into either an *international* or a *domestic* seafood system. These two major seafood systems overlap and have distinct characteristics.

The international system can be defined as a *system reliant on internationally sourced material (material caught from stocks in the North Atlantic and elsewhere landed outside the UK, material farmed outside the UK)*. Within the 'international system', the key UK actors are: agents and merchants in the UK importing fish and shellfish that is caught, landed or farmed and possibly processed outside of the UK; seafood processors of imported fish located in the UK; and the downstream supply chain in the UK of all of the former including food service companies, retailers and re-exporters.

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The domestic system can be defined as a system reliant on domestically sourced material (material caught from stocks in North Atlantic/UK waters and landed in the UK, material farmed in the UK). Within the 'domestic system', the key UK actors are: producers (farmers/vessels), agents and merchants in the UK handling material landed/farmed in the UK; seafood processors located in the UK; and the downstream supply chain in the UK of all of the former including food service companies, retailers and exporters.

From a UK perspective, seafood material for UK consumption is largely imported, whilst material originating in the UK is generally exported for overseas consumption. The UK consumer maintains a robust preference for salmonids (farmed salmon), whitefish (wild caught cod, Alaska pollock and haddock), pelagics (wild caught tunas) and shellfish (farmed warm-water prawn and wild caught cold-water prawn). Meanwhile, UK landings volumes are dominated by mackerel and herring (pelagics), Nephrops (shellfish) and cod and haddock (whitefish).

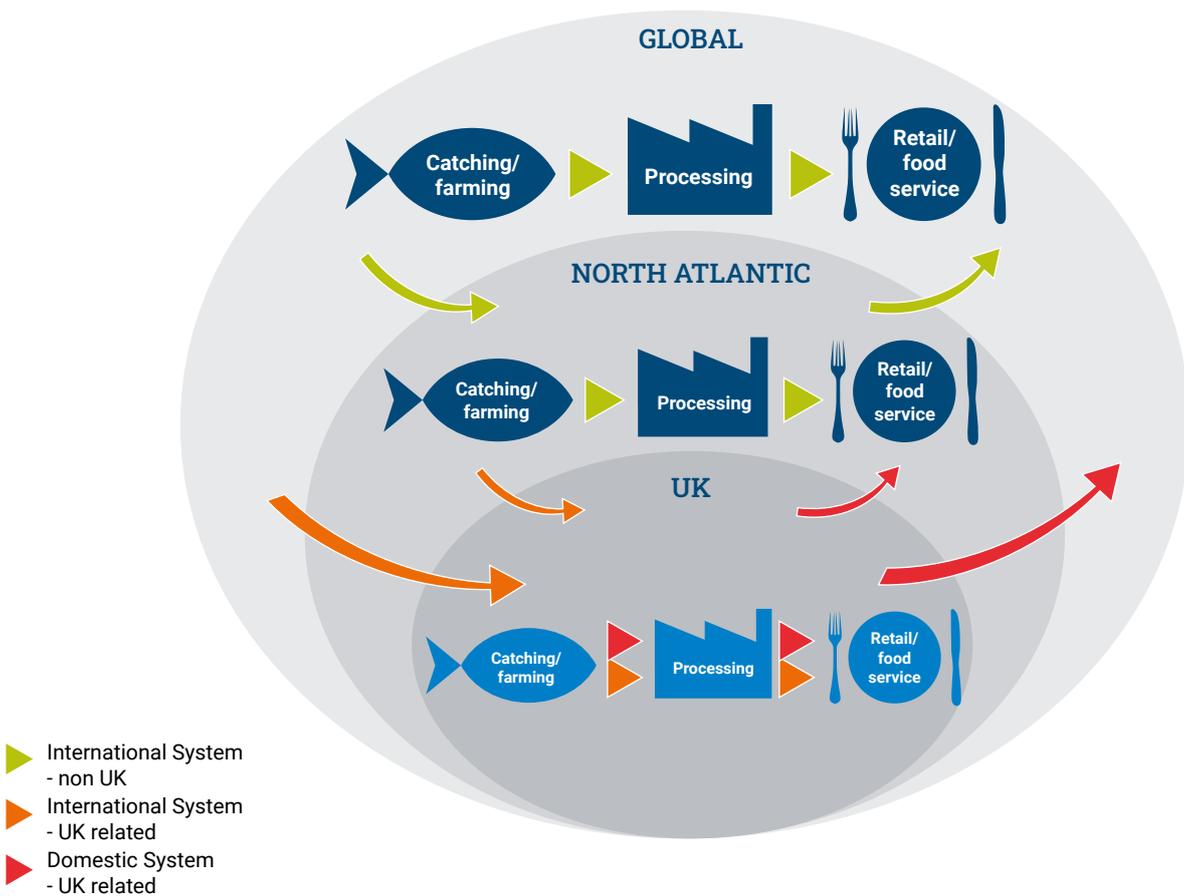


Figure A1.4 Components of the UK international and domestic systems and how they are interrelated

A2. UK population and food consumer

A2.1 UK population

In 2020, the population of the UK was estimated to be 67.1 million. Table A2.1 provides details of population age bands within the UK, showing the maximum number of potential seafood consumers.

Table A2.1 Population summary

Age band	Relevant generational groups	Typical consumer groups within the age band	2020	%
0-15	Generation Alpha, Generation-Z		12,727,569	19%
16-25	Generation-Z, Millennials	Limited budget	7,922,864	12%
26-30	Millennials	Students/young professionals	4,532,078	7%
31-40	Millennials, Generation-X	Busy young families	8,894,241	13%
41-50	Generation-X	Older, more affluent, families	8,414,838	13%
51-65	Baby Boomers	Older families	12,770,204	19%
Over 65	Baby Boomers, Silent Generation	Elderly people	11,819,440	18%
TOTAL			67,081,234	100%

Source: ONS

Around two thirds of the UK population are working age. This amounts to around 42.5 million people. Nearly 12 million have reached retirement age.

In 2019, amongst the working age population, 79% were economically active (either in work, seeking or available for work). The remaining 21% were inactive due, for example, to study, looking after family, sickness/disability, or not needing to work.

Average (mean) disposable income for all households in 2019-20 was £36,856.

Average total household expenditure in 2019-20 was £30,571, with the five highest categories of spend being:

- Housing (net¹), fuel and power (£4,316)
- Transport (£4,243)
- Recreation and culture (£3,890)

- Food and non-alcoholic drink (£3,312)
- Restaurants and hotels (£2,751)

On average, 10.8% of all UK household 2019-20 spend went on food and non-alcoholic drink. This rose to 13.8% for the lowest 10% of household income.

Note, the data precedes Covid-19, and the emerging energy and 'cost of living' crises. These events will have reduced disposable income, increased expenditure on 'housing, fuel and power', and decreased expenditure across other categories.

Disposable income is a measure of a household's ability to increase spending without reducing savings or increasing borrowing. Any shortfall between average levels of disposable income and expenditure for the UK household illustrates a 'squeeze' in household finances.

1 excluding mortgage interest payments, council tax and Northern Ireland rate.

Within these headline descriptions of the UK consumer, there are differences between consumer groups based on factors such as life stage, age group, and occupation. For example, there are comparisons and contrasts in expenditure between younger and older age groups:

- For households in the 'under 30 years' age group, expenditure is relatively higher in housing (26%) and lower in food and non-alcoholic drink (8%) and recreation (9%).
- For households in the 'over 65 years' age group, expenditure is relatively lower in housing (12-13%) and food and non-alcoholic drink (12-13%), but higher in recreation (15-16%).
- Across all age groups, households tend to spend around 9% on restaurants and hotels.

Specific consumer segments for seafood are identified in appendix 3.

A2.2 UK population trends

UK population has grown at an accelerating rate and is ageing, this growth is expected to continue at a slowing rate. The UK population was 67.1m in 2020 and this is expected to grow to 70.4m by 2040 and 71.6m by 2066.

- **An ageing population is a global trend, and particularly so in developed countries, driven by lower fertility/mortality rates, increased life expectancy, and the limited effects of immigration.** In the 10 years to mid-2019, the UK 'working age' population (16-64 years) showed the lowest growth of any age group, whilst those aged over 65 years showed highest growth.

- **The UK ageing population is expected to continue with a growing older age cohort and a 'working age' group increasing marginally.** In 2016, the 'over 65' group represented 18% of total population but is projected to be 24% by 2041 (and 26% by 2066 – an increase equivalent to the size of London's population today). In contrast the 'working age' population, representing 63% of total population in 2016 is projected to decrease share to 58% by 2041 (and to 56% by 2066).
- **Older age groups are generally wealthier than younger groups, as wealth increases with age, however today's younger cohorts are less wealthy than previous younger generations.** By 2020, wealth of UK households headed by someone between 55 years and 'state pension age' was 25 times higher than youngest households (aged 16-24 years). Much of this disparity is related to the housing market and the lower property wealth of younger people.

All age cohorts are seeking to maintain, or enhance, their standard of living. From 1980-2007 UK households enjoyed a long period of rising household disposable income, coupled with widening inequality. Since 2007 households have been under pressure; disposable incomes have plateaued with younger age groups particularly challenged. Over the last 10 years, households have chosen to save less to maintain living standards with some able to achieve this more easily than others. For example, in general terms:

- **'Strivers' may be increasingly time poor and cash poor.** Young people (aged to mid-20s) have a greater share of low paid job occupations and those on zero-hours contracts. In the 10 years to 2019 younger

cohorts household disposable income has fallen between 3 and 7%. This group are remaining in the family home longer, being unable to afford housing, and exposed to opportunities that can be increasingly out of reach.

- **‘Thrivers’ may be increasingly time poor and cash poor/rich.** ‘Thrivers’ (age from mid-20s to 50) are having more demands put on them; examples include caring for elderly relatives (as public services become stretched) and women having to switch family for work to maintain disposable income. Economic inactivity has reduced for women, with the main reasons being an increase in the state pension age, and a decline in the share of women staying out of work to look after the family or home. This has not been compensated for by men staying at home to look after the family or home.
- **‘Survivors’ may be increasingly time rich and cash rich.** For ‘Survivors’ (aged from 50 onwards) the disposable income of retired households has grown considerably over the longer term, mainly due to increased share of private pension but also increased state pension. In the 10 years to 2019 disposable income for households over 65 increased between 18 and 26%.

UK population dynamics mean the older cohort is generally expanding (and able to work longer) relative to the younger cohorts. If population increases faster than the economy, then UK consumers will get poorer on a per capita basis. Likewise, if the total population increases faster than the working population then this will constrain the economy. These developments will increase pressure on housing, services, and

disposable income such that consumers will either cut spending or, failing that, cut savings or increase borrowing. This increases pressure to be active in the economy e.g. more pressure for both parents to work at the expense of looking after the family/home and to extend working lives (increased state pension age).

A2.3 UK social attitudes over time

Our individual attitudes are shaped by psychological factors, e.g. our moral foundation/compass, and our context e.g. our age and generation. According to Haidt (2012) our moral foundation shapes our attitudes: six moral ‘taste receptors’ (harm/suffering, fairness/injustice, liberty, loyalty, authority and sanctity) shape our moral ‘cuisine’. Recent work by ‘More in Common’ draw on these moral foundations to identify several distinct social groups across the UK that share particular attitudes.

Age cohorts and ‘generations’ tend to harbour shared attitudes, shaped by the external context. The term ‘generation’ simultaneously refers to an individual’s life cohort, as well as stages of a particular life:

- An individual belongs to a ‘generation’ that reflects the culture, attitudes and ‘consciousness’ of their time e.g. the *Silent generation* (World War II), *Baby boomers* (1960s and liberal society), *Generation X* (Live Aid and the cold war), *Generation Y* (9/11 and social media), *Generation Z* (global warming and mobile devices) etc.
- An individual is also part of an age cohort at a stage in their life: the younger generation, older generation, middle aged etc. The demands of particular ‘life stages’ shape generational attitudes.

Over the last 10 years social attitudes trends suggest increased fragmentation, polarisation and volatility across many western countries including the UK. This can be seen in recent democratic instability: the rise of radical political parties (challenging the effectiveness and ideological coherence of governments), decline in voter turnout – particularly amongst the young or less well-educated voters, decline in the party membership of political parties (raising electoral volatility as voters change affiliation).

Research published in 2020 by ‘More in Common’ suggests that contrary to the perception of deep division, there is important common ground across social groups in the UK and their distinct beliefs and priorities: *‘most Britons wish for a country that is hard-working, environmentally-friendly, and compassionate’*. This is a situation that bodes well for the UK in the face of wider polarising forces.

As Table A2.2 shows, social groups are reasonably spread across the UK representative research sample (‘All’ column) however there are important differences across generations e.g. Compared to the UK share, Gen-Z have a higher share of ‘progressive activists’, whilst the Silent Generation have a higher share of ‘backbone conservatives’.

Generation Z, or ‘Gen Z’ (loosely, those born between 1997 and 2013²) is a cohort of particular interest because, although major drivers and change developments affect everyone, the preferences and behaviours of this young group are still in flux. Of interest is whether the emerging attitudes and norms of this group - who were aged 7-23 years in 2020 - will be carried forward as they move into a different life stage, with greater influence.

Table A2.2 Social group across generations in the ‘More in Common’ sample

Social group/Generations	Gen Z (18-24 years)	Millennials (25-44 years)	Gen X (45-54 years)	Baby Boomers (55-74 years)	Silent Gen (75-100 years)	All
Progressive Activists	23%	18%	9%	10%	6%	13%
Civic Pragmatists	12%	14%	14%	13%	12%	13%
Disengaged Battlers	19%	15%	14%	7%	5%	12%
Established Liberals	15%	12%	12%	11%	11%	12%
Loyal Nationals	3%	12%	18%	24%	21%	17%
Disengaged Traditionalists	20%	19%	20%	17%	14%	18%
Backbone Conservatives	7%	11%	13%	19%	31%	15%
Unweighted N	827	2,968	1,789	3,826	695	10,105

Source: More in Common

² See Dimock (2019) for example.

For Vieira et al (2020) this generation is set apart from previous generations having grown up immersed in the digital world (smartphones, tablets, Wi-Fi, online gaming and social networks). Amongst other attributes, Gen Z are considered to value:

- Freedom: placing high value on freedom of choice and expression and ways of working.
- Customization: personalising what is around them, including scope of work and career paths.
- Integrity: seeking integrity and openness as consumers or employees to ensure values are aligned.
- Scrutiny: researching about companies and products/services is considered normal in order to get better transparency on reputation.
- Collaboration: being known for collaboration and relationships, using online social networking, to discuss and share opinions about companies, brands, products and services.
- Entertainment: valuing the availability of entertainment - at workplaces, in education, in their social life.
- Speed: valuing speed of action, driven by digital environments in which responses are responses and virtual conversations are in real-time.
- Innovation: as innovative products contribute to their social status and self-image.

Central to the shaping of these preferences is the role of technology and social media in the modern world. The development of technology and online services has meant the consumer is more 'connected' than ever, and has been relieved of burdensome, mundane and time-consuming tasks; increasing leisure time and exposure to wider influences and opportunities. Yet ironically this is leading to lifestyles that are increasingly fragmented (tastes, smaller households, the 'always on' consumer).

More broadly, the combination of an ageing population, a fragmented society, and sharp differences in wealth, alongside priorities and concerns between generations, could provoke inter-generational conflict.

A3. Consumer food interests and attitudes

Consumer interest in food ranges from the functional to the pleasurable. Three food interests are notable:

- A functional concern - looking at food as fuel and focusing on nutritional content.
- Quick or convenient food – looking for a quick meal or protein.
- An experience - a ‘foodie’ interest based on a particular emotional and enjoyable experience. This could be customised for pleasure, reward (“you deserve it”), or a special occasion, or around intrinsic attributes such as what and where food comes from.

Consumer attitudes, and more specifically the factors driving their purchasing behaviours, are complex and interconnected. Attitudes can be simplified and explored as ‘concentric circles of concern’ (noting that the boundaries are fluid and may vary significantly). This is shown in figure A3.1.

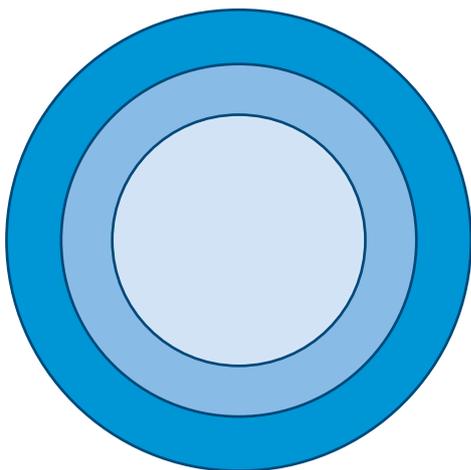


Figure A3.1 Concentric circles of concern

Of central concern is ‘Me and my family’: where consumers’ primary focus is the health and welfare of themselves and their children. Only once this need is satisfied, do consumers begin to widen their ‘circle of concern’.

Other people (and animals) are of next concern (mid-circle). This is where we move beyond ‘the garden gate’ to a concern for the health and safety of other people, the way animals are treated, and issues of fair-trade begin to feature.

Finally, the outer circle represents the environment. Once people are satisfied that humankind is being fairly treated, consumer concerns move on to the environment (trees, landscapes, oceans).

Across these circles, economic, social and environmental factors influence consumer behaviours. At one end, economic factors play a dominant influence in ‘Me and my family’, further out social, and then environmental, factors have an important influence.

Factors include:

- Economic:
 - Price
 - Quality (such as freshness, and taste)
- Social:
 - Convenience (such as time, versatility, and norms)
 - Nutrition
 - Welfare (people, animals)
- Environmental:
 - Resources

A3.1 Food attitudes and changes over time

Changes in food attitudes are shaped by two opposing dynamics. These are:

- value for money for *me and my family* (price, quality, convenience and health) and
- what's right for *other people and the wider world* (health, welfare, and resources).

The balance of these dynamics shift over time. Until 2008 there had been a long trend towards food consumption as a pleasurable experience and attitudes that embraced the wider world. Following the financial crisis, with tighter economic conditions, UK consumer attitudes sharpened. Greater interest was shown towards value for money for *me and my family* relative to

what's right for *other people and the wider world* (see figure A3.2). Over the last 10-15 years, as economic conditions have eased, initial sharpening of attitudes gave way to a wider concerns. For example, attitudes have embraced convenience, health, and welfare (supported by an ageing population and scandals such as 'horsegate'). Consumers have also had increased exposure to concerns about the *wider world* notably through high profile campaigns, political announcements, and popular nature programmes (such as the BBC's Blue Planet) highlighting climate change and other environmental impacts such as microplastics. However, consumer attitudes around price, quality and health have long had much greater influence than sustainability concerns, with the latter remaining a confusing concept to many consumers.

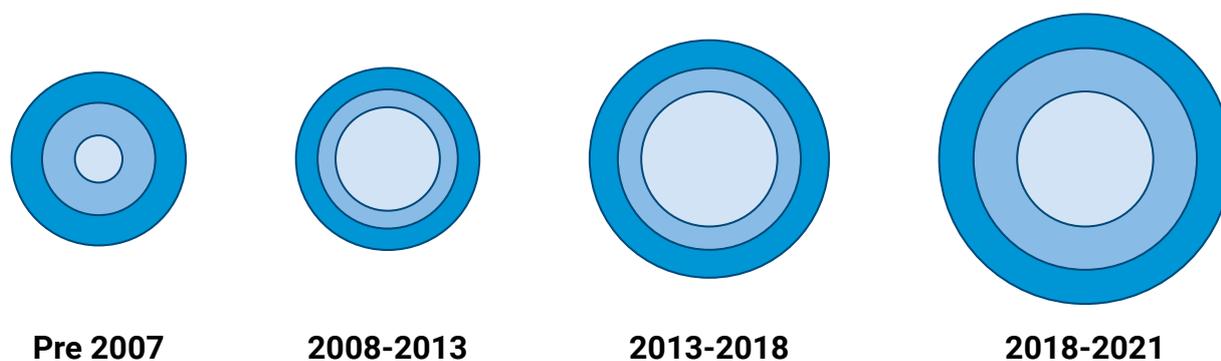


Figure A3.2 A growing concern for price and widening expectations

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If economic conditions hold rather than deteriorate, consumer concerns for food will continue to focus on function (food as fuel), balancing this where possible with food as an experience (emotion and pleasure). Attitudes will continue to focus on *me and my family* (price, quality, convenience) with an expectation that concerns of *other people* and *the wider world* (health, welfare, and resources) are 'taken care of'.

However, within these general attitudes there are potentially sharp differences in attitudes between generations. The demands of particular life stages has been recognised as influential in seafood consumption (see figure A3.3 and table A3.3). For example:

- It has long been held that consumers 'grow into fish', as older cohorts – with greater wealth and concern for health - recognise

the benefits of seafood and increase their seafood consumption.

- Younger cohorts such as Gen Z (those born between 1997 and 2013) are of particular interest as the evolving preferences and behaviours of this young group - being still in flux - could shape future seafood consumption.

With a progressively individualistic society, consumers are increasingly dining alone. This affects generations in different ways. Consumers in the older 'baby boomer' generation may maintain a traditional lifestyle arranged around 'three-meals-a-day', the likes of Gen Z may be more oriented towards 'grazing' that fits around lifestyle and 'screen time'. The gradual decline in food preparation time may partly reflect this.

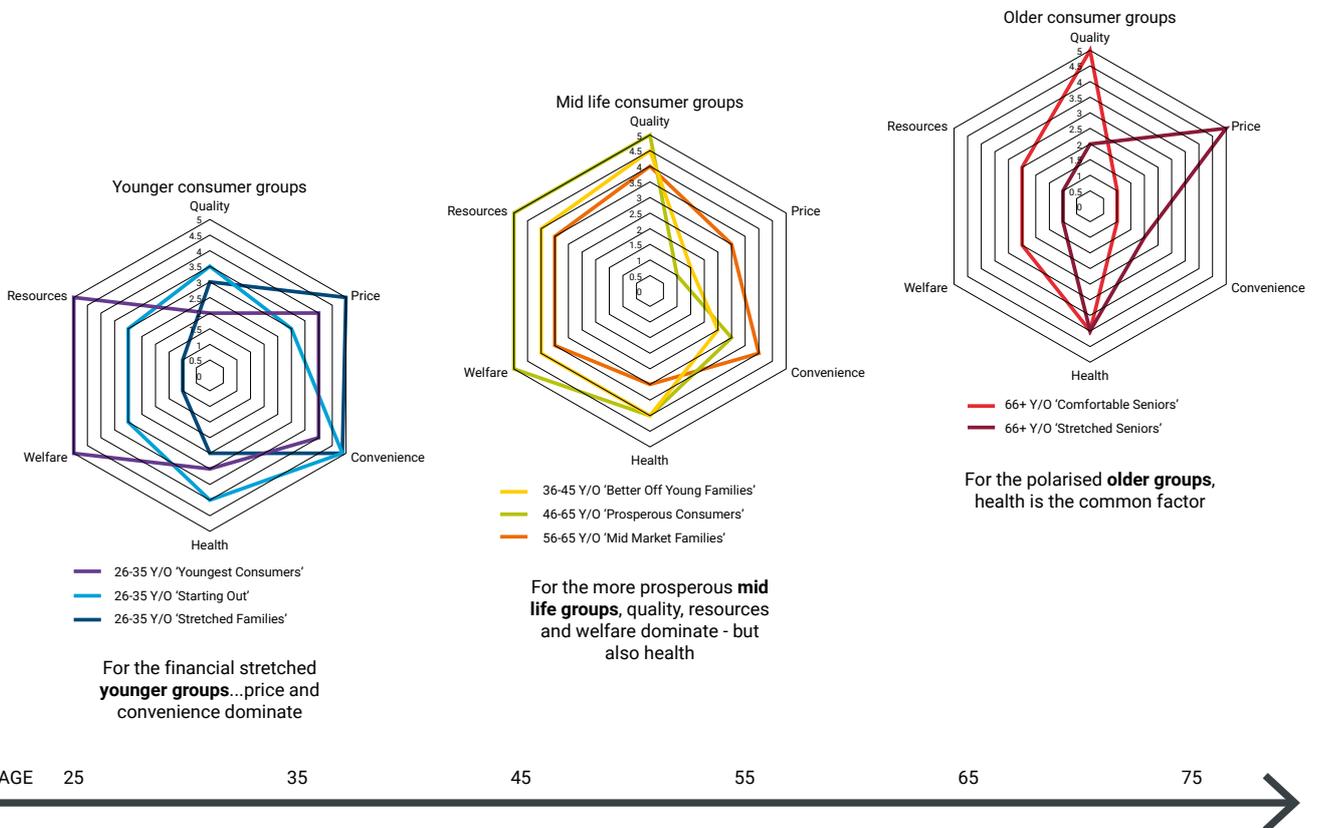


Figure A3.3 Consumer attitudes: relative importance of purchasing factors by generational 'life stage'. Factors scored 1-5, where 1 is highly insensitive, 5 is highly sensitive.

Table A3.3 Key consumer groups for seafood products

Age band	Groups								Population 2020	Population 2030 (projected)
0-15									12,728	11,632
16-25									7,923	8,685
26-30									4,532	4,164
31-35									4,502	4,404
36-40									4,392	4,542
41-45									4,017	4,502
46-50									4,398	4,330
51-55									4,653	4,107
56-60									4,388	4,281
61-65									3,729	4,409
Over 65									11,819	14,151
TOTAL									67,081	69, 207

Source: Population data based on ONS 2020-based Interim National Population Projections (January 2022)

Key (seafood consumer groups based on Experian data):

	'Youngest Consumers' 26-35 years		'Prosperous Consumers' 46-65 years
	'Starting Out' 26-35 years		'Mid-Market Families' 56-65 years
	'Stretched Families' 26-45 years		'Comfortable Seniors' 66+ years
	'Better Off Young Families' 36-45 years		'Stretched Seniors' 66+ years

A recent report from the FSA examined the older members of the Gen Z cohort: those aged 16-25 years. The FSA report highlights that, whilst there is a lot of 'hype' surrounding Gen Z, robust research and evidence to support claims is relatively thin. Members of this cohort are 'in many ways ... just like young people in generations before them' i.e. focused on what's immediately ahead, trying new things etc. That said, there are some clear aspects that appear as particular features of this generation. They:

- Are the first true 'digital natives', with social media central to their lives - something they see as distinct to their generation.

- See themselves having a strong sense of social responsibility and being environmentally conscious (yet it's unclear how far these views translate into behaviour) with a more international outlook.
- Have high levels of concern and pessimism about the future they face - tends to be related to political instability, climate change and the rising 'cost of living'.
- Are often referred to as 'generation sensible' (e.g. reduced drinking, drug taking, tendency to save rather than spend), a more 'fluid' generation (e.g. on sexual and gender identities), yet stereotyped as 'image obsessed' (linked to social media and online image), entitled and over emotional.

In relation to food, the FSA findings suggest that for this age cohort:

- *Their interest in food is broadly in line with the rest of the population (whether that interest is particular/'foodie', convenient, or general/'food as fuel' oriented).*
- *Food behaviours are strongly influenced by life stage (e.g. living at home, university) and socio-economic background, with price being a strong driver.*
- *Are among the most likely to eat no meat, or to be reducing meat consumption, based on environmental concerns (yet still a relatively small proportion of the cohort).*
- *Have a low awareness and understanding of food system issues, aside from a minority of 'conscious consumers' and what is picked up from viral content on social media.*
- *Believe technology will be key to delivering food quality, variety and value with less harmful impacts.*

Drawing on FSA findings for 16-25 year olds, a tentative description of the older Gen Z cohort can be made against those factors affecting food consumption. A particularly important factor is **price**, and this is a stronger driver for this age group than for older generations. In terms of **quality** the cohort appears distrustful of large corporations and their lack of transparency. Beyond this the group appears largely unaware of food production systems: taking the system for granted and being unconcerned about the global nature of supply chains. However, the **convenience** of current food provision and the choice available is valued. In attitudes to **health**, Gen Z appears to be a health-conscious generation that is more likely to prioritise

nutritional content (and one of the most likely cohorts to use fitness apps). Attitudes to **welfare and resources** suggest interest in animal welfare is in line with the rest of the population, but the cohort appears to be more environmentally concerned.

Yet many of the Gen Z preferences regarding health, welfare and resources are not enacted in actual food behaviours. With price such a strong driver this is unsurprising. However, it does suggest this cohort is conflicted. The FSA highlight Gen Z as having a high level of concern and negativity about the future, with a sense of hopelessness and powerlessness rather than influence and activism, such that Gen Z 'are less likely than older generations to be *ethically-conscious consumers*'.

In the next 10 years Gen Z will gradually become part of the working population. As of 2020, Gen Z were aged 7-23 years and represented 13.5m people in the UK. By 2025 this cohort will be aged 12-28 years and is expected to represent 14.1m people. By 2030 the cohort will be aged 17-33 years and expected to be 14.6m people i.e. wholly within, and representing 34% of, the UK working age population.

If the generational norms of this group are carried into later life stages, this could mean preconceptions about protein combine with buying power to affect the market. Alternatively, this group may carry forward their financial constraints and lower wealth. In which case the imperatives of those later life stages - *me and my family* (price, quality, convenience) - may become more important and begin to dominate and temper the current attitudes of Gen Z.

A4. Proteins/products

A4.1 Protein and product landscape

In general, the UK market facilitates the matching of consumer food interests to specific product solutions. On the one hand, products are offered in a simple basic format that can provide the essential protein that can provide for a functional need or a premium experience. On the other hand, products where the original protein has been significantly transformed are offered as added value solutions to support convenience.

As shown in Appendix 1, these products are available to the consumer through various retail and food service outlets. These outlets are reliant, in turn, on various protein production systems specialising in seafood, white meat, red meat, or meat substitutes.

4.1.1 Key proteins

Seafood sits within a broad protein landscape that contains several substitute proteins. This landscape includes the following protein categories:

- Seafood (salmon, whitefish, pelagic, shellfish, exotic fish)
- White meat (chicken, turkey, gamebirds etc)
- Red meat (pork, lamb, beef, veal, etc)
- Meat substitutes (*mycoproteins* - such as Quorn, and plant-based proteins such as grains, pulses, nuts, or seeds, and insect proteins)

With each protein category comes a distinct set of attributes that provide advantages and disadvantages in the eyes of the consumer. These can influence consumption levels, but also where products are consumed (in-home or out-of-home). Key attributes include:

- Price – seafood is often relatively more expensive than other proteins.
- Quality – seafood can show greater variation than other proteins in the likes of freshness or taste. Seafood is unusual for a retail food category as the majority shoppers value quality above price.
- Convenience – compared to other proteins, seafood offers an abundance of choice with more than 100 species available to UK consumers. However, seafood may appear to offer a more limited product format and be less versatile (the UK consumer can be scared of seafood).
- Health and nutrition – seafood has several health benefits relative to other proteins like red meat. Some of these are uniquely abundant in some seafood species, for example long-chain omega-3 fatty acids.
- Welfare and resources – seafood's sourcing and environmental credentials (such as sustainability and welfare) can be seen as more complex or uncertain compared to land-based proteins.

4.1.2 Changes in key proteins over time

The relative quantities of vegetables, fish and selected white and red meats purchased for in-home consumption by UK households since 1974 is shown in figure A4.1. Out-of-home consumption over the last 20 years is shown in figure A4.2.

Figure A4.1 Quantity of vegetables and selected meat proteins for in-home consumption

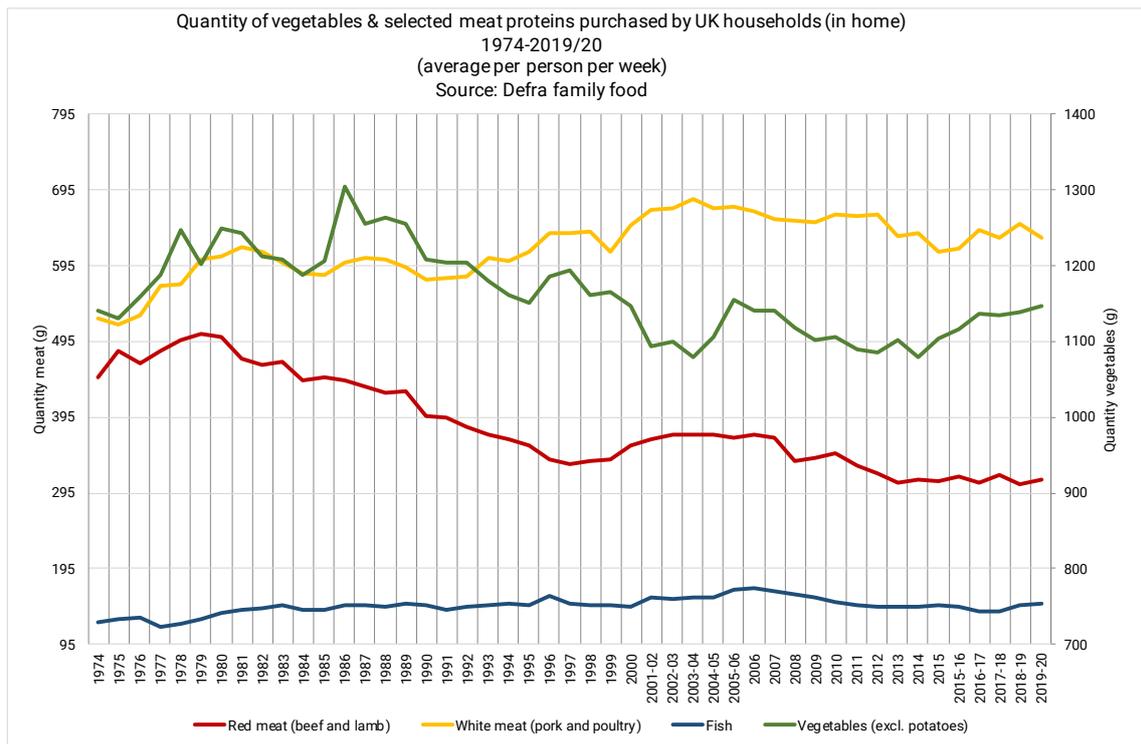
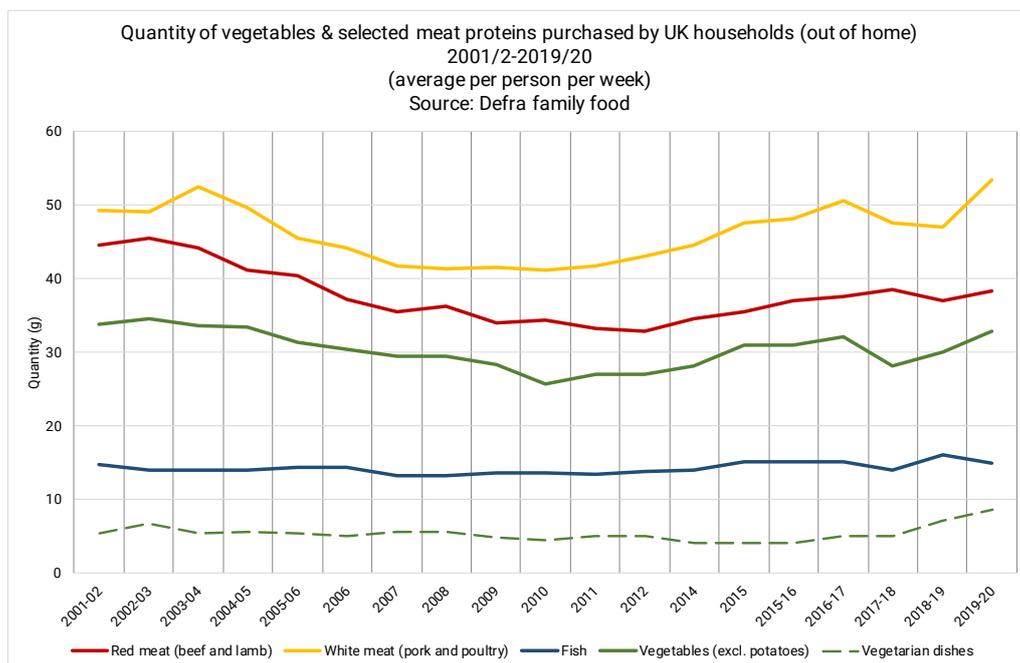


Figure A4.2 Quantity of vegetables and selected meat proteins for out-of-home consumption



According to the ONS (Consumer Price Index including owner occupiers' housing costs - CPIH), the retail price of all major food and non-alcoholic beverage groups have risen since 2009 at an overall rate of 23% (see table A4.1). With price rises ranging from 2% to 38%, fish has seen the highest rise in price since 2009. Notably, the price of meat increased by 10% over the same period.

Table A4.1 UK retail price changes by food group, 2009 to 2019

Food group	Percentage change between 2009 and 2019
Consumer Price Index including owner occupiers' housing costs (overall index)	23%
Fish	38%
Oils and fats	38%
Fruit	33%
Catering services	32%
Mineral waters, soft drinks and juices	28%
Sugar, jam, syrups, chocolate and confectionery	28%
Coffee, tea and cocoa	24%
Food and non-alcoholic beverages	17%
Alcoholic beverages	15%
Bread and cereals	15%
Meat	10%
Vegetables including potatoes and tubers	10%
Milk, cheese and eggs	2%

Source: ONS

4.1.3 Product landscape

Within the protein landscape, a wide range of products are available for direct consumption in the UK to serve specific consumer interests. In serving these interests, proteins are processed to provide convenience (including time saving) for those storing, preparing, or cooking the product. Products offer a spectrum of solutions to the consumer (or chef):

- **Basic products** meet a functional 'food as fuel' requirement such as meals.
- **Added value products** meet a convenience requirement such as a quick meal or protein.

- **Premium products** meet a particular experience requirement e.g. a special occasion.

Primary products are relatively simple in comparison to the more sophisticated secondary products (where the protein is enhanced in some way) or tertiary products (where protein is one of several ingredients in the final product). Greater product variation can be expected with the latter and in minor or specialised primary products.

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Table A4.2 shows some typical products supporting seafood, white and red meat, and vegetarian consumption.

Table A4.2 Example products supporting seafood, white and red meat, and vegetarian consumption

	Primary	Secondary	Tertiary
Seafood	Whole Loins Filletts - skin on Filletts - skinless Portions - skinless Meat in shell Meat	Cooked seafood: baked, grilled, fried, poached, steamed etc Coated or battered seafood Fish cakes and fish balls Fish paste and pate Preserved seafood: smoked, pickled, dried, salted, frozen, canned etc. Seafood sticks Sushi Taramasalata	Curry or oriental dishes Fish pie Fish in a sauce Kedgerree Pizza Salmon en crouete Sandwich Szechuan prawns with vegetables Prepared pre-school meals (<5yrs)
Poultry	Breast Meat portions - dark Meat portions - light Meat portions - skin on Meat portions - skinless Whole	Burger Chicken wings Cooked poultry: roasted, grilled, deep-fried, baked, boiled Meat spread Pate Soup	Pie – chicken/turkey/game Chicken casserole Chicken in white sauce Chicken chow mein, curry, tandoori, tikka masala, satay, stir fry etc Coronation chicken Sweet and sour chicken Coq au vin Spring rolls Prepared pre-school meals (<5yrs)
Pork	Bacon Belly joint/slices Diced, minced pork Fillet strips Ham, gammon joint Heart, kidney, liver Joints – legs, Loin – chops, medallions, steaks Shoulder – joint, steaks	Frankfurter Luncheon meat Pate Salami Sausages Spare ribs Savaloy Faggots in gravy	Pork pie Sausage rolls Scotch eggs Pork, sausage casserole Pork stir-fry, sweet and sour pork Sandwich Pasta with ham Pizza Prepared pre-school meals (<5yrs) Quiche
Lamb	Breast Heart, kidney, liver, tongue Leg Loin – chops, joints Mince Neck – cutlets, fillets Shoulder Stewing lamb	Haggis Donor kebab Shish kebab	Lamb curry Lamb kheema Lamb hot pot with potatoes Lamb stir-fry Lancashire hot pot Irish stew Meat samosas Prepared pre-school meals (<5yrs)

	Primary	Secondary	Tertiary
Beef	Braising steak Heart, kidney, liver, tongue, tripe Fillet steak Mince Rib Roast Rump steak Silverside Sirloin steak Stewing steak Topside	Burger / grillsteak Corned beef Meat spread Pate Sausages	Cornish pasty Beef pie / steak & kidney Stewed steak with gravy Beef bourguignon Beef casserole Beef chow mein, curry, stir-fry Beef kheema Beef stew Chilli con carne Cottage/Shepherds pie Enchiladas Goulash Beef hot pot with potatoes Lasagne Meat samosas Moussaka Pasta with meat and tomato sauce Spaghetti bolognese Prepared pre-school meals (<5yrs)
Vegetables (incl. cereals, legumes, nuts)	Asparagus, celery, leek, onion Cucumber, courgette, marrow Leafy vegetables: cabbage, lettuce, cauliflower, broccoli, Legumes: beans, lentils, peas, peanut Mushrooms Nuts and seeds: almonds, cashew, hazelnut, macadamia, pecan, pistachio, walnut, corn, rice, quinoa etc Peppers Root vegetables: carrots, potatoes, parsnips, swede, turnip, beetroot Seaweed	Cooked vegetables: boiled, steamed, fried, baked Mixed nuts Mixed vegetables Houmous Peanut butter Preserved vegetables: dried, salted, frozen, canned etc. Potato chips Sauerkraut Tomato puree Quorn pieces	Bhaji, pakora, falafel Burger - vegetable/bean/tofu Casserole - vegetable Chilli - vegetable/Quorn Crumble - vegetable Flan Lasagne Lentil/Nut/rice/seed roast Moussaka Nut croquettes/cutlets Pasty - vegetable Pie - vegetable/Quorn/lentil/Shepherds Stuffed aubergines/peppers/tomatoes Pizza Ratatouille Salad Savoury rice Quiche Vegetable stir-fry, curry, korma

Source: Public Health England, 2021

In seafood, *fresh/chilled products* have traditionally been primary processed material (chilled never frozen, including live animals in some cases). Secondary processed products are mainly *frozen* and *ambient* products (including prepared and preserved). Tertiary or composite products could be chilled or frozen. Fresh/chilled products increasingly include secondary processed products i.e. ‘refreshed’ product chilled having previously been frozen. The extent of processing for different types of seafood product is shown below in table A4.3 and how these relate to basic, added value and premium solutions is shown in table A4.4.

Table A4.3 Types of seafood products by format and extent of processing

Format	Description	Live	Primary	Secondary	Tertiary
Fresh / chilled	Chilled never frozen	x	x		
Fresh / chilled	Refresh - chilled previously frozen			x	x
Frozen	Frozen			x	x
Ambient	Prepared and preserved			x	

Table A4.4 Seafood product formats

Product solution	Product format	Retail examples	Food service examples
Basic	<ul style="list-style-type: none"> • Primary products • Mainly chilled, frozen • Basic centre plate protein • Mix and match, mission-based fixtures 	<ul style="list-style-type: none"> • ‘Natural’ formats 	<ul style="list-style-type: none"> • Standard component product for outlets creating seafood meals e.g. frozen fillet for fried fish • Particularly in fish and chip shops and pub chains
Added value	<ul style="list-style-type: none"> • Secondary and tertiary products • Chilled or frozen or ambient • Prepared products or meals • Mix and match, mission-based fixtures 	<ul style="list-style-type: none"> • Breaded, battered, marinated and sauce, prepared products • Meals 	<ul style="list-style-type: none"> • Sandwiches, seafood burgers, pre-battered fish • In quick service restaurants and pub chains, fried fish in some fish and chip shop chains, travel and leisure, work and college
Premium	<ul style="list-style-type: none"> • Primary and secondary products • Chilled • Bespoke products or meals • Meal kits (kit/component) 	<ul style="list-style-type: none"> • Niche products – sushi, crab meat • Premium ‘restaurant quality’ meals • Hot counter ‘meal for tonight’ 	<ul style="list-style-type: none"> • Unique products for chefs creating specialist seafood offer e.g. high value species, catch of the day meals, sushi • In full service restaurants, independent pubs, hotels

4.1.4 Changes in product format over time

Up until 2020, retail sales of chilled seafood was the only sector in consistent growth with frozen and ambient either flat or in decline. Chilled seafood consumption has increased, benefitting from a perception that these products are better quality and value for money. The chilled natural product format dominates seafood sales alongside cakes, fingers and sushi. Since 2011 formats such as natural, prepared and sushi showed the highest volume growth. Meals and sauce segments have been in decline. Breaded seafood has shown significantly lower growth; with batter and fingers in slight growth.

In food service, growth over the long term (since 2007) has been in lower price and convenient formats; seafood burgers, seafood sandwiches and fried fish. Despite competition from an increased range of take away options, fish and chips remain a hugely popular format with the UK consumer. Thought to have originated around the mid nineteenth century, it is in many ways an iconic seafood format in the UK market. In the year to September 2018, total fish and chip servings across the whole of foodservice totalled 201 million, up +13.5% from 2009. The continued popularity of fish and chips has been supported by format innovation in the supply chain, particularly the development of frozen at sea fillets.

Recent events, particularly the Covid-19 pandemic, have given rise to shifts in some product formats - and a consolidation of others - to suit the rapidly changing needs of the consumer. For example, in early lockdown, retail formats shifted markedly: frozen seafood was preferable to chilled and ambient was up from 2019; pre-pack seafood

being important to consumers (who wanted to be in and out of stores quickly). However, as the pandemic subsided, frozen seafood began to slow as the sector showed signs of returning to pre Covid-19 trading patterns i.e. chilled in growth and frozen/ambient sales either static or in decline. In the food service sector, meanwhile, fish and chips remained a relatively popular format given the limited availability of food service offerings during the pandemic. For example, in Q3 2021 total seafood servings had declined by 20% over the previous two years but fish and chips meals only declined by 10%. This reflected the format as being better suited for delivery; often, a serving of fish and chips was the only other option for consumers tired of home cooked meals.

A5. Food outlets

Products are made available to consumers through a wide range of outlets, oriented towards consumers interested in food function, convenience or experience. Large corporate outlets (like main estate retailers or some quick service restaurant and pub chains) support functional interest offering the widest range of products, convenience outlets offer a more limited range, specialist outlets offer more unique products to those seeking 'an experience'.

They can be broadly categorised as:

- retail (in-home consumption) and
- food service (out-of-home consumption).

Around two thirds of seafood sales by volume is through retail, and a third is through food service. Food service can be considered the 'innovation engine' for the retail sector. Higher end food service outlets develop product innovations to provide seafood solutions for unsure consumers and generate awareness of novel products. These innovations are then diffused into larger corporate food service and retail outlets as functional products.

5.1 Retail

The retail sector emphasises certain product types as a solution to the needs of the consumer:

- **Basic product solutions**

- Include 'natural' formats that offer a centre-plate protein that, combined with other products, provide a basic meal solution.
- The solution works for 'mix and match fixture-based shopping' in support of mission-based shoppers (e.g. those picking a protein, a carbohydrate, and a sauce).

- Basic primary processed products, either chilled or frozen.
- Such products are particularly suited to reducing food waste.
- **Added value product solutions**
 - Include 'breaded', 'battered', 'marinated and sauce', 'prepared' formats.
 - Can support 'mix and match fixture-based shopping' in support of mission-based shoppers.
 - Secondary and tertiary processed products with significant transformation of the original protein, either chilled, frozen or ambient.
 - This supports off-the-shelf, and longer shelf life, products that are ready to eat.
- **Premium product solutions**
 - Are relatively minor volume and relate to unique or bespoke product/meal formats.
 - Includes 'natural' formats that can be 'assembled' with other products to provide a meal-kit solution.
 - Includes unprocessed, primary or secondary processed products, chilled.
 - These are available through premium focussed retailers (including fishmongers), with an emerging trend for some large multiples to provide hot counters offering 'meal for tonight' solutions. Meal-kit products are well suited to an emerging trend for meal-kit companies such as *Hello Fresh*.

In retail, basic and added value products dominate, with premium products relatively minor. Within retail, large corporate outlets that support more functional consumption are dominated by the main estate multiple retailers. These include Tesco, Sainsbury, Asda, Morrison's etc.

Discounters and convenience store outlets tend to offer a more limited range of products. These include Lidl, Aldi and Iceland and the metro outlets of the major multiple retailers.

Outlets that serve premium products include fishmongers, delicatessens, and fish counters within premium-end multiple retailers (e.g. Waitrose, etc). Specialist supermarkets (such as Wing Yip or Seewoo) serve niche interests in country or region-specific cuisine.

5.2 Food service

In contrast to retail, the food service sector emphasises a slightly different balance of solutions given the role played by chefs. In food service, basic product and added value solutions dominate. Premium products, being the preserve of skilled chefs, are more common than in retail - although this would appear to be changing in the face of skills shortages and food service consolidation.

- **Basic product solutions** tend to serve the product format needs of the food service provider:
 - Examples include a significant volume of frozen at sea fillets provided for fried fish (particularly through fish and chip shops).
 - Outlets are provided with a standard component product, such as a standard fillet, to then assemble with other items into a relatively *flexible* menu offer.
- **Pre-processed products** are prepared (cooking, coating, creating a sauce, adding accompaniments or other items) to create a standard meal solution for the consumer.
- **Added value product solutions** serve the product format needs of the food service provider or are provided to the consumer directly.
 - As much of the preparation has already been done, minimal effort is required by the outlet to produce the final product for the consumer. Examples include seafood sandwiches, seafood burgers, pre-battered fish and chips etc
 - These items provide a relatively simple but *fixed* offer to the consumer – directly to the consumer in the case of sandwiches for example.
 - Available through quick service restaurants and fast casual dining, some fish and chip shop chains, gastro pubs or pub chains, travel or leisure outlets, work and college outlets.
- **Premium product solutions** tend to serve the needs of skilled chefs that can provide a changing 'day-to-day' seafood offer.
 - With very little prior preparation of the seafood material, the chef makes considerable effort to craft a unique final product for a discerning consumer.
 - Examples of this include high value species, sushi or 'catch of the day' menu items in full service restaurants, artisanal restaurants and independent pubs.

Within food service, outlets that provide a flexible range of basic product solutions to support functional consumption include fish and chip shops and pubs.

Outlets that provide added value products, offering a more limited range of convenience meals and snacks, operate in both the non-profit sector and the profit sector. 'Non-profit' outlets include schools, colleges, hospitals, and prisons. 'For profit' outlets include 'quick service' 'fast casual', hotel restaurants, bistros, and gastro pubs.

Outlets providing premium products, include full service restaurants, specialist restaurants that serve specific country or regional cuisine, and independent pubs.

5.3 Changes in outlets over time

Outlets in the UK have seen significant changes over the last ten years. According to a recent RAND report, the channels through which consumers purchase food are diversifying. In the retail sector, this has been driven by consumer convenience, whilst in the food service sector this has been driven by consumers' desire for new experiences. Out of home consumption is a major part of the diet of younger adults and adolescents (Gen Z) whilst, in contrast, older adults' preferred location tends to be at home. Specifically:

- In retail:
 - UK consumers continue to buy from large supermarkets but other forms of retailer, including mini-supermarkets, have increased in popularity.
 - As food prices have increased, retail has become much more competitive with lower price outlets such as Aldi and Lidl taking a great share of the retail market. In response, larger multiples are

now competing on choice to maintain customer share – this has implications for new product development and supply chains as competing on choice means rotating products more frequently.

- The online grocery market has become increasingly important, and this has led to an increase in supermarket home delivery and other forms of delivery e.g. vegetable boxes and the emergence of services like *Amazon Fresh* and *Hello Fresh*.
- In food service:
 - There has been significant growth in out of home food consumption
 - The out of home environment is increasingly facilitated by digital technology and the expansion of online food delivery platforms, particularly through new players such as *Deliveroo*, *Just Eat* and *Uber Eats*.

Seafood has not been immune to changes in outlets over time:

- In retail:
 - There has been a continued trend in closure of retail fish counters. The availability of counters have reduced over the last few years: Asda and Sainsbury's have completely closed, and Tesco have reduced counters considerably. With pressure on independent fishmongers, the closure of counters is removing an important outlet for seafood consumers who have not subsequently switched their purchasing volume to other areas.

- The greater share of lower price outlets could potentially reduce the variety of seafood consumed. Discount retailers have tended to carry a much more limited line of seafood than major multiple retailers. The growth of this sector, as consumers switch to these channels, could limit the variety of seafood consumers are exposed to.
- The growth of online shopping may also impact on the variety of seafood consumed as many niche sectors rely on impulse purchasing, which does not tend to happen with online shopping. The pandemic, and associated boost in retail sales, showed how bigger lines expanded and smaller lines contracted.
- In food service:
 - Since the 2007 credit crunch the trend in seafood servings followed a broadly similar pattern to overall servings in food service. The number of servings in GB food service declined through austerity and returned to growth from 2014, with servings of seafood taking slightly longer before returning to growth (from 2015). By 2018, GB seafood servings reached 1.16bn, an estimated value of £4.4bn.
 - Over the same period basic product solutions, such as fish and chips, has seen considerable growth in convenience outlets such as quick service restaurants and fish and chip shops. Between 2009 and 2018 fish and chip shops outperformed most other channels, growing fish and chips meal servings by 22% (in comparison to growth in overall fish and chip servings of 13.5%).

Recent events, particularly the Covid-19 pandemic, interrupted some of these trends whilst accelerating others. There was a significant boost to retail sales, for example seafood saw increases (up +13% on pre Covid-19) driven by more in-home meal occasions arising from home working, school closures and the subsequent restrictions on foodservice. Consumer visits to foodservice outlets were severely curtailed – for example traffic in Q2 2021 was still down 39% on pre-pandemic levels (Q2 2019). It was notable that Just Eat delivery orders in the UK grew more than 700% in the first half of 2021 compared with the same period in 2020. Restaurants on Just Eat in the UK rose to 58,000 in June 2021 compared to 50,000 at the start of 2021. Of particular note was the sale of seafood through fish and chip shops: this sector responded very strongly from the initial lockdown. With restrictions forcing change, the fish and chip shop sector moved forward in areas such as ‘click and collect’. Such changes may have taken 10 years otherwise and are now embraced by many fish and chip shops.

A6. Production systems

The wider seafood production system can be described in terms of seafood products, their associated species and chain destined for the UK market, and major source regions:

- **UK market products:** A diverse set of products, ranging from sale of live seafood to sophisticated added value products that match consumer interests.
- **Species and chain:** A diverse range of species, with product supply chains ranging from short to long (reflecting species but also the time required to cook/consume versus time required to produce

seafood products). Variation in the level of control, ranging from vertically integrated chains to market-based supply.

- **Major source regions:** Origin and main producing countries - UK and international.

Table A6.1 describes the seafood production system in terms of whitefish, pelagic, shellfish, and exotic species.

There have been important changes over time in the production systems serving UK seafood consumption. These changes are summarised in the horizon review *UK seafood supply base to 2030*.

Table A6.1 Key characteristics of whitefish, pelagic, shellfish and exotic supply

	Major source regions	Species and chain	UK market products
Whitefish	International sources include Arctic / Barents Sea (Norway, Russia, Iceland) and North Pacific / Bering Sea (USA). UK domestic sources include UK waters and NE Atlantic.	Cod, haddock, whiting, monkfish, sole, plaice, hake, Alaska pollock. UK domestic chains more fragmented than integrated chains of competitors e.g. Iceland. Fresh product sent direct by truck. Frozen product held in storage, containerised then shipped and sent by truck.	Whitefish products for the UK market include domestic sourced fresh product (lower volume and higher value (£/kg)) and internationally sourced refreshed/frozen product (higher volume and lower value (£/kg)).
Pelagic	International sources include Eastern Atlantic ocean (Spain, Morocco), Indian ocean, Pacific ocean, and Atlantic ocean. UK domestic sources include UK waters and NE Atlantic.	Herring, mackerel, sardine/pilchard, anchovy, tunas. UK fresh product sent direct by truck, overseas fresh material sent by truck and air freight. Frozen product held in storage, containerised and then shipped and sent by truck. UK domestic chains more fragmented than integrated chains of Iceland and Faroes.	Pelagic products for the UK market include fresh product (lower volume and higher value (£/kg)) that is either domestically sourced or internationally sourced and frozen product (higher volume and lower value (£/kg)) that is internationally sourced.
Shellfish	International sources include North Atlantic, and farmed sources in South East Asia and Central America. UK domestic sources include UK waters and NE Atlantic.	Nephrops, cold water prawn, farmed warm-water prawn. UK fresh product sent direct by truck. Frozen product held in storage, and then sent by truck with international material containerised and shipped.	Shellfish products for the UK market include fresh but a sizeable volume of frozen product is also represented from UK and international sources. Fresh domestic product tends to be high value low volume, and frozen product tend to be low volume and high value (£/kg).
Exotics	International sources include EU, Asia, Australia, and Africa. UK domestic sources include UK waters.	Carp, wild and farmed bass, farmed bream, snappers, kingfish, parrotfish, and groupers.	Exotic seafood products for the UK market include fresh (including live) product, and frozen product. Both fresh and frozen product tend to be low volume and range from low to high value (£/kg).

A7. Key factors influencing consumption

The impact of any specific change on seafood consumption varies by consumer group, product type, outlet, and the wider production system. Typical changes that can influence UK seafood consumption are summarised in table A7.1 with examples of industry impact in terms of price, quality, convenience, health and nutrition, welfare, and resources.

Table A7.1 Factors and changes influencing seafood consumption

Factors	Change	Examples of change
Price	Price range	Polarisation of product value: premium versus value
	Price ceiling (max)	Expectation that seafood price should fall or be at a low price
		Seafood can be expensive relative to substitutes as disposable income decreases
	Price floor (min)	The availability of volume supply: top five species or alternative species
	Price of edible protein	Level of waste involved in storing, preparing or cooking seafood products
Quality	Taste	Changes in ethnic mix and the influences on seafood as a protein and particular species within that
	Freshness	Capability of freezing technology to support freshness
	Consistency	Level of consumer trust in chefs, brands, other influencers (trusted advocates such as bloggers)
		Brand loyalty falling with a more promiscuous consumer
		Enhanced by trusted brands, trusted outlets and online purchasing
Capability of a consolidated or fragmented industry to deliver consistent products		
Convenience	Availability	Presence and presentation of seafood on online retail platforms
		Heightened awareness with rise of digital marketing, real-time campaigns
		Awareness constrained by fragmented industry/promotion
		Priorities of influential outlets
		Focus of outlets (e.g. discounters/number of metros) constraining shop window
		Specialisation (e.g. focus on chilled or frozen) undermines diversity message
		Range and exposure of seafood on offer resulting from store layout or formats and fragmented internal operations e.g. presence of fish counters
		New forms of attractive and/or informative packaging
		Seafood sitting alongside/given lower billing versus other proteins (e.g. Deli's/ Number of fish dishes on menu's/in restaurants)
	Product format	Seafood a more difficult protein to choose, for example chilled or fresh can require a personal assessment ('eyeballing' the product)
		Format matching to suit evolving eating habits (consumers grazing, on the go snacking / household size e.g. older people 'eating for one')
		Range of product formats (fresh, frozen, ambient) and need for pre-processing
		Format matching the deskilling of kitchen staff (reduced whole fish/increased portions)
	Versatility / preparation	Protein versatility
		Norms or traditions versus experimentation (e.g. younger people being more adventurous)
	Time	Variety driven by time or experience seeking
		Competing demands on consumers' time
		Purchase frequency, foot fall or traffic

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Factors	Change	Examples of change
Health and nutrition	Safety	Health, fraud and mislabelling concerns e.g. horse meat scandal
	Health awareness	Promotional focus on emotion and experience at expense of function and vice-versa
	Nutritional content	Polarisation of role: 'functional' versus 'experience' Health credentials
Welfare	People	Slavery, bonded labour concerns, fair trade etc
	Animals	Welfare of fish and other animals in food chain e.g. seals
Resources	Oceans	More environmental factors now required as a market access requirement

A8. Food and seafood consumption in the wider world

This chapter summarises the main drivers and developments affecting the food and seafood industry over the long term, with a particular focus on seafood consumption. This draws on developments that are both observed (by third parties, such as researchers) and experienced (by industry operators).

8.1 Changes in the wider world

Table A8.1 shows long term developments and change pathways associated with the wider world. These concern the economy, political/regulatory developments, social conditions, advances in technology, and environmental conditions (such as climate,

biodiversity and resources). Changes relate to those experienced or observed in the last 10 years or anticipated in the next five-year period, and further out to the next 10 to 15 years.

These systemic global developments act as *multipliers* amplifying changes underway in food and seafood. They present several strategic challenges and dilemmas that need to be resolved in building industry resilience. The economic (food security) and environmental (climate change) paths are particularly notable in their capacity to enhance food related opportunities and threats.

Table A8.1 Developments and change pathways in the wider world from 2010 to 2035

	Last 10 years	Next five years	Next 10-15 years
Economy	Growth, reliance on cheap labour and global supply chains	Recession, inflation, labour shortages, hybrid working	Growth, stability, decline? Return to localism?
Political / regulatory	Crisis of democracy, rise of 'populism' and autocrats, foregrounding of 'rights-based' approaches to problems	Political polarisation and dominance by radicalised 'interest' groups?	Global autocracy versus national cooperation? Governance failure?
Social conditions	Increasing population with high immigration, rise of virtue signalling and 'identity' based groups / tribes	Managed immigration, polarised groups, culture wars and discontent?	Ageing population with fragmented lives and society, inter-generational conflict?
Technology advances	Dynamic internet (2nd generation) and social media	Internet of things (3rd generation) - accelerated due to pandemic	Online world, artificial intelligence, and alternative reality?
Environmental conditions	Mainstreaming of climate change and biodiversity concerns	Radical 'zealotry' versus 'managed transition' and consequent backlash?	Climate effort transforms, is just enough, or fails?

8.2 The economy and food security

The global economy, global population increase, and availability of raw material all affect food security. Global economic and financial conditions will influence economic growth, growth in population (and middle-class incomes), and changing tastes and diets in regions around the world.

Food security projections have suggested:

- A world economy rebalancing towards Asia.
- An expanding global middle class (which is squeezed in developed countries).
- Increased seafood consumption due to rising incomes, urbanisation, and dietary shifts (through increased variety and a focus on better health). However, the rate of increase will be slower than in the past, due to lower seafood production, higher prices and slowing population growth. Regional differences are expected:
 - In growth rate of per capita fish consumption across major areas to 2030 with high growth rates in Asia (9%), Europe (7%), Latin America (6%) and Oceania (6%) and only Africa having a declining rate (3%).
 - In total seafood consumption to 2050 with China being the largest seafood consumer (accounting for over half of growth) and notable increased demand in India, Nigeria, Brazil, and Mexico.
- Global seafood production expected to increase but is constrained, based on:
 - Wild capture having very limited growth, if any, through better management of fisheries and harvest utilisation.

- Aquaculture expanding at a declining rate (due to environmental challenges, regulatory requirements, increased disease outbreaks, decreasing productivity, and reduced availability of fishmeal).
- Concentration in Asia (particularly India, SE Asia and China) driven by species amenable to aquaculture (including prawn, salmon, tilapia, carp and pangasius).

Furthermore, geopolitical pressures may influence food security as individual nations use food resources as a tool to achieve political objectives in the manner other commodities have been used. Examples in energy include the action of major oil producing countries in the last century, and more recently in relations between Europe and Russia. The latter is leveraging energy assets but also may have similar ambitions in relation to metals and food commodities.

UK food security is enhanced when food is sourced from a diverse portfolio of areas. This includes a range of stable geographic regions as well as domestic production. Consequently, the shape of the food industry will change to ensure food can be supplied to market requirements.

An interconnected globalised economy, and the challenges of food security, increases the complexity of managing risks, costs and securing investment. To address this, a previously fragmented seafood industry is driven to consolidate. The operational scale of seafood businesses might be expected to polarise, and a clearer division emerge between smaller operations in locally oriented supply chains and large scale consolidated global seafood chains.

8.3 Climate change and food resources

Climate change and biodiversity concerns can be expected to drive a broadening focus on environmental impact. Some aspects of this will centre on regulatory requirements, other aspects will be market oriented and driven by reputation management. The likely result will be increased scrutiny of:

- Greenhouse gas emissions resulting from food production and consumption, how these are mitigated, including profiling and reducing product carbon footprints.
 - All food production relies on environmental resources and has some form of impact.
 - Food overall makes a sizeable contribution to global climate change; some suggest as much as 20 to 30% of all human derived emissions.
 - Almost half of global food production emissions is attributed to livestock and around 4% is attributed to fisheries.
 - Seafood is a relatively low emissions protein making it a 'climate smart' food choice – without it, consumers might have to rely on higher impact foods.
- Disruption to food production arising from the impacts of a changing climate, and supply chain adaptations.
 - Seafood may be affected by:
 - ♦ sea level rise and extreme water levels;
 - ♦ changes in storms and waves;
 - ♦ changes in temperature;

- ♦ ocean acidification and de-oxygenation of sea water; and
- ♦ changes in terrestrial rainfall.
- This may mean seafood has to be sourced from different locations, or that supply is disrupted because of damage to infrastructure, interruption to electricity or transport.
- Managing shared resources responsibly, including resource utilisation and impacts on biodiversity and wider environmental impacts.

These concerns increase the complexity of managing food businesses and requires additional due diligence. 'Industrial science' can be expected to increase, with in-house scientists supporting food business oversight of resource use and supply chain operations.

8.4 Forward pathways to 2050

Looking forward, some of these developments could have a driving influence on food consumption and production. Climate change and economic developments are particularly notable drivers. Depending on our choices, efforts to address climate change could be meaningful or fruitless, whilst the economic prospects could show continued growth or decline. By 2050, these economic and climate pathways could lead to several destinations for the world at large, each having implications for our food and seafood industries.

A9. Support for industry response

9.1 Supporting response to changing seafood and wider protein consumption

Various initiatives have supported industry response to changes influencing consumption. Initiatives at different levels can support responsible protein consumption and production. Led by industry, policy, or research stakeholders, recent examples are listed below.

Industry:

- General protein awareness, generic marketing, and data
 - Seafood - Seafish
 - Pork, Lamb, Beef - Agriculture and Horticulture Development Board (AHDB)
- General protein initiatives demonstrating responsible business practice
 - Courtauld Commitment
 - WWF Retailers Commitment for Nature
- Specific seafood promotions (often species specific) by regional sources of supply
 - Norwegian Seafood Council (cod, haddock, etc)
 - Alaska Seafood Marketing Institute (salmon, Alaska pollock, etc)
 - Seafood Scotland (cod, haddock, mackerel, herring, Nephrops, etc)
- Specific seafood product promotions
 - Individual brand owner campaigns
 - Multiple retailer campaigns
 - Scottish salmon, Scottish shellfish.

Policy: Regulation, Government, NGOs

- Global
 - UN FAO: The Livestock Environmental Assessment & Performance Partnership
 - UN FAO/UNEP - Sustainable Food Systems Programme (SFSP)
 - Global Roundtable for Sustainable Beef
- UK
 - Eating Better campaign (encouraging dietary shifts towards less and better meat consumption)
 - World Wildlife Fund Livewell Plate

Research:

- Global
 - The Blue Food Assessment: a collaborative initiative of the Stockholm Resilience Centre, Stanford University and EAT drawing together over 100 scientists from more than 25 institutions around the world. Helping to evaluate trade-offs and implement solutions to build healthy, equitable and sustainable food systems
- UK
 - Specialist research centres with an interest in food and seafood consumption include Stirling University ('consumers and marketing'), Aberdeen University ('health and nutrition') Oxford University ('the future of food' through initiatives such as TABLE, the Oxford Martin Programme on the Future of Food, and the Food Climate Research Network).

9.2 Communicating the taste of seafood

In recent years Seafish sought to de-mystify seafood for the consumer and foodservice sector by developing the *Seafood Lexicon*. This *lexicon* could provide a way of communicating the taste of seafood to the consumer. The aim was to give individuals greater confidence in understanding the flavour and texture of seafood, promote the range of fish species, and encourage less enthusiastic consumers and more conservative chefs to feel comfortable in trying new species.

Based on a series of research workshops with Westminster Kingsway College and chefs, the *Seafood Lexicon* was an exploratory initiative that:

- Developed a common language to describe variation in flavour (sweet, mild, medium, savoury, strong) and texture (soft, medium, flaky, firm, meaty).
- Mapped 29 types of seafood on a grid showing variation by flavour and texture.
- Brought the lexicon to life in symbols (see figure A9.1).

The intention was that such a lexicon could be displayed and consulted at the point of purchase or menu selection. This would encourage consumers and chefs to switch species more easily and broaden their repertoire



Figure A9.1 Seafood Lexicon

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