
Appetite for change: food, ESG and the nexus of nature

Part II: The drive against “deviance”

Contents

- 1 **Executive summary**
- 2 **Introduction**
- 3 **Respecting the nexus**
 - 3.1. Industrialisation and unintended consequences
 - 3.2. Case study: Grieg Seafood
- 4 **A growth industry**
 - 4.1. Protein demand and the hunger for alternatives
 - 4.2. Case study: Maple Leaf Foods
- 5 **Turning the tide**
 - 5.1. Aquaculture and the scale of the challenge
 - 5.2. Case study: Mowi
- 6 **Insights from the frontiers of positive change**
 - 6.1. Food and ESG: past, present and future
 - 6.2. Risks, results and resonance
- 7 **Conclusion**
- 8 **References and suggested further reading**

Authors



Glen Yelton
Head of ESG Client Strategies
North America, Invesco

Glen Yelton is Invesco's Head of ESG Client Strategies in North America. He was previously a Director of ESG and Impact Investing at OppenheimerFunds and also held ESG-related and research-related roles at a number of investment, data and ratings businesses. As well as helping build strategies, he works with Invesco's product teams to identify new ESG opportunities.



Dr Henning Stein
Global Head of Thought
Leadership, Invesco

Dr Henning Stein is Invesco's Global Head of Thought Leadership. He joined Invesco in 2016 from Deutsche Asset Management, where he led EMEA institutional and retail marketing and chaired the company's academic foundation. He holds a PhD in business and strategy from the University of Cambridge and is a Fellow at Cambridge Judge Business School.



Conor Hartnett
ESG Client Strategies
Manager, EMEA, Invesco

Conor Hartnett is Invesco's ESG Client Strategies Manager in EMEA. He helps the business integrate ESG into issues into mainstream investment processes, particularly with a view to mitigating and adapting to climate change. He previously worked for CDP (formerly the Carbon Disclosure Project), including serving as its Senior Project Officer for Capital Markets.



Maria Lettini
Executive Director, FAIRR

Maria Lettini is Executive Director of FAIRR. She was previously Head of the Americas for the Principles for Responsible Investment (PRI) and also worked for financial institutions including JP Morgan and Deutsche Bank. She studied environment, politics and globalisation at King's College London and business, Latin American studies and Spanish at San Diego State University.

1

Executive summary

- Various key aspects of food production and consumption increasingly represent examples of what the academic literature describes as “the normalisation of deviance”.
- This term is applied to organisational settings in which unsustainable policies and practices have become accepted and, as a result, catastrophe is imminent or inevitable.
- We highlight a number of areas in which this might be seen as the case – specifically, factory farming, overreliance on animal protein and critical resource depletion.
- We discuss alternatives to prevailing approaches and highlight instances in which responsible investing is supporting more sustainable and resilient attitudes and methods.
- These examples underline how investors can help bring about positive change by considering material environmental, social and governance (ESG) factors in this sphere.
- Reflecting the hyperconnectivity that characterises the “nexus of nature”, they also illustrate how positive change in one area can lead to positive change in others.
- This means that the drive against “deviance” in this sector can also play a part in addressing global challenges such as biodiversity loss, climate change and human health.

2

Introduction



Responsible investing – in the form of the judicious allocation of capital and the power of active ownership – will continue to underpin this new and more sustainable direction of travel.

In *Lessons from the COVID Crisis*, the first paper in this series, we explored what we called the nexus of nature, a series of highly interconnected phenomena that combine to produce many of the existential threats confronting the planet and its inhabitants. In particular, we explained how the COVID-19 pandemic has further exposed the unsustainability of many key aspects of food production and consumption.

We concluded with a celebrated quote from Nobel laureate Richard Feynman: “Nature cannot be fooled.” Feynman famously delivered this warning after being tasked with investigating the Challenger space-shuttle disaster, a tragedy that – like so many present-day catastrophes – arose from humanity’s disregard for the natural realm¹.

Challenger exploded after the O-rings in its solid rocket boosters failed during launch on a freezing-cold morning. NASA was aware of the craft’s vulnerability but pushed ahead with the mission in an attempt to silence escalating criticism that the shuttle programme was losing momentum and relevance. Having been taken for granted, nature delivered a devastating reminder of its primacy.

Another study of the accident offers a further parallel with the problems evident in certain areas of food production and consumption. American sociologist Diane Vaughan used the Challenger story to coin a term that the academic literature would subsequently employ to designate an organisational setting in which unsustainable policies and practices become accepted: the normalisation of deviance.

Is this innately emotive idiom genuinely appropriate for describing the most worrying elements of food production and consumption? We believe that it is, in so far as some approaches found in this sector mirror Vaughan’s concept of situations that could result in immediate disaster or in which calamity occurs after “a long incubation period, with early warning signs misinterpreted, ignored or missed completely”².

In this paper, drawing on pioneering research and real-world examples, we take a closer look at the status quo and how the investment community is helping make a difference. We examine how production is being reshaped, how the shift to alternative sources of protein is accelerating and how innovations such as aquaculture encapsulate the risks and opportunities to which advances in this space are giving rise.

In short: we show how the incorporation of material environmental, social and governance (ESG) considerations is supporting positive, lasting change. Going forward, responsible investing – in the form of the judicious allocation of capital and the power of active ownership – will continue to underpin this new and more sustainable direction of travel.

3

Respecting the nexus



There exists a direct link between production methods, the occurrence of zoonotic infections and the potential emergence of another devastating pandemic.

3.1. Industrialisation and unintended consequences

In some areas of food production, as noted in Lessons from the COVID Crisis, speed and scale have been the overriding objectives for more than a century. The realisation of these aims has now been honed into a science. In the words of US academics Troy Vettese and Alex Blanchette: “Complex breeding regimens, genetic and hormonal manipulation, climate-controlled confinement and drugs make livestock bodies more uniformly standardised... Species have been remade to save seconds of waged time.”³

This ethos can imperil animals and employees alike⁴. Among other risks, as has become especially obvious in light of recent events, the homogenisation of factory-farmed livestock – not least through the overuse of growth-enhancing antibiotics– has made slaughterhouses breeding grounds for highly resistant pathogens that can be passed from animals to humans.

One such, of course, is COVID-19. Thus there exists a direct link between production methods, the occurrence of zoonotic infections and the potential emergence of another devastating pandemic.

In addition, this branch of the nexus of nature clearly funnels into the single greatest existential threat to the planet: climate change. The Food and Agriculture Organisation (FAO), the United Nations’ oldest permanent specialised agency, has calculated that nearly 15% of all anthropogenic greenhouse gas (GHG) emissions – that is, those caused by human activities – come from livestock⁵.

In 2013, unveiling a report entitled Tackling Climate Change Through Livestock: A Global Assessment of Emissions and Mitigation Opportunities, the FAO suggested that significant cuts in emissions from factory farming were “within reach”. This optimism has proven misplaced.

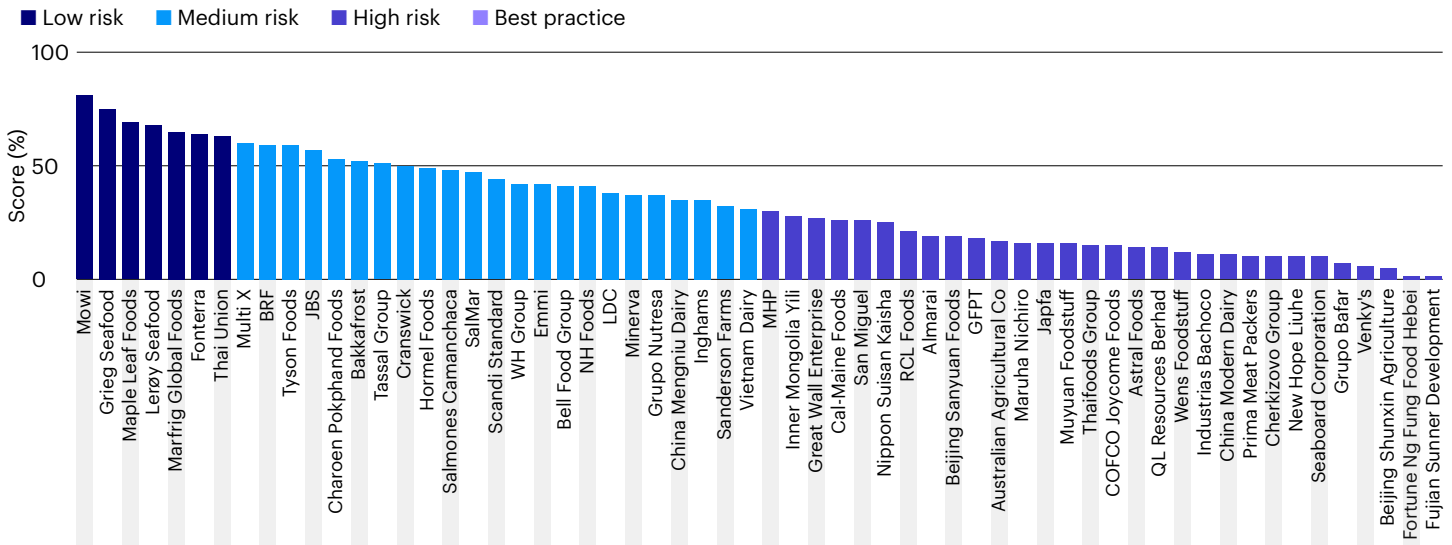
FAIRR (Farm Animal Investment Risk and Return), an investor network that raises awareness of the ESG risks associated with intensive food production, revealed in 2019 that most major meat and livestock firms still lacked targets for cutting GHGs⁶. This finding led to investors with more than \$6.5 trillion in assets under management calling on some of the biggest companies in the sector to act urgently on the climate risks prominent within their global supply chains.

Similarly, US-based sustainability advocacy group Ceres has branded the industry “the largest-emitting sector that doesn’t have a low-carbon plan”. “While some companies in some high-emitting industries are starting to set goals and transform their business models in line with the Paris climate agreement,” said senior director Brookes Barton, “the meat and dairy industry is digging in its hooves.”⁷

Genuine commitment or “hot air”?

The 2021 edition of FAIRR’s groundbreaking Protein Producer Index categorised dozens of listed companies involved in intensive farming as high-risk in their approach to a number of ESG factors. The 60 businesses studied were valued at a total of around \$360 billion at the time of the research.

FAIRR assessed each firm’s performance with regard to 10 issues: deforestation and biodiversity loss; water use and water scarcity; waste and water pollution; antibiotic stewardship; working conditions; animal welfare; food safety; governance; sustainable proteins; and GHG emissions. Some 68% of major meat and dairy suppliers were judged high-risk in relation to the last of these.



Source: : FAIRR: FAIRR Protein Producer Index, 2021. Holdings are shown is for illustrative purposes only, should not be considered recommendations to purchase or sell a particular security.

3.2. Case study: Grieg Seafood

FAIRR's annual Protein Producer Index divides companies into four risk-related categories: high risk, medium risk, low risk and best practice. Only one business among the 60 assessed for the 2021 version of the index was deemed to represent best practice in relation to use of antibiotics: Grieg Seafood.

Grieg specialises in aquaculture, a relatively new industry that involves cultivating freshwater populations of fish, crustaceans, molluscs, aquatic plants, algae and other organisms under controlled conditions. We will revisit this sector in more detail in chapter 5; here we focus specifically on what FAIRR terms "antibiotics stewardship", with particular reference to Grieg's exceptional dedication to this cause.

In 1992, when it was founded by entrepreneur Per Grieg Jnr and members of the Grieg shipping family, the company operated only in western Norway. It has since expanded to northern Norway; British Columbia and Newfoundland in Canada; and Shetland in the UK. It has more than a thousand employees and aims to harvest 130,00 tonnes of salmon in 2025.

Grieg describes ensuring a low environmental impact and the welfare of fish as both an ethical responsibility and key to its drive for profitability. It uses antibiotics "only as a last resort to treat bacterial diseases when fish health and fish welfare are threatened". In its operations in Norway, thanks to effective vaccines, there has been zero use of antibiotics since 2016⁸.

The 2021 Protein Producer Index reported a "modest" improvement in scores for antibiotics use across all businesses. This was attributed to "growing scrutiny" worldwide driving tougher regulation and better practices. Even so, although 6% higher than in 2020, the average overall score was only 27%.

Grieg scored 100% for its policy on use of antibiotics, 90% for its disclosure of use of antibiotics and 95% overall. By way of context, almost two thirds of all companies in the index were rated high-risk in relation to this issue – meaning an overall score of 20% or less.

Solveig Nygaard, Grieg's Global Fish Health Manager, has argued that aquaculture still has much work to do – despite the sector leading the way in combatting antibiotics use in food production. "Ensuring good fish health and welfare is one of the main tasks of a salmon farmer," he has said. "While we have seen progress in recent years, we are not satisfied with the status quo. We need more research and development and to continuously improve."⁹



Almost two thirds of all companies in the index were rated high-risk in relation to this issue – meaning an overall score of 20% or less."

4

A growth industry



Studies increasingly identify the rejection of meat and dairy products as the single most effective measure that an individual can take to help curb global warming.

4.1. Protein demand and the hunger for alternatives

It is conceivable that the COVID-19 crisis could eventually spur regulators to push for better policies and practices around intensive food production. This could herald anti-consolidation legislation and action on concerns such as live exports and antibiotics use. In the meantime, alternative proteins represent one of the brightest hopes for sustainability and resilience.

Sales of plant-based protein alternatives are already skyrocketing. The worldwide market, worth \$10.3 billion in 2020, has been projected to hit \$14.5 billion in 2025¹⁰. Innovation, dietary habits – especially among the millennial generation – and pandemic-inspired disruption to animal-protein supply chains have all contributed to the rise. For many people, according to an analysis by revenue impact company MarketsandMarkets, plant-based protein is seen as “an ideal food solution”¹¹.

The scientific community seems to agree. Studies increasingly identify the rejection of meat and dairy products as the single most effective measure that an individual can take to help curb global warming.

For example, researchers at Sweden’s Chalmers University of Technology warned in 2014 that beef and lamb production could account for half of all agricultural GHG emissions but just 3% of caloric intake by 2050 – making reduced meat and dairy consumption “indispensable” in achieving the goals set out in the Paris Agreement¹². In 2017, in a report entitled Appetite for Destruction, the WWF (World Wide Fund for Nature/World Wildlife Fund) detailed animal protein consumption’s “devastating effect” on biodiversity and predicted that 650 million hectares of land could be spared the harm wrought by agricultural production if everyone on the planet were to lower their meat intake¹³. Dr Joseph Poore, the lead author of a 2018 University of Oxford analysis of the environmental damage caused by around 40,000 farms in 119 countries, has claimed: “A vegan diet is probably the single biggest way to reduce your impact on planet Earth. It is far bigger than cutting down on your flights or buying an electric car.”¹⁴

Greater interest in both veganism and vegetarianism has been accompanied by a rapid growth in meat substitutes. Using plant-based ingredients, companies such as Beyond Meat and Impossible Foods have been able to replicate the taste and even the appearance of beef. As a result, many supermarket chains now even stock “bleeding” vegan burgers.

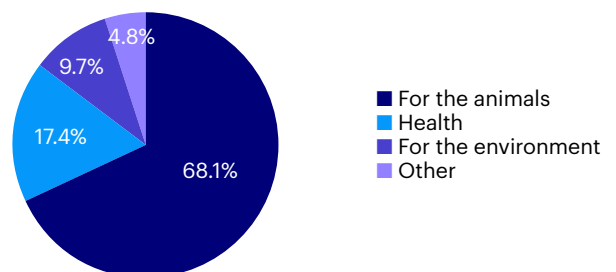
By creating muscle tissue from stem-cell samples, laboratory-grown meat – sometimes known as “clean” or “cultured” meat – is going yet further in the quest to replicate the real thing¹⁵. The costs were astronomical during the concept’s infancy – the first lab burgers were priced at almost a quarter of a million dollars¹⁶ – but have since fallen massively, with producers attracting substantial venture capital investment.

The Adam Smith Institute, a UK-based think-tank, has urged policymakers to accept that such breakthroughs “are in the process of radically transforming the world economy”. Launching a 2018 report into the sector, the institute’s president, Dr Madsen Pirie, said: “Cultured meats are a game-changer. [They] will release millions of acres of pasture land for other uses, resolve all of the ethical issues involved in the rearing and slaughter of animals and give the world access to a low-cost, high-protein diet.”¹⁷

Reasons to reject

According to a survey by Vomad, a website for the global vegan community, the vast majority of vegans abandon meat and dairy products in the interests of animal welfare. However, awareness of intensive farming’s environmental impact is proving ever more influential.

Carried out in 2019, the research also asked respondents how best to influence others to become vegans. The most popular response, offered by 28.1% of those surveyed, was “Show them good vegan food”.



Source: Vomad: The 2019 Global Vegan Survey, 2019; findings based on survey of almost 13,000 vegans worldwide



Jitendra Sagili, Maple Leaf's Vice-President of Research, Development and Technology, was asked to summarise the food sector in three words. He replied: 'Broken, exciting, diverse.'

5

Turning the tide

4.2. Case study: Maple Leaf Foods

The 2021 edition of FAIRR's Protein Producer Index revealed surging popularity in alternative proteins. Almost half the businesses featured were found to have some exposure to this market, compared with 37% in 2020 and just 25% in 2019.

Maple Leaf Foods, which grew out of a 1991 merger between two Canadian firms with long histories in milling and meat-packing, is an established leader on this issue. In 2017 it declared its mission "to raise the good in food". It has set a target for its diversification into alternative proteins, with its Plant Protein Group aiming to reach \$3 billion in sales by 2029.

With around 13,000 employees, Maple Leaf actively promotes itself as "a sustainable protein company" and has pledged to build on its pre-eminence in this space by "increasing organisational and operational capacity and our pace of innovation"¹⁸. In early 2019, as part of its plans, it announced proposals for a cutting-edge facility in the US. One of its brands, Field Roast Grain Meat, produces vegetarian "meats" from grains, vegetables and spices; another, Lightlife, specialises in vegetarian and vegan foods.

Interviewed ahead of 2021's Future Food-Tech Summit, a virtual industry event exploring "moonshot solutions for a food system under stress", Jitendra Sagili, Maple Leaf's Vice-President of Research, Development and Technology, was asked to summarise the food sector in three words. He replied: "Broken, exciting, diverse."¹⁹

"When we look at the stats on obesity versus undernourishment, food waste versus food insecurity and the food industry's impact on the environment, we see a broken food system," he said. "But it's exciting, because we're seeing a ton of awareness and innovation in ingredient, process, equipment and packaging technology to tackle this imbalance."

Maple Leaf has suffered setbacks in the past, but it has used them to improve its all-round focus on sustainability. In 2008, for example, there was a serious contamination incident at one of its plants: the company has since established itself as a leader in food safety.

Discussing Maple Leaf's goal of becoming "the most sustainable protein company on Earth", Sagili said: "We're committing significant capital and mind time to getting this done. To achieve our vision, we continue to diversify our protein sources – meat, plant and other alternate proteins, such as insect protein... The diversity in types of food available is incredible – and it keeps on growing."²⁰

5.1. Aquaculture and the scale of the challenge

The EAT-Lancet Commission on Food, Planet, Health brought together 37 eminent scientists to answer a question of irrefutably global importance: can we feed a future population of 10 billion people a healthy diet within planetary boundaries? The commission's answer, presented in a landmark report published in early 2019, was summarised as follows: "Yes, but it will be impossible without transforming eating habits, improving food production and reducing food waste."²¹

A key element of this multifaceted shift, said the commission, would be the wider use of aquaculture – "one of the fastest-growing food-production sectors in the world". "The oceans need to be effectively managed," the report concluded, "to ensure that fisheries do not negatively affect ecosystems, that fish stocks are used responsibly and that global aquaculture production is expanded sustainably."

Five years earlier, in another milestone study, the World Bank estimated that nearly two thirds of all seafood could be farm-raised by 2030 and that aquaculture would play a vital part in delivering both economic and food security. Fish to 2030: Prospects for Fisheries and Aquaculture stressed in particular aquaculture's importance in emerging markets – estimating, for instance, that China, because of its burgeoning middle class, would produce 37% and consume 38% of the world's fish by 2030²².



Aquaculture offers an instructive snapshot of how innovation in food production and consumption generates opportunities and threats in tandem.

Aquaculture's controlled conditions are very different to those found in commercial fishing, which relies on the harvesting of wild stocks – which, as studies have long cautioned, are depleting to the point of commercial non-viability. The sector sits within both the ocean economy, which the OECD has forecast will expand at twice the rate of the mainstream economy during the next 10 years²³, and the protein industry, which – as discussed earlier and in Lessons from the COVID Crisis – is distending at an unprecedented pace.

Crucially, this method of upping the productivity of the oceans is not as simple as it sounds. In fact, aquaculture offers an instructive snapshot of how innovation in food production and consumption generates opportunities and threats in tandem. As such, it underlines how a variety of material ESG factors must invariably be incorporated into investment thinking in this space as a whole.

Aquaculture might in some ways be thought of as an intensive means of production, and there have been numerous cases of environmental, social and governance failings. These include damage to marine life, disease outbreaks, “food fraud” (in the form of mislabelling) and allegations of the use of slave labour²⁴. The WWF is among those to have warned of such negative impacts, while FAIRR has drawn attention to salmon aquaculture's reliance on fishmeal and fish oil for feed²⁵.

In general, however, aquaculture has shown a willingness to acknowledge and correct its errors. “The sector has always been on a steep learning curve and was called out fiercely for early mistakes,” the WWF remarked in mid-2020. “[It] has proven that it can adjust and overcome many of these challenges through collaboration and measurable improvement.”²⁶ Investors will recognise this trajectory as consonant with the approaches and objectives of responsible investing.

The ripple effect

The WWF has identified eight key metrics intended to systematically improve ESG performance in the aquaculture sector. These are shown below.

Each metric is embedded in the standards of the WWF's Aquaculture Stewardship Council (ASC), a not-for-profit organisation founded to establish protocol on farmed seafood. By applying these measures, says the ASC, producers can have a positive impact on the habitats and communities in which they operate.

- **Energy use**
Is energy used efficiently across all aspects of production?
- **Feed efficiency and waste**
Is feeding optimised to minimise the waste of excess nutrients?
- **Land and habitat conversion**
Does production threaten wildlife/habitats, cause pollution etc?
- **Social issues**
Do production methods respect human dignity and welfare?
- **Survival**
Are fish kept healthy to help ensure resource efficiency?
- **Water pollution**
Is waste water kept free from chemicals and other pollutants?
- **Water use**
Is water used efficiently and in ways that help limit negative impacts?
- **Wild fish for feed**
What proportion of feed ingredients comes from unsustainable sources?

Source: WWF, ASC



The company might not be able to avoid related losses altogether, but the point is that it is determined to try to minimise them through effective ESG management.

5.2. Case study: Mowi

Mowi is among the world's largest seafood companies. It began in 1964 as a backyard fish-farming business and now has a global workforce of almost 15,000. It runs several sites in the municipality of Stavanger, which is regarded as the food capital of Norway – one of a number of countries with plans to significantly augment the use of aquaculture.

Mowi is aware that companies in this sector do not encounter the degree of popular backlash and government scrutiny often directed towards their meat and dairy counterparts. Broadly speaking, this is because seafood is not so readily associated with environmental pressures, health fears and other issues. Yet this distinction does not grant immunity from the risks found in the sphere of food production and consumption.

Aquaculture, after all, is more than capable of causing environmental damage. At Mowi's open-sea facility in Stavanger, as visited by members of Invesco's ESG team, managers guard against this prospect through a combination of strong governance, well-defined internal processes and technological innovation – including the use of underwater cameras to constantly monitor feeding and net integrity, thereby minimising waste and preventing escapes and contamination.

Given the nexus of nature, it follows that climate change and other existential threats also influence Mowi's operations. Algae blooms have been at their highest levels in 30 years in northern Norway, incurring millions of euros' worth of losses for salmon producers, while diseases arising from fish lice are a mounting concern. Mowi has set targets to deal with such problems not just in Norway but in every one of the 25 countries in which it has a presence.

The company might not be able to avoid related losses altogether, but the point is that it is determined to try to minimise them through effective ESG management. It is determined, too, to incorporate them in its financial assessments, so equipping investors with more accurate data around performance. In the words of CEO Ivan Vindheim: "We are leading the Blue Revolution."²⁷

Mowi's example also underscores the further ripple effects of positive change throughout supply and value chains. Invesco itself can use the findings from its field visit to Stavanger to inform engagement with a range of investee companies – including manufacturers, restaurants, caterers and retailers – all of which face snowballing disruption from physical, consumer and regulatory perspectives²⁸.

It is obvious that ESG factors constitute financially material risks for aquaculture companies and their stakeholders, not least in the absence of stringent standards across countries or even individual enterprises' own policies and practices. It is also obvious, we say, that many of these risks can be managed in a sector that will clearly have an enormous role in reshaping food production and consumption for the better. As the top performer in FAIRR's 2021 Protein Producer Index, Mowi shows what can be achieved.

6

Insights from the frontiers of positive change

6.1. Food and ESG: past, present and future

Glen Yelton is Invesco's Head of ESG Client Strategies in North America. He was previously a Director of ESG and Impact Investing at OppenheimerFunds and also held ESG-related and research-related roles at a number of investment, data and ratings businesses.

Conor Hartnett is Invesco's ESG Client Strategies Manager in EMEA. He previously worked for CDP (formerly the Carbon Disclosure Project), including serving as its Senior Project Officer for Capital Markets.

In this Q&A Glen and Conor discuss ever-greater investor awareness of the threats and opportunities associated with food production and the broader concept of the nexus of nature. They also explain continued challenges around data and disclosure and consider how the sector might further its ESG journey in the years to come.

How significantly has the approach that asset managers and their clients take to this sector changed in recent years?

GY: Looking back over the two decades and more that I've been involved in the ESG investing space, topics such as factory farming, rampant antibiotics use, pesticides and genetically modified organisms have often been present in discussions. However, they've seldom been the sole focus.

One reason why many of these issues have struggled to gain attention is the lack of consistent and widespread data for investors to leverage, particularly at scale. As FAIRR has continued its work, the issue of data and actionable courses for investors to implement has become less of an impediment.

CH: Threats to our food production systems are nothing new. Droughts, diseases and pests have always been concerns for farmers, and there have always been commercial opportunities in mitigation – such as developing pest-resistant seed varieties or water conservation systems.

However, until recently these threats tended to be viewed through an extrinsic lens – the impact nature can have on production. Now there's a growing awareness of the intrinsic sources of risk – the impact production can have on nature and, by extension, ourselves.

The rise of ESG has definitely enabled investors to view this sector more broadly and with much greater sophistication, and the research of organisations like FAIRR is helping us seek to quantify a wide range of factors that modern-day agricultural practices can have on enterprise value. As a result, there's growing understanding of the opportunities that alternative methods and products present in benefiting businesses and society as a whole.

Is it sometimes difficult to persuade investors that how food is produced and consumed is central to many of the biggest threats facing the planet?

GY: As has often been pointed out, ESG doesn't mean one single thing to investors. The perspective, framing and values that each investor brings to the table may vary.

But on the topics of food production and consumption there's one commonality: all investors consume food every single day – and rarely is that food something they've produced directly. This actually provides a very useful locus to begin a discussion about ESG overall, although it isn't without risks.

As you begin to speak to investors about the direct and indirect impacts of our current system of food production and our approach to consumption – and to waste – you have to navigate a path that wanders along an edge of mischaracterisation. People are quick to over-personalise the story of food and either lose the thread of the narrative about impacts or shift to where they feel this may be more of an attack on them directly. Inadvertently reminding someone that their last dinner out at a restaurant included a steak imported from Brazil or salmon from Norway – which they didn't even eat all of – while discussing deforestation or sustainable seafood can very quickly end a conversation.

CH: Most of us are very removed from the means of our food production. We often have some awareness of the harmful practices within this industry, but we're complicit in an "out of sight, out of mind" mentality. Historically, the absence of a broad base of consumer attention and demand for alternatives meant businesses – and investors – had little incentive to bring about change.

But consumer demand for products such as plant-based alternatives to meat is growing, as is the popularity of dietary choices such as vegetarianism, veganism and flexitarianism²⁹. With some of the companies specialising in plant-based alternatives also attracting enormous valuations, businesses and investors are now taking notice.

As a result of all these factors, the conversation is steering towards wider considerations – including the fact that current agricultural practices present great potential risk to our health and way of life. Discussing alternatives can make for a difficult conversation, as for many individuals and businesses it feels like a fundamental shift in values and practices, but efforts towards addressing climate change as a collective responsibility have helped socialise ways of thinking around other issues that pose similar and not unrelated systemic threats.

[Does the concept of the nexus of nature and interconnected causality help investors look beyond the more mainstream ESG considerations – climate change being the most obvious?](#)

GY: If you can successfully navigate the pitfalls described above, the nexus of nature can be a very effective framework.

For example, tracing the above-mentioned steak from Brazil illustrates many of the interconnected issues – deforestation, overuse of antibiotics, human rights issues related to the acquisition of land, emissions from transportation both locally and internationally, food waste and its impact on landfill content and methane... There are a dozen or more strands of ESG that can be unravelled in a discussion with an investor willing to listen.

CH: Climate change has received the lion's share of attention from investors in recent years – and with good reason. But climate change isn't a single-front issue – it encompasses everything within the biosphere.

As investors have delved into tackling climate change, their awareness of all the interconnected drivers and the often positive feedback loops between them has grown. So has recognition of the fact that there's no single approach that can be taken to address these complex, interrelated issues.

Investors need to look across activities and geographies and at different parts of the value chain to determine which issues are prevalent. ESG investing has undoubtedly encouraged a more holistic approach to risk assessments and solution opportunities in this respect.

[Data is in many ways the lifeblood of ESG, yet FAIRR's research in particular shows levels of disclosure in this sector are often still low. How quickly might this change – and how?](#)

GY: Disclosure on ESG issues can be encouraged in many ways, but the most effective by far is the creation of pressure to disclose by regulatory action. This can be federal regulation, sub-state regulation or pressure from exchanges or industry bodies.

In the absence of this type of pressure, action by investor-led organisations such as FAIRR is the next-best bet.

"Naming and shaming" can work if the audience it's directed at is one the subject sector believes is critical. The most sensitive part of a company is its bottom line – actions that affect this lead to responses to ease the pain on the pocketbook. For this type of pressure to be successful, though, it has to be consistent and revolve around achievable goals for the targeted sector.



We may now be witnessing a transformation towards a more holistic valuation of enterprise, and our food production system could exemplify that.

CH: FAIRR's research identifies some alarming risks in our food production industry that need to be addressed. But how do you manage risks or identify opportunities without decision-useful data?

Change can't happen without disclosure, and disclosure tends to be quite poor within these sectors. Investors can and do demand better disclosure from investee companies, but this can only go so far. We're dealing with globalised supply chains that cut across public and private markets throughout uneven territories with incompatible regulatory landscapes.

As an example, a publicly listed food retailer may operate in a developed market with high regulatory standards and disclose good-quality data to its stakeholders. But the risks from deforestation, biodiversity loss and human rights abuse will be occurring several increasingly opaque tiers up the supply chain, in faraway territories with weak governance regimes.

Technological advances are allowing for better monitoring of some activities in areas that can't be penetrated by standard oversight mechanisms, but robust ESG management requires high-quality disclosure throughout the whole value chain. In turn, this requires a coordinated effort by all stakeholders – investors, customers and local and international authorities. The greater the transparency, the greater the action. Advances in ESG show the momentum is there, but international coordination is still lacking.

How does the future of this sector reflect the broader notion of stakeholder capitalism?

GY: We have to remember that Milton Friedman's seminal article³⁰ that led to the modern focus on maximising shareholder value was a response to the concept of stakeholder capitalism as it existed from the early 1930s until the early 1970s. The modern manifestation of stakeholder capitalism has to avoid the fatal flaw of that earlier iteration – the lack of a central guiding universal principle or set of principles.

There's no single homogenous set of stakeholders to be considered by every company. Companies instead need to navigate the best interests of the stakeholder groups most relevant to their business and their market.

The agricultural sector has to balance the needs of future generations, including their need for safe and healthy sustenance, with the stakeholders of today – employees who rely on firms for work, communities that have grown up around operations, industries that predicate their success on access to mass-produced and cheap ingredients, consumers who have become acclimated to quickly and cheaply having whatever they desire available whenever they desire it, shareholders who demand a clear return on their investment... The list goes on.

Stakeholder capitalism can succeed, creating lasting change on a substantial scale, but it must acknowledge these challenges. This journey is just starting, and it will proceed in fits and starts – but it's a journey many investors and companies are choosing to embark upon.

CH: We may now be witnessing a transformation towards a more holistic valuation of enterprise, and our food production system could exemplify that. If we recognise our position as stakeholders in many forms and our connection to global communities and means of production, we might move towards placing a more accurate value on food production.

Ultimately, businesses don't operate in isolated bubbles and answer only to profit. We're all participants in the global marketplace – as employees, customers and investors. The value and interconnectivity of all stakeholders must be recognised if we're to be truly sustainable and ensure long-term prosperity for our own futures and those of the generations to come.

6.2. Risks, results and resonance

Maria Lettini is Executive Director of FAIRR. She was previously Head of the Americas for the Principles for Responsible Investment (PRI), leading its signatory relations and outreach strategy.

In this Q&A Maria considers what might be required to eradicate all traces of deviance from the food sector. She also explains why such a goal should be attainable.

Is it fair to describe aspects of food production as examples of the normalisation of deviance?

I think it's a term that's justified in a lot of cases. The bottom line is that things have been done in certain ways for a long time – not just for years but for decades – and we now recognise these ways are absolutely wrong.

It's like there's a kind of "light-bulb moment". People suddenly think: "Wait a minute – what are we doing here? How did we get to this point? How did we come to believe this is even remotely acceptable?"

Sometimes it might take a single, huge catastrophe to get to that moment. Other times it could be the result of an accumulation of things – a scandal here, a scare there, a series of controversies that gradually add up to something really significant, the steady exposing of one risk after another. And I think food production has definitely reached that stage, whatever the exact tipping point may have been.

Will the progress that investors are helping drive in the sector truly put an end to this deviance?

We're already seeing real change, which is very encouraging – even inspiring. But it's true that there's a big difference between reducing deviance and completely eliminating it.

It's like climate change. Are we going to be content with net-zero emissions or are we going to push for negative emissions? On the one hand you have offsetting, which in the final reckoning is still a compromise, and on the other hand you have absolutely demonstrable change, which is what the goal should actually be.

It's great when a food producer sets "ambitious" targets for 2030 or 2040, because committing to doing something is obviously better than doing nothing at all. But I think investors are going to make increasingly tough demands of companies – particularly those that come up with these commitments early – because the investment community's expectations are getting higher all the time.

What are these expectations?

The end goal should be total, positive transformation. Again, it's like the next step beyond net zero. If a company improves one area of its supply chain just to offset the failings of another – well, that isn't what this is all about.

We want to see effective mitigation and reduction strategies that result in clear, far-reaching benefits. Businesses are going to leave themselves open to reputational risk if they don't deliver on their promises – and maybe even if they don't exceed them.

I think we'll see ever-greater scrutiny from investors. We've got to be wise to greenwashing, window dressing and the like, which means we have to call out all these commitments and take an extremely close look at them. We need companies to really pinpoint what they plan to do, and we need to move past the idea of doing good here to balance out doing bad there. Then we should really see definitive, lasting change.



Businesses are going to leave themselves open to reputational risk if they don't deliver on their promises – and maybe even if they don't exceed them.

7

Conclusion



This is a matter of trying to create positive connections and supporting the innovation and transformation that farsighted companies promote or welcome – and it is a matter of embracing opportunity.

Technological advances aside, are there any particular innovations that could accelerate this process?

We need much more board representation with proper expertise on all sustainability-related issues. That would help companies in this sector develop the internal support required to respond to the climate crisis and other risks embedded in the system. This is something FAIRR has now really started to track.

Something else that should be in our favour over the long term is the simple fact that we're talking about food here. We're talking about something that affects all our lives, something very personal, something most people deal with maybe three times a day. When you begin to understand the risks that exist in the system, when you really appreciate the deviance that's become central to it, it's an idea that's tough to shake off.

I remember the first time FAIRR spoke about the overuse of antibiotics in factory farming and the dangers this presents in terms of antimicrobial resistance. A couple of months later I met some people who had seen our presentation, and they told me they couldn't help thinking about what we had said every time they had a plate in front of them.

So this stuff genuinely resonates. It compels us to make choices. It certainly shapes how consumers think, which usually shapes how businesses think. It's an issue for individuals, just like it's an issue for investors, and that should help keep driving the wave of positive change that we know is already under way.

In 2019, in the pages of *Science*, a team of researchers presented an exhaustive analysis of “food shocks” witnessed over the course of more than half a century. The authors concluded: “In a more shock-prone and interconnected world, bold food policy and social protection mechanisms... will be central to sustainability.”³¹

As we have seen both in this paper and in its predecessor, “deviance” in food production and consumption is unlikely to satisfy the demands of a “shock-prone and interconnected world”. Quite the contrary: it is more liable to encourage further shocks while taking precious little account – or even none at all – of interconnectedness.

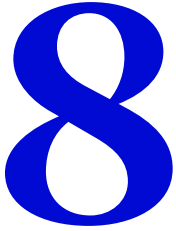
In contemplating such a scenario, it is worth reminding ourselves of Diane Vaughan's formative framing of the normalisation of deviance's consequences. Within an organisational setting, Vaughan posited, deviance is likely to lead to immediate or eventual catastrophe – the latter coming in the wake of a lengthy incubation period during which early warning signs are misinterpreted, ignored or missed.

The warning signs around food production and consumption – and, indeed, around the nexus of nature more broadly – are increasingly difficult to overlook. Experience and science alike indicate that the sector has become home to established, entrenched and accepted policies and practices that are not only suboptimal but may contribute to a plethora of highly interrelated existential threats.

As we stressed in *Lessons from the COVID Crisis*, responsible investing cannot miraculously break all these connections. Neither is this a straightforward matter of separating “good” businesses from their “bad” counterparts and merely channelling funds towards the former while shunning the latter.

Rather, this is a matter of trying to create positive connections by incorporating material ESG factors into investment decisions. It is a matter of supporting the innovation and transformation that farsighted companies promote or welcome – and it is a matter of embracing opportunity.

As such, ultimately, it is a matter of asset managers and their clients developing a suitably nuanced appreciation of interconnected causality. This fast-emerging phenomenon has been at the heart of these papers, and there is much to suggest that it will also be at the heart of ever more investment decisions in the years and decades to come. It is a theme that we expect to return to again and again.



References and suggested further reading

- Adam Smith Institute: *Don't Have a Cow, Man: The Prospects for Lab-Grown Meat*, 2018
- Aquaculture Stewardship Council: *2017-2021 Strategic Overview*, 2017
- Cottrell, R, Nash, K, Halpern, B, Remenyi, T, Corney, S, Fleming, A, Fulton, E, Hornborg, S, John, A, Watson, R, and Blanchard, J: *Food Production Shocks Across Land and Sea*, 2019
- Daily Telegraph*: "£220,000 lab-grown burger is eaten for first time – but needed ketchup", 5 August 2013
- Dignard, C, and Leibler, J: *Recent Research on Occupational Animal Exposures and Health Risks: A Narrative Review*, 2019
- EAT-Lancet Commission: *Food in the Anthropocene: The EAT-Lancet Commission on Healthy Diets from Sustainable Food Systems*, 2019
- FAIRR: "Global investors turn up heat on fast-food companies to tackle climate and water risks", 28 January 2019
- FAIRR: *FAIRR Protein Producer Index*, 2021
- FAIRR: *Sustainable Aquaculture: Managing Biodiversity and Climate Risks in Feed Supply Chains*, 2021
- Feynman, R: *What Do You Care What Other People Think?*, 1988
- Forbes*: "Move over, PETA: meat companies have a new thorn in their side", 7 April 2019
- Future Food-Tech: "Interview: Jitendra Sagili, Maple Leaf Foods", 2021
- Guardian*: "COVID-19 shows factory food production is dangerous for animals and humans alike", 8 September 2020
- Guardian*: "No-kill, lab-grown meat to go on sale for first time", 2 December 2020
- Hedenus, F, Wirsenius, S, and Johansson, D: *The Importance of Reduced Meat and Dairy Consumption for Meeting Stringent Climate-Change Targets*, 2014
- Independent*: "Veganism is 'single biggest way' to reduce our environmental impact, study finds", 24 September 2020
- Lombardo, M, Stein, H, and Lettini, M: *Appetite for Change: Food, ESG and the Nexus of Nature – Part I: Lessons from the COVID Crisis*, 2020
- MarketsandMarkets: *Plant-Based Protein Market by Source, Form, Application and Region – Global Forecast to 2025*, 2020
- New York Times*: "A Friedman doctrine – the social responsibility of business is to increase its profits", 13 September 1970
- OECD: *The Ocean Economy in 2030*, 2016
- Poore, J, and Nemecek, T: *Reducing Food's Environmental Impacts Through Producers and Consumers*, 2018
- Rogers Commission: *Report to the President by the Presidential Commission on the Space-Shuttle Challenger Accident*, 1986
- Salon*: "We can't stop global warming unless we start eating a lot less meat", 1 April 2014
- UN Food and Agriculture Organisation: *Tackling Climate Change Through Livestock: A Global Assessment of Emissions and Mitigation Opportunities*, 2013
- Vaughan, D: *The Challenger Launch Decision: Risky Technology, Culture and Deviance at NASA*, 2016
- Vomad: *The 2019 Global Vegan Survey*, 2019
- World Aquaculture Society: *Achieving Sustainable Aquaculture: Historical and Current Perspectives and Future Needs and Challenges*, 2020
- World Bank: *Fish to 2030: Prospects for Fisheries and Aquaculture*, 2014
- WWF: *Appetite for Destruction*, 2017
- WWF: "Today, tomorrow and beyond: experts chart the future of aquaculture", 29 June 2020

1. During a televised hearing into the tragedy, to NASA's embarrassment, Feynman revealed that he had immersed one of the shuttle's faulty components in a glass of iced water to demonstrate its susceptibility to freezing temperatures. Branded "a real pain" by the head of the commission, he subsequently wrote his own report – which, despite being condemned to an appendix in the final findings, became the most celebrated element of the commission's judgement. See Appendix F of the Rogers Commission's Report to the President by the Presidential Commission on the Space-Shuttle Challenger Accident, 1986. Feynman's experience of serving on the commission is recounted at length in his 1988 book, *What Do You Care What Other People Think?*.
2. See Vaughan, D: *The Challenger Launch Decision: Risky Technology, Culture and Deviance at NASA*, 2016.
3. See Guardian: "COVID-19 shows factory food production is dangerous for animals and humans alike", 8 September 2020.
4. See, for example, Dignard, C, and Leibler, J: *Recent Research on Occupational Animal Exposures and Health Risks: A Narrative Review*, 2019.
5. The FAO has reported that cattle account for around 65% of GHGs generated by livestock. It has also stressed "a direct link between GHG emission intensities and the efficiency with which producers use natural resources". See UN Food and Agriculture Organisation: *Tackling Climate Change Through Livestock: A Global Assessment of Emissions and Mitigation Opportunities*, 2013.
6. See, for example, FAIRR: "Global investors turn up heat on fast-food companies to tackle climate and water risks", 28 January 2019.
7. See Forbes: "Move over, PETA: meat companies have a new thorn in their side", 7 April 2019.
8. Grieg's approach to sustainability issues in general is outlined in detail on the company's website. See www.griegseafood.com.
9. Ibid.
10. See MarketsandMarkets: *Plant-Based Protein Market by Source, Form, Application and Region – Global Forecast to 2025*, 2020.
11. Ibid.
12. See Hedenus, F, Wirsenius, S, and Johansson, D: *The Importance of Reduced Meat and Dairy Consumption for Meeting Stringent Climate-Change Targets*, 2014. Lead author Dr Fredrik Hedenus, interviewed shortly after the study's publication, said that a reduction of up to 75% could be necessary by 2070, adding: "Broad dietary change can take a long time... We should already be thinking about how we can make our food more climate-friendly." See Salon: "We can't stop global warming unless we start eating a lot less meat", 1 April 2014.
13. See WWF: *Appetite for Destruction*, 2017. Launching the report, WWF Policy Manager Duncan Williamson said: "For people and nature to thrive we need to consume and produce food differently. Eating less animal protein would allow us to farm in a more sustainable way, with less impact on the environment and healthier and more nutritious food."
14. See Poore, J, and Nemecek, T: *Reducing Food's Environmental Impacts Through Producers and Consumers*, 2018, and Independent: "Veganism is 'single biggest way' to reduce our environmental impact, study finds", 24 September 2020.
15. See, for example, Guardian: "No-kill, lab-grown meat to go on sale for first time", 2 December 2020.
16. See, for example, Daily Telegraph: "£220,000 lab-grown burger is eaten for first time – but needed ketchup", 5 August 2013.
17. See Adam Smith Institute: *Don't Have a Cow, Man: The Prospects for Lab-Grown Meat*, 2018. The report also emphasised cultured meat's role in tackling the rise of superbugs, stating: "Lab-grown meat has the potential to solve the looming antibiotic resistance crisis... Government must shy away from lobbying attempts... to lock out competition by changing the legal definition of meat to exclude meats produced in labs or factories."
18. Further details of all aspects of Maple Leaf's approach to sustainability can be found on the company's website. See www.mapleleaffoods.com.
19. See Future Food-Tech: "Interview: Jitendra Sagili, Maple Leaf Foods", 2021.
20. Ibid.
21. The full findings can be found in EAT-Lancet Commission: *Food in the Anthropocene: The EAT-Lancet Commission on Healthy Diets from Sustainable Food Systems*, 2019.
22. See World Bank: *Fish to 2030: Prospects for Fisheries and Aquaculture*, 2014. Launching the report, Dr Juergen Voegelé – now the World Bank's Vice-President for Sustainable Development – said: "There is a major opportunity for developing countries that are prepared to invest in better fisheries management and environmentally sustainable aquaculture."
23. See OECD: *The Ocean Economy in 2030*, 2016. The study devoted "special attention... to the emerging ocean-based industries in light of their high growth and innovation potential and contribution to addressing challenges such as energy security, environment, climate change and food security".
24. The WWF and its Aquaculture Stewardship Council, which was founded in 2010, have stressed that aquaculture can be regarded as responsible only if "managed in ways that protect wildlife, workers, communities and the environment in which they all live". See, for example, Aquaculture Stewardship Council: *2017-2021 Strategic Overview*, 2017.
25. Fishmeal and fish oil are produced from wild forage fish, the supply of which is forecast to remain flat. This could increase costs and constrain growth in salmon aquaculture. FAIRR is urging investors to engage with producers on this issue, not least with a view to encouraging the use of novel alternative feed ingredients. See, for example, FAIRR: *Sustainable Aquaculture: Managing Biodiversity and Climate Risks in Feed Supply Chains*, 2021.
26. See WWF: "Today, tomorrow and beyond: experts chart the future of aquaculture", 29 June 2020. The article followed the publication of *Achieving Sustainable Aquaculture: Historical and Current Perspectives and Future Needs and Challenges*, a review produced to mark the 50th anniversary of the World Aquaculture Society.
27. Mowi's all-round commitment to sustainability is outlined at length on the company's website. See www.mowi.com.
28. To take just one illustration: aquaculture was central to a one-to-one strategic meeting between a member of our ESG team and a UK supermarket group's Head of Sustainability.
29. Flexitarians aim to adopt a predominantly plant-based diet but eat meat occasionally.
30. Friedman famously outlined his notion of shareholder capitalism in a New York Times article in 1970. He was awarded a Nobel Prize in Economic Sciences six years later. See New York Times: "A Friedman doctrine – the social responsibility of business is to increase its profits", 13 September 1970.
31. See Cottrell, R, Nash, K, Halpern, B, Remenyi, T, Corney, S, Fleming, A, Fulton, E, Hornborg, S, John, A, Watson, R, and Blanchard, J: *Food Production Shocks Across Land and Sea*, 2019. The study set out to explore "sudden losses to food production – that is, shocks – and their consequences [in terms of] threats to global sustainability".

Important information

Risk warnings

The value of investments and any income will fluctuate (this may partly be the result of exchange rate fluctuations) and investors may not get back the full amount invested. The use of environmental, social and governance factors to exclude certain investments for non-financial reasons may limit market opportunities available to funds not using these criteria. Further, information used to evaluate environmental, social and governance factors may not be readily available, complete or accurate, which could negatively impact the ability to apply environmental, social and governance standards.

By accepting this material, you consent to communicate with us in English, unless you inform us otherwise. This document is marketing material and is not intended as a recommendation to invest in any particular asset class, security or strategy. Regulatory requirements that require impartiality of investment/investment strategy recommendations are therefore not applicable nor are any prohibitions to trade before publication. The information provided is for illustrative purposes only, it should not be relied upon as recommendations to buy or sell securities. All material presented is compiled from sources believed to be reliable and current, but accuracy cannot be guaranteed. This is not to be construed as an offer to buy or sell any financial instruments and should not be relied upon as the sole factor in an investment making decision.

As with all investments there are associated inherent risks. This should not be considered a recommendation to purchase any investment product. This does not constitute a recommendation of any investment strategy for a particular investor. Investors should consult a financial professional before making any investment decisions if they are uncertain whether an investment is suitable for them. Please obtain and review all financial material carefully before investing. Past performance is not indicative of future results. The opinions expressed are those of the author, are based on current market conditions and are subject to change without notice. These opinions may differ from those of other Invesco investment professionals. Where individuals or the business have expressed opinions, they are based on current market conditions, they may differ from those of other investment professionals, they are subject to change without notice and not to be construed as investment advice. These materials may contain statements that are not purely historical in nature but are "forward-looking statements." These include, among other things, projections, forecasts, estimates of income, yield or return or future performance targets. These forward-looking statements are based upon certain assumptions, some of which are described herein. Actual events are difficult to predict and may substantially differ from those assumed. All forward-looking statements included herein are based on information available on the date hereof and Invesco assumes no duty to update any forward-looking statement. Accordingly, there can be no assurance that estimated returns or projections can be realized, that forward-looking statements will materialize or that actual returns or results will not be materially lower than those presented.

Restrictions on distribution

Australia

This document has been prepared only for those persons to whom Invesco has provided it. It should not be relied upon by anyone else. Information contained in this document may not have been prepared or tailored for an Australian audience and does not constitute an offer of a financial product in Australia. You may only reproduce, circulate and use this document (or any part of it) with the consent of Invesco.

The information in this document has been prepared without taking into account any investor's investment objectives, financial situation or particular needs. Before acting on the information the investor should consider its appropriateness having regard to their investment objectives, financial situation and needs.

You should note that this information:

may contain references to dollar amounts which are not Australian dollars;

- may contain financial information which is not prepared in accordance with Australian law or practices;
- may not address risks associated with investment in foreign currency denominated investments; and does not address Australian tax issues.
- Issued in **Australia** by Invesco Australia Limited (ABN 48 001 693 232), Level 26, 333 Collins Street, Melbourne, Victoria, 3000, Australia which holds an Australian Financial Services Licence number 239916.

Canada

This document is restricted to accredited investors as defined under National Instrument 45-106. All material presented is compiled from sources believed to be reliable and current, but accuracy cannot be guaranteed. This is not to be construed as an offer to buy or sell any financial instruments and should not be relied upon as the sole factor in an investment making decision. As with all investments there are associated inherent risks. Please obtain and review all financial material carefully before investing.

- Issued in **Canada** by Invesco Canada Ltd., 120 Bloor Street East, Suite 700, Toronto, Ontario, M4W 1B7.

Continental Europe, Dubai, Ireland, the Isle of Man, Jersey and Guernsey and the UK

The document is intended only for Professional Clients in Continental Europe, Dubai, Ireland, the Isle of Man, Jersey, Guernsey, and the UK and is not for consumer use. Marketing materials may only be distributed without public solicitation and in compliance with any private placement rules or equivalent set forth in the laws, rules and regulations of the jurisdiction concerned. This document is not intended to provide specific investment advice including, without limitation, investment, financial, legal, accounting or tax advice, or to make any recommendations about the suitability of any product for the circumstances of any particular investor. You should take appropriate advice as to any securities, taxation or other legislation affecting you personally prior to investment. No part of this material may be copied, photocopied or duplicated in any form by any means or redistributed without Invesco's prior written consent.

Further information is available using the contact details shown:

- Issued in **Belgium, Denmark, Finland, France, Ireland, Greece, Italy, Netherlands, Spain, Sweden, Luxembourg, Norway and Portugal** by Invesco Management S.A., President Building, 37A Avenue JF Kennedy, L-1855 Luxembourg, regulated by the Commission de Surveillance du Secteur Financier, Luxembourg.
- Issued in **Dubai** by Invesco Asset Management Limited. PO Box 506599, DIFC Precinct Building No 4, Level 3, Office 305, Dubai, UAE. Regulated by the Dubai Financial Services Authority.
- Issued in **Austria and Germany** by Invesco Asset Management Deutschland GmbH, An der Welle 5, 60322 Frankfurt am Main, Germany.

- Issued in **Switzerland** by Invesco Asset Management (Schweiz) AG, Talacker 34, 8001 Zurich, Switzerland.
- Issued in **the Isle of Man, Jersey, Guernsey** and the **United Kingdom** by Invesco Asset Management Limited which is authorised and regulated by the Financial Conduct Authority. Invesco Asset Management Ltd, Perpetual Park, Perpetual Park Drive, Henley-on-Thames, RG9 1HH, UK.

Hong Kong

This document is provided to professional investors (as defined in the Securities and Futures Ordinance and the Securities and Futures (Professional Investor) Rules) only in Hong Kong. It is not intended for and should not be distributed to or relied upon by the members of public or the retail investors without written consent.

- Issued in **Hong Kong** by INVESCO HONG KONG LIMITED 景順投資 管理有限公司, 41/F, Champion Tower, Three Garden Road, Central, Hong Kong.

Japan

This document is only intended for use with Qualified Institutional Investors in Japan. It is not intended for and should not be distributed to, or relied upon, by members of the public or retail investors.

- Issued in **Japan** by Invesco Asset Management (Japan) Limited, Roppongi Hills Mori Tower 14F, 6-10-1 Roppongi, Minato-ku, Tokyo 106-6114; Registration Number: The Director-General of Kanto Local Finance Bureau (*Kin-sho*) 306; Member of the Investment Trusts Association, Japan.

New Zealand

This document is issued only to wholesale investors (as defined in the Financial Markets Conduct Act) in New Zealand to whom disclosure is not required under Part 3 of the Financial Markets Conduct Act. This document has been prepared only for those persons to whom it has been provided by Invesco. It should not be relied upon by anyone else and must not be distributed to members of the public in New Zealand. Information contained in this document may not have been prepared or tailored for a New Zealand audience. You may only reproduce, circulate and use this document (or any part of it) with the consent of Invesco. This document does not constitute and should not be construed as an offer of, invitation or proposal to make an offer for, recommendation to apply for, an opinion or guidance on interests to members of the public in New Zealand. Any requests for information from persons who are members of the public in New Zealand will not be accepted.

- Issued in New Zealand by Invesco Australia Limited (ABN 48 001 693 232), Level 26, 333 Collins Street, Melbourne, Victoria, 3000, Australia, which holds an Australian Financial Services Licence number 239916.

Singapore

This document may not be circulated or distributed, whether directly or indirectly, to persons in Singapore other than (i) to an institutional investor under Section 304 of the Securities and Futures Act (the "SFA"), (ii) to a relevant person pursuant to Section 305(1), or any person pursuant to Section 305(2), and in accordance with the conditions specified in Section 305 of the SFA, or (iii) otherwise pursuant to, and in accordance with the conditions of, any other applicable provision of the SFA. This document is for the sole use of the recipient on an institutional offer basis and/or accredited investors and cannot be distributed within Singapore by way of a public offer, public advertisement or in any other means of public marketing.

- Issued in **Singapore** by Invesco Asset Management Singapore Ltd, 9 Raffles Place, #18-01 Republic Plaza, Singapore 048619.

Taiwan

This material is distributed to you in your capacity as Qualified Institutions/Sophisticated Investors. It is not intended for and should not be distributed to, or relied upon, by members of the public or retail investors.

- Issued in **Taiwan** by Invesco Taiwan Limited, 22F, No.1, Songzhi Road, Taipei 11047, Taiwan (0800-045-066). **Invesco Taiwan Limited is operated and managed independently.**

United States

- Issued in the **US** by Invesco Advisers, Inc., Two Peachtree Pointe, 1555 Peachtree Street, N.E., Suite 1800, Atlanta, GA 30309.