

The relationship between climate change and agriculture is a contentious, complex and important one. In this series of twelve blogs, UCD Adjunct Professor Frank Convery will explore the context, challenges and potential solutions for dairy, beef and sheep farming in Ireland. Each blog presents key evidence to underpin informed debate and the series seeks to help plot a sustainable future for the sector.

Responses are invited via earth.institute@ucd.ie and the UCD Earth Institute will host a workshop in association with the UCD School of Agriculture and Food Science and the National Economic and Social Council at the end of the series to discuss the evidence and its implications.

Professor Tasman Crowe, Director, UCD Earth Institute

8. Climate Performance by Irish Ruminant Farming: Companies Driving Decarbonization – Retailers and Investors

Frank Convery, Adjunct Professor, University College Dublin

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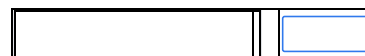
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"Ireland will become a **world leader** in Sustainable Food Systems (SFS) over the next decade. This will deliver significant benefits...and will also provide the basis for the future competitive advantage of the sector."

Food Vision 2030[1]



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"Work is about a daily search for meaning as well as daily bread; for recognition as well as cash; for astonishment rather than torpor; in short for a sort of life, rather than a Monday-to-Friday sort of dying."

Studs Terkel

Some Key Points

- Climate change will be on the world's agenda for a long time, and companies everywhere will need to decide how best to integrate this reality into their business models.
- Origin Green is a great platform to help the Irish food sector become a world climate leader, but it can only succeed if it reduces emissions and removes carbon at scale
- How companies decide to react will depend in the first instance on their values: do they see this as a serious issue for the wellbeing of their posterity, and important enough to pause and take the time to understand the realities and to prioritize finding a way that works to navigate it?
- For those who say 'Yes', the way forward is not easy, but there is plenty of evidence from which to draw in shaping a strategy. This blog uses examples showing how: energy crises and environmental challenge can create opportunities; venture capital failed to drive change in 2006–2011 but has since rebounded; Walmart is decarbonizing its supply chains; Fortescue Metals Group plans to replace fossil fuels with hydrogen in its iron ore business; Tirlán (formerly Glanbia Ireland) plans to compete in terms of its carbon footprint; BlackRock (the world's largest asset manager) is responding.
- Finally, a challenge to our three leading global entrepreneurs.

Introduction

In 'The Land Ethic' chapter in his *A Sand County Almanac* (1948), Aldo Leopold observed that "when god-like Odysseus returned from the wars in Troy, he hanged all on one rope a dozen slave-girls of his house-hold, whom he suspected of misbehaviour during his absence. His action was entirely consistent with the ethics then prevailing in Greece"; his point being that a society's ethical compass evolves over time. He then goes on to observe that:

"There is as yet no ethic dealing with man's relation to land and to the animals and plants which grow upon it. Land, like Odysseus' slave-girls, is still property. The land relation is still strictly economic, entailing privileges but no obligations. The extension of ethics to this third element in human environment is, if I read the evidence correctly, an evolutionary possibility and an ecological necessity."

'Zeitgeist', from the German words Zeit, meaning "time," and Geist, meaning "spirit" describes the defining spirit or mood of a particular period of history as shown by the ideas and beliefs of the time, and it affects almost everyone.[2].

In our 'particular period of history' climate change is our zeitgeist, and it will be with us for some time, as its costs become more apparent, and as we realize that effective action is an ecological necessity.

Milton Friedman observed that: "The purpose of business is to make as much money as possible, while conforming to the basic rules of society, both those embodied in law and those embodied in ethical custom". Those of intellectually indolent inclination often omit 'and those embodied in ethical custom'. This blog does not.

Origin Green

Origin Green was established in 2012 to provide an infrastructure for farmers and producers committed to positive change and sustainable food production across Ireland. In 2021, Bord Bia published Pathways to Net Zero, highlighting new procedures and guidelines that put carbon emission targets on a mandatory footing for food and drink manufacturers as the sector seeks to accelerate its contribution to the Programme for Government's aim of carbon neutrality by 2050..."This will see member companies go beyond reductions of energy-related emissions, to include a more comprehensive assessment of their entire carbon footprint, including value chain emissions which incorporates all indirect emissions (Scope 3) associated with food manufacturing." [3]

The overall ambition of the Origin Green programme[4] is that Irish food and drink is the first choice globally because it is trusted as sustainably produced by people who care. It has a strong commitment to:

- Measuring progress, including on-farm assessments at farm level through Bord Bia's Sustainability Assurance Schemes
- Recognizing and celebrating excellence – its Gold Membership now recognises the ambition of certain companies who are making significant strides in their sustainability efforts and awards them accordingly.
- Supporting capacity building to ensure that key actors have state of the art understanding of what is required and how best to make progress.[5]

Origin Green can only succeed if policy design and implementation for the sector is such that it maximizes the prospect of emissions reduction and carbon storage at scale. The 'what' and 'how' of that is the subject of forthcoming Blogs 9 (Essentials for Success) 10 (CAP 2023–2027), 11 (Other Policy Instruments) and 12 (Innovation). However, ensuring that Irish companies are fully aware of relevant developments on the corporate front, understand their import, and helping them navigate the emerging terrain is the purpose of this one.

Evidence

In a capitalist society, businesses in the commercial world must successfully compete with others to stay in business. Doing so is a primary responsibility if they are to survive. This poses a challenge when it comes to protecting public goods like environmental quality and avoiding damage from climate change. If there is no reward in the marketplace for doing so, or no government rules that require conservation, the incentives are perverse, and we can expect the market untrammelled to result in environmental destruction.

But not all businesses are alike, either in the nature and intensity of the competition they face or their inclination to protect the environmental commons or take the broader public interest into account in their decision-making.

Below I touch on how the emerging zeitgeist, including: those elements that are now being 'embodied in ethical custom' by some businesses, focussed on where some are taking a leadership role in addressing the climate challenge, namely: how climate policy and other changes create opportunities; mobilising venture capital to find new and better ways to reduce emissions and store carbon at scale; giving weight to climate performance in their own activities but in particular their supply chains; finding ways that work to integrate emerging emissions reduction technologies into their business operations; avoiding investments that 'go bad' because they fail to take account of capital being stranded and shareholder value being destroyed as new technologies emerge that result in low or zero carbon products that destroy their markets.

Events and Changing Environmental Rules create Opportunities

In October 1973 members of the Organization of Arab Petroleum Exporting Countries (OPEC), led by Saudi Arabia, proclaimed an **oil embargo**. This was targeted at nations that had supported Israel during the Yom Kippur War. It has two effects: the price of gasoline and diesel escalated, and, for those jurisdictions such as Ireland who capped prices below the market clearing level, it also resulted in absolute shortages and queues, as oil companies diverted supplies from countries that had imposed such caps to those which had not done so. As Americans started seeking smaller, more fuel-efficient vehicles, Japanese car makers had an advantage over gas-guzzling US brands. This advantage was further advanced by air quality legislation. The [1970 Clean Air Act](#) restricted the amount of lead in gasoline. In 1974, Honda engineers created a [new type of combustion engine](#), which made the Honda Civic the first vehicle to meet the strict new limits on auto emissions.[6] Most US auto manufacturers had been in 'we're grand' mode. 'American consumers will always have a love affair with large cars, and we can head off environmental legislation by arguing that it is impossible'. They were wrong. In 2021, the three largest Japanese auto companies accounted for 31.96% of total new car sales in the US.[7]

Potential Short-term Economic Impacts of Climate Change

The late Marty Weitzman paid more granular attention to what climate scientists were saying than most economists. He framed the economic challenge as one of managing uncertainty:[8]

“The climate science seems to be saying that the probability of a system-wide disastrous collapse is non-negligible even while this tiny probability is not known precisely and necessarily involves subjective judgements. Motivated by the climate-change example, this paper presents a mathematically rigorous (if highly abstract) economic-statistical model of huge-impact tiny-probability catastrophes.” One of his 5 conclusions was that “the conventional economic advice of spending modestly on abatement now but gradually ramping up expenditures overtime is an extreme lower bound on what is reasonable rather than a best estimate of what is reasonable.”

Sectoral Dysfunction as Macro Economic Threat

To me this framing is compelling, but there is also a view that looks at much shorter-term possible impacts, informed by the housing crisis which in Ireland and elsewhere, imposed massive costs on the wider economy, largely a result of poor regulation of the housing sector.[9] Mark Carney is a Canadian with an Irish passport who served as Governor of the Bank of England (2013-2020). In this role he worried that, if unaddressed, climate change has the same potential to destroy our future, and the profitability of companies; if the financial system is left with “stranded assets” tied to fossil fuels that are no longer able to generate an economic return because of changes associated with decarbonizing the economy, this could destabilize the financial system.

Since stepping down as governor, he devotes much of his time to getting companies to build this risk into their commercial systems, and investors and financial institutions to do likewise. His ambition is the creation of a financial system that “has the information, tools and markets so that every decision takes climate change into account”.

Venture Capital

John Doerr is a venture capitalist. In 2006, his then 15-years old daughter Mary challenged him and his generation to fix the climate problem for which they were largely responsible. He responded to her challenge by mobilizing venture capital to find new and better ways to reduce emissions at scale.

When venture capital (VC) funds make 10 to 20 investments, they expect that most investments will fail, a few may break even, and one or two might succeed wildly, justifying investments across the portfolio. Gaddy et al. (2016) document how, led by John Doerr, venture capitalists (VCs) in the US invested US\$25 billion into Clean Tech over the 2006–2011 period, and lost half of it.[10] The returns were dramatically lower than those yielded over the same period by VC investments in medical and software technology. Typically, VC investments operate on a ten-year cycle, with the expectation that, within the first five years, those that have commercial prospects will be purchased by large, cash rich companies (typical in the pharma and IT world) or issue an initial public offering of shares. They found that ‘cleantech companies developing new materials, hardware, chemicals, or processes were poorly suited for VC investment because they required significant capital, had long development timelines, were uncompetitive in commodity markets, and were unable to attract corporate acquirers’.

However, lessons have been learned: John Doerr continues his commitment to invest in innovation-led low carbon energy, Bill Gates has become an investor[11] and Elon’s Musk’s investment in 2004 of \$30 million in start-up Tesla and chairing its Board of Directors has resulted in a company with an enterprise valued on January 11 2023 at €378 billion,[12] in part because it has found ways to dramatically reduce the costs and increase the range of batteries.[13]

Integrating Emissions Reduction into the Business Model

There is a broad movement along many dimensions where some businesses are acting to address climate change and such developments are garnering support from policy systems.[14] Below, I touch on a few examples.

Decarbonizing Supply Chains

Many retail companies have committed to reduce their own carbon footprint, and to reducing emissions from their supply chain. One of these is Walmart, headquartered in the US, which had revenues of \$559.2 billion in 2021; it is a major food retailer, and Irish dairy products are to be found in most of its stores. It has committed to “work with suppliers to reduce or avoid carbon dioxide equivalent (CO₂e) emissions from Scope

3[15] by 1 gigaton from global value chains by 2030”,[16] and is applying metrics to evaluate its progress.[17] Many other retailers in Ireland’s three largest food markets – EU UK and US – are moving in the same direction.

Mining Company

Fortescue Metals Group is an Australian company which is one of the world’s biggest producers of iron ore. It is to invest \$6.2bn in an attempt reduce and then eliminate greenhouse gas emissions. Gillian Tett reports[18] that it has established a separate unit – Fortescue Future Industries – to invest in renewable and hydrogen technologies that can be applied to its own operations and developed as separate businesses. The chairman Andrew Forrest argued that eliminating the use of fossil fuel at Fortescue’s mines by converting vehicles, including enormous trains, to hydrogen would reduce operating costs by \$818mn a year from 2030. He said cumulative cost savings would reach \$3bn by the end of the decade, with its investment paid back by 2034 based on current market prices for fossil fuels. “We smoke \$2.5bn plus of fossil fuels into the atmosphere every year with nothing to show for it,” he told the Financial Times in an interview in New York.

Food Company[19]

Following the introduction of milk quotas by the EU in 1984, some Irish milk co-operative societies – which included Avonmore Foods and Waterford Foods – decided that the shrinking of growth opportunities in Ireland meant that they should look to expansion abroad, funded by a stock exchange flotation which took place in 1988. As they both grew, they concluded that there would be considerable economies of scale and scope achieved if they merged, which they did in 1999 with the mission of reducing commodity exposure to be achieved by a focus on: acquiring higher margin; lower volatility, higher value-added sectors. Many acquisitions followed in the fields of health, wellness, nutrition, ingredients etc. On January 11, 2023, Glanbia plc was valued at €3.10 billion.[20]

In 2022, independent shareholders of the plc voted to approve proposals for the it to sell its 40% stake in Glanbia Ireland – which has 11 high tech processing facilities, 52 agri-branches and over 2,100 employees – to Glanbia Co-operative Society.

Following the Co-op’s agreement with Glanbia plc to acquire the full ownership of its dairy and grain operating business, since August 31, 2022 the co-op is now trading as Tirlán; it will continue to hold a 31.9% share of Glanbia plc.[21]

Before the separation, Glanbia Ireland (now Tirlán) prepared a company-wide sustainability strategy, which will align with the [Science Based Target initiative](#), which drives ambitious climate action in the private sector by enabling companies to set science-based emissions reduction targets. The SBTi is a partnership between the Climate Disclosure Project (CDP), the United Nations Global Compact (UNGC), World Resources Institute (WRI) and the World Wide Fund for Nature (WWF). As part of the sustainability strategy, priority areas for action have been identified: on-farm carbon, air (ammonia), water quality, biodiversity & economic sustainability. The strategy will contain clear targets out to 2030 for each of these priority areas and an emphasis will be placed on the “win-win” of improving farm returns while enhancing the rural environment through better resource management.

In addition, it has developed specific sustainability programmes such as the Open Source Future Farms, Twenty20 Beef Club, and FarmGen. These Programmes are all endeavouring to align environmental and economic sustainability as a platform for vibrant rural communities. It is also focused on biodiversity action at farm level and participates in a number of EIP projects on biodiversity, including the BRIDE project.

Other processors are also actively engaged in the development and delivery of a sustainability agenda notably the Carbery Group, which, amongst other initiatives is a leader of the Farm C Zero project which I address in Blog 11 (Innovation).[22]

Asset management services

BlackRock Inc is the world’s largest asset manager with total assets under management of **\$8.5 trillion** on June 30, 2022.[23] Larry Fink, Chairman and CEO, issues annual letters to the CEOs of the companies whose shares are included in its Portfolio[24] and separate letters to investors in BlackRock.[25] Here is a flavour of thinking on the rationale and roles for business:

2021 letter to CEOs:

- The creation of sustainable index investments has enabled a massive acceleration of capital towards companies better prepared to address climate risk and better technology

and data are enabling asset managers to offer customized index portfolios to a much broader group of people

- Companies that are not quickly preparing themselves for the net zero transition will see their businesses and valuations suffer, as stakeholders lose confidence that those companies can adapt their business models to the dramatic changes that are coming.
- Data and disclosure matter. Last year, we asked all companies to report in alignment with the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD) and the Sustainability Accounting Standards Board (SASB), which covers a broader set of material sustainability factors. TCFD reports are the global standard for helping investors understand the most material climate-related risks that companies face, and how companies are managing them. While the world moves towards a single standard, BlackRock continues to endorse TCFD- and SASB-aligned reporting.
- Action matters: asking clients to inter alia: publish a temperature alignment metric for our public equity and bond funds; we are: incorporating climate considerations into our capital markets assumptions; for managing holdings that pose significant climate risk include flagging holdings for potential exit; launching investment products with explicit temperature alignment goals, including products aligned to a net zero pathway; and using stewardship to ensure that the companies our clients are invested in are both mitigating climate risk and considering the opportunities presented by the net zero transition.
- We have seen how purposeful companies, with better **environmental, social, and governance (ESG) profiles**, have outperformed their peers. During 2020, 81% of a globally-representative selection of sustainable indexes outperformed their parent benchmarks

2022 Letter to CEOs:

- The next 1,000 unicorns won't be search engines or social media companies, they'll be sustainable, scalable innovators – start-ups that help the world decarbonize and make the energy transition.
- Caveat: BlackRock does not pursue divestment from oil and gas companies as a policy. We do have some clients who choose to divest their assets while other clients reject that approach
- Policy Imperatives: We need governments to provide clear pathways and a consistent taxonomy for sustainability policy, regulation, and disclosure across markets. They must also support communities affected by the transition.
- **Empower clients with choice on ESG votes** – pursuing an initiative to use technology to give more of our clients the option to have a say in how proxy votes are cast at companies their money is invested in.
- Action: we are asking companies to: set short-, medium-, and long-term targets for greenhouse gas reductions: issue reports consistent with the Task Force on Climate-related Financial Disclosures (TCFD): – these are essential tools for understanding a company's ability to adapt for the future.

Assessment

1. 'Origin Green' is a great platform for promoting the climate and other sustainability credentials of Irish food, but it can only do so effectively on the climate change front if Irish farmers deliver carbon footprints that are competitive with those likely to be achieved by those producers who will be their main competition in key markets – see [Blogs 3 \(EU\)](#), [4 \(UK\)](#), and [5 \(US\)](#).
2. Companies are not 'all the same'. Some are very serious about:

- Clarifying why it makes sense to take on the climate challenge. This will include some of a mix that include: conscience – Mencken’s observation that ‘conscience is the quiet voice that tells us that someone may be looking’ is apropos; responding, as John Doerr did, to his 15 year’s old daughter Mary’s challenge to help fix the problem; seeking a more enduring epitaph than “I made a lot of money”; attracting employees who are searching for meaning rather than torpor; successfully managing the risks of losing some or all of the company’s most lucrative markets and limiting access to new markets; getting favoured treatment by investors and lenders.
- The companies that best manage risk will be those who are paranoid about what the competition is up to. They will have a sign saying: “Only the paranoid survive” – the motto of Andy Grove, former CEO and the chair of Intel – on every real and virtual desk.
- They will make it their business to: understand the nature of the climate challenge; put together a strategy to reduce their carbon footprint in Scope 1 (directly under its control), scope 2 (indirect GHGs from the purchase of electricity, steam, cooling and heating) and scope 3 (other indirect emissions across a company’s value chain, including in particular those emanating from farmers in the production of food for processing; learn what they can from those, e.g. Signpost farmers, who are ahead of them; implement the strategy, with constant adaptation from learning by doing, which is the most valuable learning of all.
- They will lobby the policy system, both individually and collectively to: remove the key constraints inhibiting progress; support emissions reduction and carbon removal which deliver the best value for money; actively discriminate in favour of companies that are climate performance leaders and help ensure that they have the evidence to validate this status; ensure that Teagasc has the resources and the mandate to build on its excellent progress at providing a credible platform to maximize the prospects of become a global leader in Sustainable Food systems by 2030.

3. Origin Green has the objective of making all Irish food, and those who produce and process it, a world leader in sustainability. This is a great ambition, and it will be wonderful if we deliver it, but we should have a plan B if this is not achieved. Origin Green identifies those companies and farmers who are exceptional as ‘Gold Members’ and Teagasc’s ‘Signpost Farmers’ are likewise sustainability leaders. These doers will be the nucleus of a much larger group, and it is important that they benefit, financially and in terms of status, from their achievement, and not be dragged down by the laggards. If the Irish average carbon footprint is not competitive in key markets, is it essential that those companies and farmers who have rolled up their sleeves and excelled do not lose out.

4. I hope that you will find Blogs 9 (Essentials), 10 (CAP 2023–2027), 11 (Innovation) and 12 (Policy Integration) useful sources of insight for the design and delivery of climate policy for the sector, and of for ideas as to what to prioritise in your lobbying efforts.

5. Crisis always opens opportunity. Honda was able to use the energy crisis and air quality legislation in the early seventies to open the door to the US market. Is there an Irish company with the courage, ambition, talent, and luck to convert our current energy crisis and climate challenge to market advantage?

6. Walmart and BlackRock are driving change, but note that, at this stage, their advocacy is taking the form of strong encouragement to their suppliers (Walmart) and to the companies included in their many funds (BlackRock). They are not threatening them with exclusion

7. I get three key messages from Larry Fink’s (BlackRock) letters to CEOs: notwithstanding the huge turbulence in markets created by Covid-19, the Russia-Ukraine war etc., a growing number of companies are embracing a climate responsible agenda; credible information on performance is critical; corporate action is not a substitute for effective and ambitious climate policy.

8. The climate ambition of the Fortescue Metals Group is different; iron ore is an intermediate good going to steel and other processors – there is as yet no dividend in the market-place for producing climate responsible product. Its commercial viability depends on finding a way that works to substitute fossil fuels by hydrogen.

9. Eugene Murtagh (founder of Kingspan in 1965) a global leader of energy insulation products, Michael O’Leary (transformer of Ryanair in the nineties into Europe’s most successful airline) and John and Patrick Collison, founders of Stripe in 2011, represent

three generations of hugely successful (perhaps the most successful) Irish entrepreneurs. They all started from very small beginnings to create enterprises of global reach and significance. In an interview with the Irish Times John Collison had a wonderfully pithy explanation for their success: "Code wins arguments. It meant that people didn't even have to believe in us. They could just look at the data and see we were on to something." The second advantage was ease of use: Its early success was largely due to it working to simplify the payments' process; software developers only needed to add in a couple of lines of code in order to accept online payments on websites.[26] O'Leary has invested in a 1,900-acre farm in Westmeath, while John Collison has purchased a 1,100-acre estate in Laois. Accepting that the demands of their day jobs are unrelenting, it would be great if they could take a breath, pause and ask themselves if they could help find a way that works to make Irish ruminant farming a global leader in climate stewardship?[27]

Header image credit: Photo by [Marcin Jozwiak](#).

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Biography

Frank Convery has degrees [B. Ag and M.Ag (Forestry)] from UCD. Encouraged by the late Seamus Sheehy, he went to the US and took a PhD in Forestry Economics (State University of New York). After a distinguished academic career in the US (Duke University) he returned to Ireland as research professor at ESRI before being appointed as Heritage Trust Professor of Environmental Studies at UCD where he led the successful application for the funding of the UCD Earth Institute. He chaired the boards of the Sustainable Energy Authority of Ireland (SEAI) (2002-2007), Comhar Sustainable Development Council (2006-2010) and served on the Climate Change Committee (2016-2020) chaired by John FitzGerald, and the AgriFood 2030 Committee chaired by Tom Arnold. The latter produced *Food Vision 2030*. From 2014 to 2018, he was chief economist with the Environmental Defense Fund, New York. His passion is finding ways to bring the weight of

learning down to where things are done; his ambition for the sector is the same as Food Vision 2030's: "Ireland will become a **world leader** in Sustainable Food Systems (SFS) over the next decade. This will deliver significant benefits...and will also provide the basis for the future competitive advantage of the sector".

Footnotes and references

[1] [gov.ie](http://www.gov.ie) - Food Vision 2030 – A World Leader in Sustainable Food Systems (www.gov.ie) p.9

[2] It is to be distinguished from a 'meme' – an element of a culture or system of behaviour passed from one individual to another by imitation or other non-genetic means – and 'mania' as in the Dutch 'tulpenmanie', the major acceleration in tulip prices which started in 1634 and then dramatically collapsed in February 1637.

[3] Origin Green Progress Update Report 2021 [BB Progress Report Feb 2022.indd](#) (origingreen.ie) p. 4, 5

[4] [Origin Green](#)

[5] Recent examples include [Science Based Targets Webinar Series](#) (origingreen.ie) (Feb 2022) and [Leaders Sustainability Acceleration Programme.pdf](#) (smurfitschool.ie) (October 2022). Declaration of interest: I made a small contribution to the latter.

[6] [How US-made Japanese autos became an American success story | CNN Business](#)

[7] Toyota (14.94%), Honda 9.80%, Nissan (7.22%). [U.S. light vehicle market share by automotive manufacturer 2021 | Statista](#)

[8] Weitzman, M.L. 2011. Fat-Tailed Uncertainty in the Economics of Catastrophic Climate Change. *Review of Environmental Economics and Policy* 5 (2): 275–92.

[9] For an excellent rendering of the gory details, see the later chapters in Patrick Honohan's *Currency, Credit and Crisis: Central Banking in Ireland and Europe*. Cambridge University Press, 2019.

[10] [MITEI-WP-2016-06.pdf](#)

[11] Bill Gates, "[My Green Manifesto](#)", *Financial Times*, February 19, 2021.

[12] Jan 11, 2023. [TSLA Stock | News | TESLA Stock Price Today | Analyst Opinions | Markets Insider](#) (businessinsider.com).

[13] [History of Tesla: Timeline and Facts - TheStreet](#)

[14] E.g., see [John Kerry: Companies that quickly embrace green tech will clean up | Financial Times](#) (ft.com).

[15] **Scope 1** includes GHGs from sources directly in a company's control, including emissions associated with fuel combustion in boilers, furnaces and onsite vehicles. **Scope 2** consists of indirect GHGs from the purchase of electricity, steam, cooling and heating of the company's facilities. **Scope 3** includes all other indirect emissions across a company's value chain, from purchased goods and services to transportation and distribution (up and downstream) to how products are used after they're sold.

[16] <https://www.walmartsustainabilityhub.com/climate/project-gigaton>

[17] https://www.walmartsustainabilityhub.com/media-library/document/project-gigaton-accounting-methodology/_proxyDocument?id=00000165-159f-d0cc-ab77-95ff84350000

[18] Gillian Tett, "[Australian mining major Fortescue to invest \\$6.2bn in net zero push](#)", *Financial Times*, September 20, 2022.

[19] For the history of Glanbia, see [History | Glanbia](#)

[20] [market capitalization of glanbia - Search](#) (bing.com).

[21] [Glanbia Ireland and Glanbia Co-Op rebrand as Tirlán](#) (rte.ie).

[22] [Sustainability - Carbery](#)

[23] [size of funds managed by BlackRock 2022 - Search](#) (bing.com).

[24] [Larry Fink CEO Letter | BlackRock 2021](#); [Larry Fink's Annual 2022 Letter to CEOs | BlackRock](#)

[25] [Larry Fink's 2021 Chairman's Letter to Shareholders | BlackRock](#); [Larry Fink's Chairman's Letter to Shareholders | BlackRock 2022](#)

[26] Charlie Taylor "[John Collison: 'It is entirely plausible that you could set up Stripe in Dublin now'](#)" *Irish Times*, December 18, 2020

[27] Tipperary FM reports that the Collison brothers (of Stripe and Dromineer fame) will invest in Carbon Removal technology here and in Europe and will advise on the development of the technology sector <https://tippfm.com/news/economy-employment/collison-brothers-secure-major-investment/>