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Pension Funds and Sustainability.

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Abstract

This article looks at the problem of climate change and sustainable development solutions to this problem, focusing on the role that pension funds can play in supporting sustainability.

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The problem: climate change

The issue of climate change is clearly linked to population size and some scientists have begun to ask whether there are global limits to human habitability.[1] For example, Dr Steven Running, emeritus professor of ecology at the University of Montana and a member of the NASA Earth Observing System, argues that a population cannot grow indefinitely in a finite ecosystem, such as the Earth. He explains: 'Systems ecology theory predicts when resource limits are exceeded, a progressive system feedback of starvation, predation and disease limits uncontrolled population and consumption growth. The global human population has nearly tripled since 1950, and economic activity increased tenfold, leading many to suggest that humanity is heading toward a population and consumption overshoot and correction this century. The global population, currently at [8]bn people, is projected to rise beyond 10bn by 2100. Future limits become an urgent policy issue when one considers the expansion in living standards aspired to by the underdeveloped world. Is humanity smart enough to anticipate global overshoot, and shift to sustainable policies before these morally unacceptable systems feedbacks take over?'.

The core metric for quantifying total plant growth is net primary production (NPP), measured in kilograms per hectare of plant biomass. Land-based plants absorb around 30% of the carbon dioxide that human activity adds to the atmosphere. Increasing NPP slows down global warming. NASA has been monitoring global NPP for the last quarter century. Running points out that NPP depends on temperature and water availability: 'rising temperatures increase growing season length, but decrease water availability, and many of the NPP trends identified can be directly attributed to these effects. We showed how significant droughts between 2000 and 2009 caused the reduction in NPP in the Southern

[1] How much climate change is due to human intervention and how much is natural has not yet been resolved. For a discussion of this point, see: https://www.theepochtimes.com/epochtv/climate-alarmism-the-distortion-of-data-using-computer-models-facts-matter-exclusive-5662584; and M. Beenstock, Y. Reingewertz, and N. Paldor (2012) 'Polynomial Cointegration Tests of Anthropogenic Impact on Global Warming', *Earth Syst. Dynam*., 3, 173–188, www.earth-syst-dynam.net/3/173/2012/, doi:10.5194/esd-3-173-2012

Hemisphere. Decreases in cloud cover increased sunlight over tropical areas causing the largest increases in NPP, particularly in the Amazon rainforest. It initially appeared that rising global temperatures were having a positive effect on the growth of plants, potentially increasing their ability to act as a sink for excess carbon dioxide produced by human activity. However, the reduction in NPP from 2000 to 2009 from drought effects raises serious issues. If rising global temperatures reduce plant growth, the ability of vegetation to act as a carbon sink will be reduced, accelerating climate change'. He concludes: 'As the Earth's population continues to increase, and climate continues to change, consistent monitoring of NPP will become an even more essential tool for understanding and mitigating damage caused to the biosphere. It is essential for humanity to not reach catastrophic planetary limits risking collapse. There is no better and available global dataset than NPP, the foundation of food, fibre, biofuel and climate stabilization, for this essential monitor of global habitability'.[2]

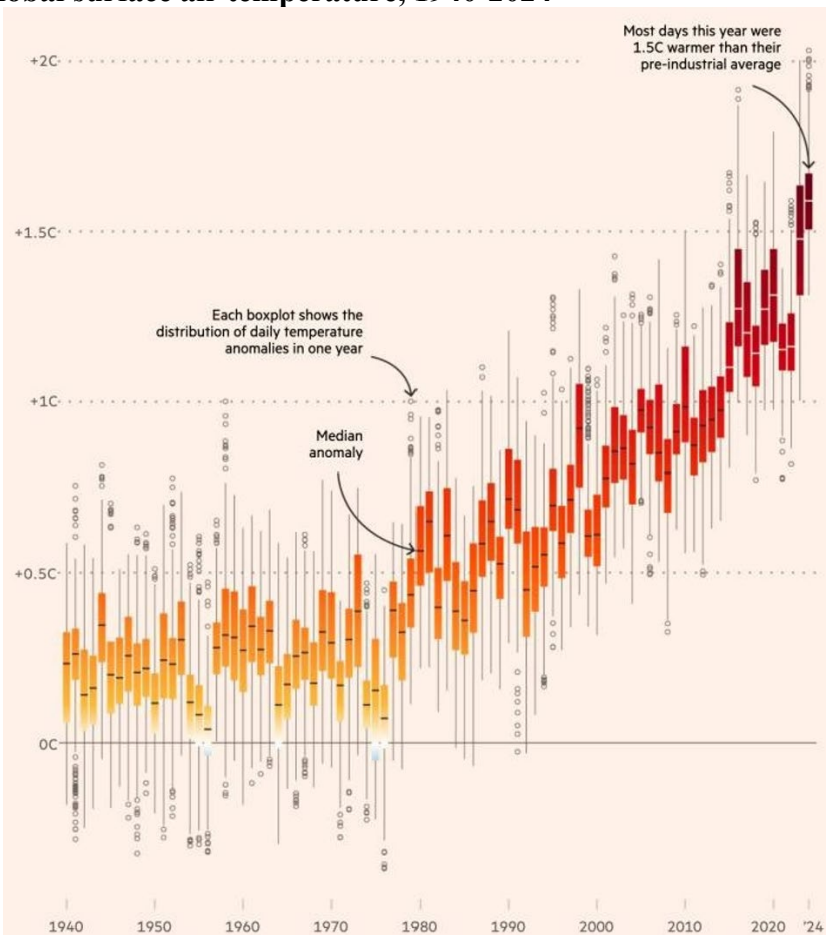
According to the World Meteorological Organization, hydrological cycles are 'spinning out of balance' and the world will experience an 'increasingly erratic' water cycle as climate change drives new patterns of both extreme flooding and drought. Droughts, extreme rainfall and melting snow and glaciers are threatening long-term water security. Petteri Taalas, WMO secretary-general, said that the overwhelming majority of disasters are water related: 'A warmer atmosphere holds more moisture. We are seeing much heavier precipitation episodes and flooding. And at the opposite extreme, more evaporation, dry soils and more intense droughts'.[3] Between June-August 2023, the Earth experienced the hottest three-month period on record with an average global temperature of 16.7ºC – see Figure 1. In September 2023, António Guterres, Secretary General of the United Nations, said that 'Climate breakdown has begun'. The UN forecasts that by 2050, more than 75% of the global population could be affected by drought and lack access to water, up from 1.1bn currently.[4]

[2] Steven Running (2019) The biosphere: Global limits of human habitability, 30 October; https://www.openaccessgovernment.org/biosphere-human-habitability/75469/

[3] Quoted in Aime Williams (2023) Global water cycles are 'spinning out of balance', weather agency reports, *Financial Times*, 12 October; https://www.ft.com/content/a8c1b4cb-e7ec-4dd7-9eac-8adc2d874a96

[4] Quoted in Verity Bowman and Harriet Barber (2023) The world has experienced its hottest ever three-month period, *Daily Telegraph*, 13 September; https://www.telegraph.co.uk/global-health/climate-and-people/climate-change-global-warming-wildfires-drought-floods/

Figure 1: Global surface air temperature, 1940-2024



Source: ERA5, C3S/ECMWF. Note: The figure shows the average daily surface temperature compared with the pre-industrial average (1850-1900). Blocks show the interquartile range; https://www.ft.com/content/fd914266-71bf-4317-9fdc-44b55acb52f6

The World Economic Forum's *Global Risks Report 2019* warned of increasing naturally emerging infectious disease pandemics and risks posed by revolutionary new biotechnologies, claiming that these could be as big a threat as climate change.[5] And within a year this came to pass.

A study by Carlson et al (2022) asserts that at least 10,000 virus species have the capacity to infect humans, but, at present, the vast majority are circulating silently in wild mammals. However, climate and land use change will produce novel opportunities for viral sharing among previously geographically-isolated species of wildlife. In some cases, this will facilitate zoonotic spillover between species – a mechanistic link between global environmental change and disease emergence. The study uses a phylogeographic model of the mammal-virus network to simulate potential hotspots of future viral sharing and to make projections of geographic range shifts for 3,139 mammal species under climate

[5] https://cirmagazine.com/cir/epidemic-risks-pose-as-big-a-business-threat-as-climate-change.php

change and land use scenarios for the year 2070. The model predicts that species will aggregate in new combinations at high elevations, in biodiversity[6] hotspots, and in areas of high human population density in Asia and Africa, driving the novel cross-species transmission of their viruses an estimated 4,000 times. Because of their unique dispersal capacity, bats account for the majority of novel viral sharing, and are likely to share viruses along evolutionary pathways that will facilitate future emergence in humans. The study also conjectures that this ecological transition may already be under way, and holding warming under 2°C within the century will not reduce future viral sharing. The authors conclude that 'Our findings highlight an urgent need to pair viral surveillance and discovery efforts with biodiversity surveys tracking species' range shifts, especially in tropical regions that harbor the most zoonoses and are experiencing rapid warming'. Vector-borne diseases (which are caused by the bite of infected insects, such as mosquitoes, ticks, and sandflies, which act as carriers or 'vectors') account for more than 17% of all infectious diseases, leading to more than 700,000 deaths annually.[7] In March 2024, the first mammal-to-human H5N1 (bird flu) virus transmission took place between a cow and a Texan dairy worker; all previous transmissions to humans came from infected birds.[8] Live traces of H5N1 were found in batches of raw or unpasteurized milk sold at retail stores in California in November 2024.[9] The first reported human death from H5N1 occurred in Louisiana on 6 January 2915.[10]

Some scientists predict a new 'pandemic age'. Professor Eddie Holmes, an evolutionary biologist and virologist at the University of Sydney, said: 'Climate change and pandemics go hand-in-hand….The more animals are forced to mix, the more viruses will jump species'.[11] One current example is the spread of dengue – or 'breakbone fever' because of the intense joint and muscle pain it causes – by mosquitos. It affected nine countries in the 1970s, but has spread to more than 100 and affects around 400 million people a year. The main causes are climate change and rapid urbanisation.[12] Another example is mpox (monkeypox) which causes miscarriage, has a fatality rate of up to 10%, and is spreading rapidly in central Africa and could spread to Europe.[13] In August 2024, the World Health Organization declared mpox a global health emergency.[14] In October 2024, an outbreak of

[6] Biodiversity refers to the 8.7m varieties of life forms on Earth, such as plants, bacteria, animals and humans; https://education.nationalgeographic.org/resource/biodiversity/

[7] Nicola Oliver (2023) The Impacts of Climate Change on Mortality, *Life Risk News*, 8 March;https://liferisk.news/the-impacts-of-climate-change-on-mortality/

[8] https://www.telegraph.co.uk/global-health/science-and-disease/first-mammal-to-human-transmission-h5n1-bird-flu-confirmed

[9] https://www.telegraph.co.uk/global-health/science-and-disease/h5n1-bird-flu-raw-milk-california-united-states-of-america/

[10] https://www.cdc.gov/media/releases/2025/m0106-h5-birdflu-death.html

[11] https://www.telegraph.co.uk/global-health/science-and-disease/hotter-sicker-climate-crisis-will-trigger-surge-spillover-events

[12] https://www.telegraph.co.uk/global-health/science-and-disease/why-singapore-alert-record-breaking-year-disease

[13] https://www.telegraph.co.uk/global-health/science-and-disease/new-strain-of-mpox-causing-miscarriages-spreading-rapidly

[14] https://www.nytimes.com/2024/08/14/health/mpox-who-emergency-africa.html

Marburg – related to Ebola and with a fatality rate of up to 88% – occurred in Rwanda, killing more than a dozen people.

Also in October 2024, the Global Preparedness Monitoring Board (GPMB) – an independent body convened by the Director-General of the World Health Organisation and the President of the World Bank – warned that the next pandemic will probably 'catch the world napping', despite all the advances made during Covid-19: 'Changing patterns of life and the ongoing encroachment of human activities into natural environments [are] altering the global risk landscape and making the emergence of new pathogens more likely'. The GPMB made three critical recommendations to governments focusing on pandemic planning: prioritise risk profiles and assessments that account for a broad range of factors, including those like conflict or climate change that drive up the risk of new epidemics emerging, or those that will impact the world's ability to respond, such as digital connectivity and biomedical innovation; prioritise equity in their preparedness plans, making sure they 'address the specific and basic needs of vulnerable populations', and, in particular, access to 'medical countermeasures', like vaccines or treatments; and for collaboration between different sectors to be strengthened. The GPMB also identified 15 risk drivers, with four having the greatest impact: the movement of people around the world 'is at a record high and is likely to continue to increase in the coming years'; a dramatic increase in global livestock numbers is driving the spread of H5N1; the rise of social media means people are increasingly being exposed to misinformation, and 'public health organisations and governments are struggling to keep up'; and a 'decline in trust in many countries, distrust in institutions is growing and trust in the multilateral system is at risk. This is impacting our collective capacity both to tackle health emergencies and to find multilateral solutions to protect the world'.[15]

Bowman and Barber (2023) point out that: 'Many [existing] infectious diseases are climate sensitive and global warming is giving them the opportunity to expand their reach, threatening the lives of millions. With flooding, population displacement and overcrowding caused by storms and extreme flooding, waterborne infections – such as cholera, typhoid and hepatitis – are on the rise. Milder winters, warmer summers, and fewer days of frost are also making it easier for disease-carrying mosquitoes to roam beyond their habitats, bringing infections like malaria[16] [and] Zika …fever closer to countries previously out of their reach'. In August 2025, the European Centre for Disease Prevention and Control (ECDC) reported that deadly and debilitating mosquito-borne diseases are becoming the 'new normal' in Europe. These include West Nile Virus, which can cause

[15] https://www.telegraph.co.uk/global-health/science-and-disease/why-the-next-pandemic-may-catch-us-napping-despite-all-weve/

[16] The parasite that causes malaria has a complicated life cycle and is able to avoid detection by the immune system. However, two malaria vaccines for children – one developed by GSK and the other by Oxford University – have recently been approved by the World Health Organization; *Telegraph World*, 3 October 2023.

serious brain and spinal cord inflammation, and chikungunya, which can lead to long-lasting disability.[17]

Similarly with fungi. The high body temperature of humans has traditionally protected them against fungi, but fungi are beginning to adapt to higher temperatures, making transmission easier. An example is Candida auris (C.auris), a fungus that first appeared in humans in 2009.[18] A study by Denning (2024) found that four million people have been dying annually from fungal infections, including chronic pulmonary aspergillosis, pneumocystis pneumonia and cryptococcal meningitis. This is nearly double the previous global estimate and means that fungal infections are killing six times more people than malaria and nearly three times as many as tuberculosis.[19] In September 2025, the European Centre for Disease Control (ECDC) reported that drug- and disinfectant-resistant C.auris was spreading rapidly in European hospitals, with 4,000 people infected in Europe between 2013-2023. It kills nearly 60% of people who contract it within 90 days, from infections in the blood, brain, spinal cord, bones, ears, and respiratory and urinary systems.[20]

A report on climate change and health published in December 2020 by *The Lancet*[21] estimates that global warming has already caused a 50% increase in heat-related deaths of people older than 65, especially in Japan, China, India and parts of Europe. The main reasons for this are heat stroke, kidney failure (caused by kidneys overworking due to dehydration), and heart failure (caused by an excessive heart rate as the heart pumps more blood to the skin, with a corresponding reduction of blood flow to the brain).[22] In the US, the report argues that rising temperatures, combined with pollution and wildfires, are endangering the health of Americans, with fatal consequences for many older people. The solution, according to the reports' authors is to aggressively curb planet-warming gases in the next five years: 'Climate action is a prescription for health'. In February 2024, a study from the Yale School of Public Health, published in *Nature Communications*, estimated that at 1.5°C, 2°C, and 3°C increases in global warming, heat-related deaths will increase by 0.5%, 1.0%, and 2.5%, respectively. Of these, 20-25% can be attributed to population aging.[23] In May 2024, an article also published in *Nature Communications* by scientists from the CMCC Foundation–Euro-Mediterranean Center on Climate Change and Boston

[17] https://www.telegraph.co.uk/global-health/science-and-disease/outbreaks-of-tropical-diseases-becoming-europe-new-normal/
[18] Verity Bowman and Harriet Barber (2023) The world has experienced its hottest ever three-month period, *Daily Telegraph*, 13 September; https://www.telegraph.co.uk/global-health/climate-and-people/climate-change-global-warming-wildfires-drought-floods/
[19] David W. Denning (2024) Global incidence and mortality of severe fungal disease, *The Lancet Infectious Diseases*; https://www.thelancet.com/journals/laninf/article/PIIS1473-3099(23)00692-8/fulltext
[20] https://www.telegraph.co.uk/global-health/science-and-disease/drug-resistant-fungus-spreads-rapidly-in-european-hospitals/
[21] Reported in the *New York Times*, 3 December 2020.
[22] https://www.telegraph.co.uk/global-health/climate-and-people/climate-change-global-warming-wildfires-drought-floods
[23] https://medicine.yale.edu/news-article/aging-population-to-be-major-driver-of-future-climate-related-deaths/; https://www.nature.com/articles/s41467-024-45901-z

University predicted that 246 million people around the world may be at risk of heat exposure by 2050 due to global warming and an aging population.[24] Also in May 2024, the World Heart Federation (WHF) warned that air pollution was now the 'greatest single environmental health risk', responsible for annual global deaths of 7 million people, around half of which are due to cardiovascular conditions such as heart attacks and strokes. However, it also warned that measures to make homes better insulated and eco-friendly could actually increase the number of deaths by making them airtight and increasing the build-up of air pollutants.[25] In August 2024, an Air Quality Life Index (AQLI) study published by the Energy Policy Institute (EPIC) at the University of Chicago estimated that permanently cutting fine particulate matter (known as PM2.5) which gets into the lungs and bloodstream would add around two years to life expectancy.[26]

In 2022, the UK Longevity Science Panel published a report (*The Effects of Climate Change on Health in the UK*) assessing the impact of climate change on the UK's health.[27] The report suggests that climate change will be experienced unevenly across different sections of the UK population, and may deepen health inequalities in physical and mental health in the UK. The most economically deprived and those who are already frail through age or having long-term health conditions will be the most vulnerable to high temperatures and shocks induced by adverse weather events. Compared with many other countries, the report found that the direct impacts of climate change such as heat waves, flooding and the increased spread of vector-borne diseases, are likely to be relatively modest. This is because of the UK's geographic location in the Northern hemisphere and its economic power to adapt houses, workplaces and infrastructure to reduce the negative impact of climate change.

In March 2025, a study from the USC Leonard Davis School of Gerontology indicated that greater exposure to extreme heat may accelerate biological aging in older adults. The evidence was that people living in areas experiencing more days of high heat showed greater average biological aging than residents in cooler areas. The study was based on 3,600 Health and Retirement Study (HRS) participants aged 56 and older. Blood samples taken during the six-year study period were analyzed for epigenetic changes via a process called DNA methylation. The researchers used epigenetic clocks to analyze methylation patterns and estimate biological ages at each point a blood sample was taken. They then compared participants' changes in biological age to their location's heat index history and number of heat days reported by the National Weather Service from 2010 to 2016. The analysis revealed a significant correlation between areas with more days of extreme heat and individuals experiencing greater increases in biological age. This correlation persisted

[24] https://www.pensionpolicyinternational.com/up-to-246-million-older-people-may-be-exposed-to-heat-risk-by-2050-due-to-global-warming/
[25] https://www.telegraph.co.uk/news/2024/05/24/net-zero-efforts-could-cause-rise-in-air-pollution-deaths/
[26] https://www.telegraph.co.uk/global-health/climate-and-people/cutting-pollution-may-add-two-years-to-average-persons-life/
[27] https://www.pensionpolicyinternational.com/climate-change-poses-a-threat-to-health-equality-in-the-uk-the-longevity-science-panel-report/

even after controlling for socioeconomic and other demographic differences, as well as lifestyle factors such as physical activity, alcohol consumption and smoking.[28]

However, the indirect impacts could worsen existing inequalities in health for the following reasons:

- Socio-economic. When economies are stressed the health of the most disadvantaged is disproportionately affected.
- Climate change-related disruptions to global food production and supply chains will reduce food security, particularly for low-income families. Lower socio-economic households are more likely to be exposed to the damage caused by extreme weather events as poverty tends to force people to live in higher risk areas, but they often lack the disposable income to adequately prepare for the hazards associated with climate change. The build quality of certain lower income and private rental homes can make them more vulnerable to severe damage during adverse weather events.
- Gender inequalities. Women are likely to be impacted more by climate effects than men. They are more often the primary caregivers, and these responsibilities can be considered an additional source of stress in times of adversity, particularly when infants and children in their care are threatened directly by displacement or food insecurity.
- Age inequalities. The young and the old are disproportionately affected by climate change compared to working age adults. This is due to differences in physiology, impacts on education, development, exposure, vulnerability to illness, lack of social support, declining health, and disruption to daily activities.
- Mental health. Climate change can negatively impact mental health in two main ways: by causing actual harm to people, family members, homes, livelihoods or culture, or by acting as a threat of harm and source of uncertainty.
- Disruptions to the UK economy, in part caused by climate-induced global economic stresses, are a key indirect pathway through which climate change may adversely impact on population health in the UK.

On the other hand, humans can adapt to climate change as a study by Walkowiak et al (2025) shows. The authors analyzed 22 years of heat mortality in Europe and found that adaptation is outpacing climate change, with Europeans gaining 'the capacity to tolerate an additional 1 °C rise every 17.9 years'. The authors commented: 'Current predictions of climate change impacts rely on conservative assumptions about a lack of adaptation, projecting significantly increased heatwave mortality. However, long-term studies have shown a decline in actual heatwave deaths, raising questions about the underlying mechanisms. …Additionally, increasing economic output, likely driven by infrastructural improvements, especially greater affordability of air conditioning, enabled tolerating each

[28] https://www.pensionpolicyinternational.com/climate-change-may-drive-premature-aging/

additional 1 °C due to a per capita GDP increase of 19.7 thousand euros. Consistently, the increase in cooling energy demand was the strongest in eastern Europe'.[29]

Climate change can also have a major economic impact on companies and financial markets in the form of supply chain disruptions, reduced worker productivity, damage to corporate infrastructure and the communities in which businesses operate. In the US, weather-related disasters, such as wildfires, flooding and drought, cost $150bn annually, and are happening with increasing frequency, from an annual average of three in the 1980s to 18 in the 2020s.[30] A study reported in *S&P Global Sustainability Quarterly* in November 2023 analyzed the S&P Global Sustainable1 Physical Risk Exposure Scores and Financial Impact dataset. It examined seven physical climate hazards: extreme heat, water stress, coastal flood, fluvial flood, tropical cyclone, drought and wildfire. It predicted that without adaptation and resilience measures, by the 2050s, the costs to companies exposed to these hazards will average 3.3% p.a. – and up to 28% – of the value of their real assets. The average rises to 6.0% p.a. by the 2090s. Extreme heat was the biggest single hazard: 'If it is too hot, employee health and safety and company operations can suffer. Energy grids can come under pressure as the general population cranks up air conditioning use. Transportation links can be damaged, leading to delays in supply chains'. Particularly badly affected would be datacenters: 'Datacenters are sensitive to extreme temperatures and restricted access to water due to their dependency on heating, ventilating and air conditioning (HVAC) and cooling'.[31]

Open interest in the Chicago Mercantile Exchange's weather derivatives (i.e., futures and options) contracts, which was below 20,000 contracts in 2019, rose to 200,000 contracts in 2023. The contracts allow speculators to take a position on temperature swings. They also act as a form of insurance by allowing organizations to hedge extreme weather events. They track an index and their value depends on how far the temperature deviates from the monthly average. The CME said: 'They're more popular now because the market has determined that [extreme weather] events are becoming more impactful and more frequent'.[32]

In March 2024, ICE (the Intercontinental Exchange) released a report called 'The link between physical climate risk and sovereign default'.[33] The report assigned scores to around 200 Sovereigns based on their vulnerability to climate-related deaths, water stress, changes in productivity and temperature. It predicted that Sovereign issuers with the

[29] Marcin Piotr Walkowiak, Karol Bandurski, Jarosław Walkowiak and Dariusz Walkowiak (2025) 'Outpacing Climate Change: Adaptation to Heatwaves in Europe'. *International Journal of Biometeorology*, 69, 989-1002; https://doi.org/10.1007/s00484-025-02872-0

[30] https://www.pensionpolicyinternational.com/the-largest-u-s-pension-fund-just-rolled-out-a-climate-transition-plan-focused-on-risk-and-opportunity/

[31] https://www.spglobal.com/esg/insights/featured/special-editorial/quantifying-the-financial-costs-of-climate-change-physical-risks

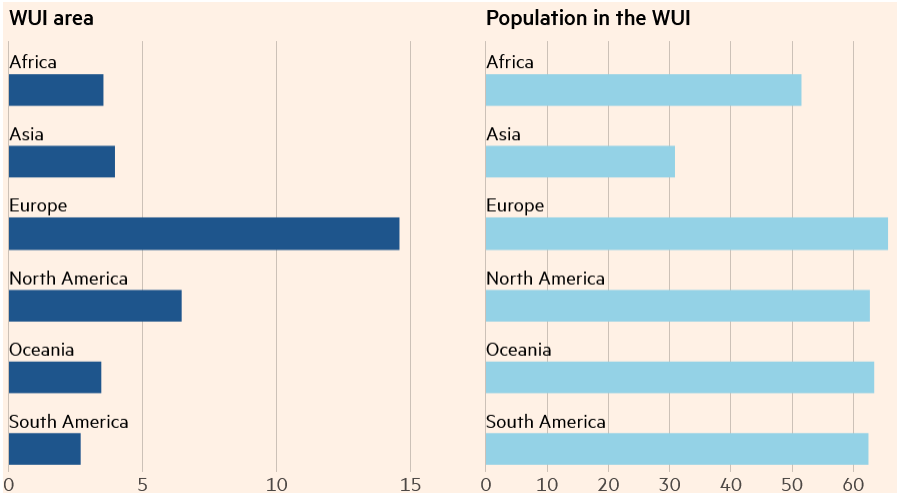
[32] https://www.fnlondon.com/articles/traders-flock-to-weather-derivatives-amid-climate-fears-20240403

[33] https://www.ice.com/insights/sustainable-finance/the-link-between-physical-climate-risk-and-sovereign-default

highest exposure to climate risk (with a score of 5) were 18.5% more likely to default than those with no physical climate risk exposure (with a score of 0). Each unit increase in the score increases sovereign default probability by 3.7%. The report said that 'under realistic emissions scenarios', the impacts of climate change were likely to have a 'profound' effect on sovereign nations' fiscal stability and economic security. To illustrate, wildfires in 2019 and 2020 cost Australia $100bn.

Figure 2 shows that Europe is particularly at risk of urban wildfires, although most of the world's population lives in wildland-urban interface (WUI) areas. Amsterdam, Athens, Lisbon and Naples are all at risk of extreme weather events, in particular, wildfires and flooding.[34]

Figure 2: Wildland-urban interface (WUI) by land mass and population (%, 2020)



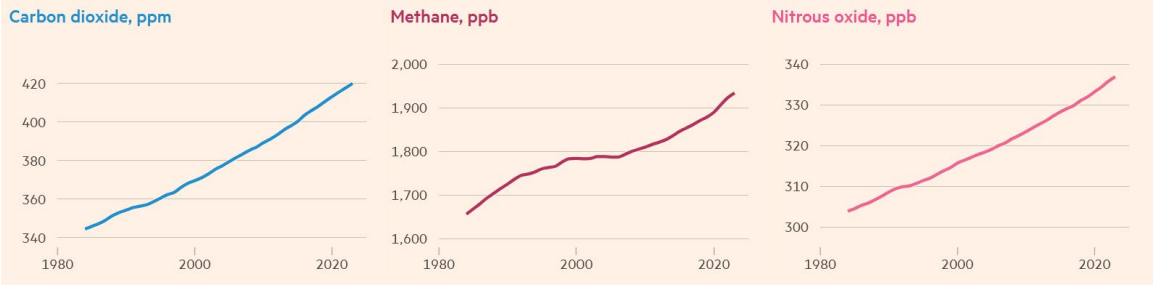
Source: Schug et al (2023)

In March 2025, the UN World Meteorological Organization reported that the concentration of carbon dioxide in the atmosphere was at its highest level in 800,000 years – see Figure 3.[35]

[34] Franz Schug, Avi Bar-Massada, Amanda R. Carlson, Heather Cox, Todd J. Hawbaker, David Helmers, Patrick Hostert, Dominik Kaim, Neda K. Kasraee, Sebastián Martinuzzi, Miranda H. Mockrin, Kira A. Pfoch and Volker C. Radeloff (2023) 'The Global Wildland–Urban Interface', *Nature,* 621: 94–99 ; https://doi.org/10.1038/s41586-023-06320-0

[35] https://www.ft.com/content/36916c9f-377b-4a3a-91d2-62d111faacc8

Figure 3: Atmospheric concentration by greenhouse gas, 1980-2024



Source: WDCGG

The solution: sustainable development

In 2015, the United Nations adopted 17 global Sustainable Development Goals (SDGs), including ending poverty, fighting inequality and addressing climate change.[36,37] According to Schroders' 2020 *Global Investment Survey*, 'increasingly clients are using the Sustainable Development Goals as a common language' and estimated global ESG (environmental, social, and governance) assets under management in excess of $1trn.[38] Investment strategies consistent with SDG include: negative screening (excluding companies based on controversial business practices), socially responsible investing (SRI), thematic (pursuing specific sustainable themes based on a company's operations or sources of revenue) and impact investing (investing in a measurable sustainable outcome in addition to financial returns).[39]

A related issue is pollution and, in 2013, Dutch inventor Boyan Slat founded The Ocean Cleanup with the aim of removing 90% of floating plastic pollution in the oceans by 2040. There are up to 200 million tons of plastic polluting the oceans, being added to at the rate of 10 million tons a year. Cleanup's system consists of a large floating U-shaped barrier three meters deep which is slowly towed by two ships. Once a week, another two ships

[36] The UN-commissioned Brundtland Report (*Our Common Future*, Oxford University Press, October 1987) defined sustainable development as meeting the present needs without compromising the ability of future generations to meet their own needs.
[37] The Global Goals for Sustainable Development: Goal 1: No Poverty; Goal 2: Zero Hunger; Goal 3: Good Health and Wellbeing; Goal 4: Quality Education; Goal 5: Gender Equality; Goal 6: Clean Water and Sanitation; Goal 7: Affordable and Clean Energy; Goal 8: Decent Work and Economic Growth; Goal 9: Industry, Innovation and Infrastructure; Goal 10: Reduced Inequality; Goal 11: Sustainable Cities and Communities; Goal 12: Responsible Consumption and Production; Goal 13: Climate Action; Goal 14: Life Below Water; Goal 15: Life on Land; Goal 16: Peace and Justice Strong Institutions; Goal 17: Partnerships to achieve the Goal; https://www.globalgoals.org.
[38] The power of measurement: Schroders approach to sustainability, *funds-europe*, November 2020.
[39] Five reasons to choose indexing for sustainable, *portfolio institutional*, November 2020.

collect the plastic which is separated into different recycling streams, packaged, and sent to recycling facilities onshore.[40]

The UK's response

The UK was the first major country to publish a Green Finance Strategy in 2019.[41] It agreed to fund a new Green Finance Institute[42] with the City of London 'to foster greater cooperation between the public and private sectors, create new opportunities for investors, and strengthen the UK's reputation as a global hub for green finance' and a new Centre for Greening Finance and Investment (CGFI) 'to advise lenders, investors and insurers [in order to] enable them to make environmentally sustainable decisions, and support a greener global economy'.[43] In September 2021, the UK government issued its first 'green gilt' to investors in order to finance projects with clearly defined environmental benefits, thereby helping the UK achieve net-zero carbon emissions by 2050. The bond satisfies the International Capital Market Association (ICMA) Green Bond Principles,[44] a voluntary framework for issuers to follow and which promotes transparency and disclosure to reduce the risk of 'greenwashing' (where investors are misled about how sustainable an investment is).

The UK government set out 6 categories of expenditure or investment that will be financed by these gilts. Each category is also mapped to appropriate UN Sustainable SDGs:

1. Clean transportation, e.g., zero-emission buses (consistent with the SDG: sustainable cities and communities)
2. Renewable energy, e.g., wind, solar and hydrogen (affordable and clean energy)
3. Energy efficiency, e.g., support schemes for energy efficiency programs for the public, commercial, industrial and residential sectors (including heating, retrofit and insulation) and research and development for new energy efficiency technologies (affordable and clean energy, industry, innovation and infrastructure)
4. Pollution prevention and control, e.g., reduction of air emissions and greenhouse gas control (responsible consumption and production)
5. Living and natural resources, e.g., protection and enhancement of terrestrial and marine biodiversity, ecosystems and natural capital;[45] sustainable land use and protection, including environmentally sustainable agriculture; environmentally

[40] https://theoceancleanup.com/; https://news.climate.columbia.edu/2022/10/13/how-do-we-clean-up-all-that-ocean-plastic/ https://news.climate.columbia.edu/2022/10/13/how-do-we-clean-up-all-that-ocean-plastic/

[41] https://assets.publishing.service.gov.uk/media/643583fb877741001368d815/mobilising-green-investment-2023-green-finance-strategy.pdf

[42] https://www.greenfinanceinstitute.com/

[43] https://www.ukri.org/news/10m-research-centre-to-spur-a-greener-global-financial-system/

[44] https://www.icmagroup.org/sustainable-finance/the-principles-guidelines-and-handbooks/green-bond-principles-gbp/

[45] Discussed in more detail below.

sustainable clean water, water storage and wastewater management initiatives (zero hunger, clean water and sanitation, life below water, and life on land)[46]

6. Climate change adaptation, e.g., flood protection, resilience and other risk mitigation programs (climate action).

In March 2023, the UK government published its 2023 Green Finance Strategy, *Mobilising Green Investment*,[47] aimed at strengthening the rapidly growing global green finance market, while encouraging private investment to deliver its energy security, net-zero and environmental objectives.[48] One example is direct air carbon capture and storage (DACCS) systems which strip CO_2 from the atmosphere and pumps it into disused oil and gas reservoirs under the North Sea which have a total capacity of 78 billion tonnes. In order to meet the UK's net zero commitment, these systems would need to collect 38-48 million tonnes of CO_2 annually by 2050. The total cost is estimated at £30bn; the high cost is due to the low concentration of CO_2 in the atmosphere, around 426 parts per million, or 0.0426%. The UK is currently responsible for about 800 million tonnes of CO_2 annually, half from domestic production and half from imported goods. Globally, around 37bn tonnes of CO_2 is produced annually, mainly from using fossil fuels such as coal, gas and oil. Around 40% is absorbed by the sea, while the rest remains in the atmosphere.[49] In April 2024, JPMorgan released a global energy strategy report which recommended that the short-term focus of the pathway to clean energy should be on the coal to natural gas switch, which could save up to 17% of global emissions compared to a 2022 baseline. Coal made up 44% of global fuel emissions while providing 33% of global fossil fuel energy in 2022.[50]

The European Union's response

In December 2019, the EU introduced the European Green Deal[51] with the aim of greening both the real economy, especially in agriculture, industry and transport, and its financing through the use of sustainable finance. One of key features of the deal is the Sustainable

[46] Bonds that invest in activities relating to SDG 6 (Clean Water and Sanitation) and SDG 14 (Life Below Water) are known as 'blue bonds'. The market in blue bonds is currently small, with only 26 blue bonds issued between 2018 and 2024 worldwide; https://professionals.fidelity.co.uk/articles/expert-opinions/2024-04-05-blue-bonds-whats-all-comm-ocean-1712297104759; https://www.investmentweek.co.uk/news/4321170/fidelitys-atkinson-blue-bonds-growing-popularity-challenges-remain

[47] This is the first update since 2019; https://www.gov.uk/government/publications/green-finance-strategy

[48] *XPS Investment Briefing*, September 2021. In September 2021, the European Commission introduced a 'gold standard' for EU 'green bonds' where the proceeds are spent on environmentally friendly activities. The standard came into force in December 2023. European green bonds are aligned with the 'European taxonomy' which specifies the types of green projects that can be funded, making it more difficult for companies to engage in greenwashing; https://www.ipe.com/news/eu-green-bond-standard-rules-to-enter-into-force-after-council-ok/10069660.article.

[49] https://www.telegraph.co.uk/business/2024/04/28/britain-30bn-strip-co2-atmosphere-hit-net-zero

[50] https://www.esgdive.com/news/jpmorgan-warns-clean-energy-transition-could-take-decades-or-generations/714180/

[51] https://www.consilium.europa.eu/en/policies/green-deal/

Finance Action Plan which aims to achieve net zero by 2050.[52] Another is the Sustainable Finance Disclosures Regulation (SFDR) which requires asset managers to publish disclosure statements about which of their products fall into three distinct categories:

- Article 9 funds: those funds that specifically have sustainable goals as their objective, e.g., investing in companies whose goal is to reduce carbon emissions (known as 'dark green' funds).
- Article 8 funds: those funds that promote E or S characteristics, but do not have them as the overarching objective (known as 'light green' funds).
- Article 6 funds: funds that are not promoted as having ESG factors or objectives (known as 'non-ESG' funds).

A survey by Morningstar (*SFDR – The First 20 Days*) found that Article 8 and 9 funds accounted for around 21% of total European funds and 25% of total European fund assets.[53]

The main ESG asset classes – which according to S&P Global account for 5% of the total global market – are sustainable investment funds ($500bn) and 'green'[54] or 'social'[55] bonds ($500bn). Many of these bonds are issued by inter-governmental organizations (e.g., the EU's SURE[56] bonds) or local authorities with high credit ratings and they offer higher yields than conventional sovereign bonds. The bonds are used for socio-economic enhancement (30%), housing (21%), education (20%), essential infrastructure (13%) and healthcare (11%).[57] Europe is the leading region for issuing ESG bonds, with 20% of all European bonds now green, social and/or sustainable. In 2023, 3,184 green social sustainable (GSS) bonds, valued at $930bn, were brought to market.[58]

[52] https://www.pensionpolicyinternational.com/how-sustainability-disclosures-and-regulations-benefit-investors/

[53] https://esgclarity.com/sfdr-which-groups-have-the-most-article-8-9-funds/

[54] Green bonds (also known as climate bonds or sustainable bonds) are designated fixed-income bonds intended to encourage sustainability and to support climate-related or other types of special environmental projects. More specifically, they finance projects aimed at energy efficiency, pollution prevention, sustainable agriculture, fishery and forestry, the protection of aquatic and terrestrial ecosystems, clean transportation, clean water, and sustainable water management. They also finance the cultivation of environmentally friendly technologies and the mitigation of climate change; https://www.investopedia.com/terms/g/green-bond.asp

[55] Social bonds are used to fund projects with positive social outcomes, such as economic development by financing small businesses, affordable housing and transportation, promoting access to education and healthcare in low-income areas, and food supply protection. Traditionally, they have been issued by supranationals and governments. But corporate social bonds are also now being issued by companies wishing to demonstrate their corporate social responsibility to their employees, customers and local communities; https://inews.co.uk/inews-lifestyle/money/ethical-money/social-bonds-what-how-work-available-who-invest-explained-1012606

[56] Support to mitigate Unemployment Risks in an Emergency (SURE); https://commission.europa.eu/strategy-and-policy/eu-budget/eu-borrower-investor-relations/sure_en

[57] ESG News, *portfolio institutional*, November 2020 (p26).

[58] https://www.investmentweek.co.uk/news/4172932/green-social-sustainable-bonds-hit-record-issuance-2023

Another key feature is the EU's Corporate Sustainability Reporting Directive (CSRD) which requires companies to include sustainability-related information in their annual reports from 2026[59] that must meet European Sustainability Reporting Standards (ESRS). This will generate considerable amounts of standardised sustainability data in future years, with digital tagging and online repositories aiming to make the data more usable and discoverable. Maurits Heldring, senior adviser for responsible investment at PGGM, said: 'We're looking forward to this data, not just for compliance reasons but also because we are starting what we call 3D investing, covering risk, return and sustainability, and to be able to steer on the third element we need good and consistent data'.[60] Investment funds are also required to make disclosures under SFDR which will allow investors to compare investment funds and their sustainability performance. An additional key feature is the European Taxonomy Regulation which requires companies to report on the percentage of their economic activities that are environmentally sustainable.[61] On 31 July 2023, the European Commission released an initial batch of 12 European Sustainability Reporting Standards (ESRSs) developed by the European Financial Reporting Advisory Group (EFRAG). The EU has adopted a double 'materiality approach', implying companies must consider both the impact of a sustainability topic, such as climate, on their activities and the impact of their activities on that topic.[62] In April 2024, the EU Corporate Sustainability Due Diligence Directive (CS3D) came into effect, requiring firms to undertake environmental and social due diligence on businesses within their value chains, and to mitigate any harms they identify during that process; they also have to develop and implement climate transition plans.[63]

In December 2023, the European Securities and Markets Authority (ESMA), the EU financial regulator, issued guidelines for funds claiming to contribute to sustainability objectives, including the climate transition. Funds with 'ESG'-related names should allocate at least 80% of their assets in line with their stated strategy, consistent with sustainable investments definitions in Article 2(17) SFDR, and reflecting the expectation investors may have based on the fund's name. The funds must also abide by exclusions developed for Paris-aligned Benchmarks (PABs), screening out companies involved in controversial weapons and tobacco, as well as those deemed to have breached the UN Global Compact or the OECD Guidelines for Multinational Enterprises. In particular, PABs ban investments in companies that generate more than 1% of revenues from coal and lignite, 10% from oil, or 50% from gas, and in companies that generate more than 50% of their revenues from carbon-intensive electricity. At the same time, ESMA has made allowance for funds marketed as contributing to the climate transition, as well as those

[59] https://www.ipe.com/news/eu-parliament-writes-two-year-delay-into-esg-reporting-rules/10071260.article
[60] https://www.ipe.com/special-reports/investors-await-influx-of-standardised-corporate-sustainability-data/10076570.article
[61] https://www.sustainable-investment.com/opinion/4077463/european-green-deals-framework
[62] https://www.ipe.com/news/eu-sustainability-board-under-pressure-to-finalise-materiality-guidance/10068505.article
[63] https://www.ipe.com/news/corporate-sustainability-due-diligence-directive-final-text-gets-green-light/10072891.article

pursuing social or governance-related objectives. For funds with 'transition'-related names, there is a new category with exclusions based on the EU's Climate Transition Benchmarks, which are less strict than PABs, and allow investments in fossil fuels. ESMA requires such funds, as well as funds with 'impact'-related names, to demonstrate that their investments 'are made with the intention to generate positive, measurable social or environmental impact alongside a financial return or are on a clear and measurable path to social or environmental transition'.[64]

Dai et al. (2023) found that, using a broad sample of international investment funds, the introduction of SFDR was followed by a significant decarbonization (around 10%) of investment portfolios of EU-marketed funds claiming to invest based on sustainability criteria. The lower level of emissions was mainly due to changes in funds' investment decisions, but a substantial part of the effect (roughly one third) was due to changes in firm-level emissions. Overall, the findings suggest that regulating investor disclosure induces asset managers to decarbonize their portfolios not only by shifting capital flows away from high-emission firms, but also by increasing pressure on portfolio firms to achieve emissions reductions at the firm level.[65]

In February 2024, ESMA warned that investment funds claiming to support the 17 UN Sustainable Development Goals could be mis-selling in the form of greenwashing or impact-washing.[66] It examined 187 funds, with total assets under management of €74bn, which claimed – via their names, investment strategies or Key Information Documents – to contribute to the goals. It then compared the assets against a number of benchmarks, including an SDG Index developed by the UN. It found that, regardless of the different frameworks used for measurement, the 187 funds do not, on average, hold significantly more SDG-aligned issuers. ESMA said 'This raises questions as to whether funds claiming to contribute to the SDGs are actually fulfilling their promise to investors… and that further monitoring was necessary'.[67] In the same month, the EU announced that ESG rating providers would be authorized and supervised by the ESMA. They would be required to adhere to transparency requirements regarding methodologies and information sources. The new rules also require the detailed disclosure of ESG rating methodologies by financial advisers using ESG ratings in marketing.[68] Also in February, a survey conducted by MainStreet Partners, a subsidiary of AllFunds, found that 24% of Article 8 funds carried a risk of greenwashing.[69] In July 2024, ESMA published Guidelines on Enforcement of

[64] https://www.ipe.com/news/eu-watchdog-spells-out-rules-for-transition-labelled-funds/10070714.article
[65] Jiyuan Dai, Gaizka Ormazabal, Fernando Penalva, and Robert A. Raney (2023) 'Imposing Disclosure on Investors that Choose to Promote Sustainability: Does it Lead to Portfolio Decarbonization?', European Corporate Governance Institute: Finance Working Paper 945/2023 and IESE Business School Working Paper No. 4564890; https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4564890
[66] Impact-washing occurs where bonds are labelled as 'impact', but there is little evidence that the issuer uses the proceeds for any demonstratable impact; https://www.funds-europe.com/impact-washing-is-a-reality-amid-growing-issuance-study-finds/
[67] https://www.ipe.com/news/esma-study-finds-sdg-labelled-investment-funds-risk-impact-washing/10071466.article
[68] https://www.funds-europe.com/eu-legislators-reach-consensus-on-overseeing-esg-ratings-providers
[69] https://www.funds-europe.com/quarter-of-article-8-funds-at-risk-of-greenwashing

Sustainability Information (GLESI) which lists its guidelines for promoting convergent and consistent supervision and enforcement by national competent authorities of sustainability information.[70]

In February 2024, the EU introduced the world's first carbon removal certification scheme. This allows the trading of carbon removal units (equal to one tonne of CO_2 removed from the atmosphere). Four types of carbon removal will be permitted:

- Permanent carbon removals, such as direct air capture and storage and bioenergy with carbon capture and storage (CCS), which can store CO_2 for several centuries.
- Temporary carbon storage in long-lasting products such as wood-based construction, for at least 35 years.
- Temporary carbon storage from carbon farming, such as restoring forests and soil, wetland management, seagrass meadows (minimum five years).
- Soil emission reduction obtained from carbon farming, such as wetland management, no tilling and cover crop practises (minimum five years). [71]

In September 2025, the new Chairman of the Securities and Exchange Commission, Paul Atkins, criticized two EU laws on companies' disclosures of their ESG impacts: the Corporate Sustainability Due Diligence Directive (which requires larger companies to verify whether their supply chains do not use forced labor or cause environmental damage) and the Corporate Sustainability Reporting Directive (which requires companies to disclose information about their ESG impacts to investors and consumers), despite the fact that the EU has watered them down in response to criticisms from some EU members. He said: 'I have significant concerns with the prescriptive nature of these laws and their burdens on US companies, the costs of which are potentially passed on to American investors and customers', adding that the EU should focus on cutting firms' reporting obligations 'rather than pursuing ends that are unrelated to the economic success of companies'. These views reflect the change in US attitudes to financial regulation since President Donald Trump came to office.[72]

In November 2025, the EU proposed amendments to the Sustainable Finance Disclosure Regulation relating to disclosure reporting and product categories. For the former, the EU proposed to simplify disclosures and delete entity-level requirements for the vast majority of financial market participants in order to remove 'overlaps' with the Corporate Sustainability Reporting Directive. Only the largest market participants would need to disclose their impact on the environment and society. In terms of product categories, the EU acknowledged that the SFDR classification (i.e., Article 6, 8 and 9) had 'effectively been used as a de facto labelling system', which has caused confusion, especially for retail

[70] https://www.esma.europa.eu/sites/default/files/2024-07/ESMA32-992851010-1600_Final_Report_on_Guidelines_on_Enforcement_of_Sustainability_Information_GLESI.pdf
[71] https://www.euractiv.com/section/climate-environment/news/eu-reaches-deal-on-worlds-first-carbon-removal-certification-scheme/
[72] https://www.reuters.com/sustainability/boards-policy-regulation/wall-street-regulator-says-it-has-concerns-over-european-esg-rules-2025-09-10/

investors, and increased the risk of greenwashing and mis-selling. In place, the EU will introduce three sustainability categories (requiring a minimum of 70% of the portfolio meeting the category criteria): Sustainable (for investments in companies or projects that 'are already meeting high sustainability standards'), Transition (for investments in companies or projects that are not yet sustainable but are on a 'credible transition path' or that contribute towards improvements in sustainability) and ESG basic (for products that integrate a variety of ESG approaches but that do not meet the criteria of the other two categories).[73] In the same month, Morningstar reported that asset managers had stopped launching 'dark green' funds in Europe due to greenwashing fears. According to data from Morningstar, just four Article 9 funds were launched during the third quarter of 2025 — the lowest number rolled out over a three month period since the sustainable investment boom in 2021.

In January 2026, the Joint Committee of the European Supervisory Authorities (ESAs) issued their Final Report on Joint Guidelines to ensure that consistency, long-term considerations and common standards for assessment methodologies are integrated into the stress testing of environmental, social and governance (ESG) risks. The Joint Guidelines have two main objectives which are to: improve the legal certainty, clarity and transparency of the supervisory approval process with regard to the integration of ESG risks into National Competent Authorities (NCAs) stress testing frameworks and scenario analysis frameworks; and ensure consistency, long-term considerations and common standards for assessment methodologies throughout the EU and across sectors.[74]

COP26 – November 2021

In November 2021, COP26, the 26th United Nations Climate Change Conference, took place in Glasgow, Scotland.[75] The outcome was the Glasgow Climate Pact which:

- Reaffirmed the 2015 Paris Agreement to limit global warming to below 2°C, preferably to 1.5°C, compared with pre-industrial levels and to achieve a climate-neutral ('net-zero') world by 2050.[76] However, it went further and expressed 'alarm and utmost concern that human activities have caused around 1.1°C of warming to date, that impacts are already being felt in every region, and that carbon budgets consistent with achieving the Paris Agreement temperature goal are now small and being rapidly depleted'.

[73] https://www.investmentweek.co.uk/news/4522151/eu-unveils-sfdr-review-trio-sustainability-categories-reporting-reductions
[74] https://www.eba.europa.eu/sites/default/files/2026-01/60ba0389-2d7a-46b7-96e8-9072c481d8ce/EIOPA-BoS-25-602%20-%20ESAs%20Final%20Report%20-%20Joint%20Guidelines%20on%20ESG%20Stress%20Testing.pdf;
https://www.regulationtomorrow.com/france/esas-joint-guidelines-to-ensure-that-consistency-long-term-considerations-and-common-standards-for-assessment-methodologies-are-integrated-into-the-stress-testing-of-esg-risks/
[75] https://www.un.org/en/climatechange/cop26
[76] https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement

- Seeks accelerated action to reduce carbon dioxide emissions by 45% in the 2020s**,** with countries producing stronger national action plans by 2022.
- Agreed to a provision calling for a phase-down of coal power and a phase-out of fossil fuel subsidies.
- Reaffirmed the pledge by developed countries to deliver $100bn a year for developing countries.
- Called for a doubling of finance to support developing countries in adapting to the impacts of climate change and building resilience.
- Agreed to complete the Paris rulebook, the operational details for the practical implementation of the Paris Agreement. An example is the norms relating to carbon markets, which will allow countries struggling to meet their emissions targets to purchase emissions reductions from other nations that have already exceeded their targets.
- Agreed to strengthen the Santiago Network that connects vulnerable countries with providers of technical assistance, knowledge and resources to address climate risks.
- Agreed new deals on:
    - Halting and reversing forest loss and land degradation by 2030.
    - Limiting methane emissions – one of the most potent greenhouse gases and responsible for a third of current warming from human activities – by 30% by 2030, compared with 2020 levels.
    - Restricting all new car and van sales to be zero-emission vehicles by 2040 globally and 2035 in leading markets, thereby accelerating the decarbonization of road transport, which currently accounts for about 12% of global greenhouse gas emissions.
    - Private financial institutions and central banks realigning $130trn towards achieving global net zero emissions, via the Glasgow Financial Alliance for Net Zero (GFANZ).

GFANZ was established in April 2021 by UN Special Envoy on Climate Action and Finance Mark Carney and the COP26 presidency to accelerate the transition to a net-zero global economy, bringing together CEOs and leaders from the financial services sector.[77] It supports the UN's Race to Zero campaign and has become an umbrella organisation of eight sub-groups, including the Net Zero Asset Owner Alliance, the Net Zero Asset Managers Initiative, and the Net-Zero Banking Alliance.

[77] https://www.gfanzero.com/

The International Financial Reporting Standards (IFRS) Foundation announced the formation of the International Sustainability Standards Board (ISSB) at COP26.[78,79] It was set up to counter the problem that ESG disclosure was being hindered by differing sets of rules, leading to confusion amongst investors and companies, and hence inaction. It has four key objectives:

- To develop standards for a global baseline of sustainability disclosures.
- To meet the information needs of investors.
- To enable companies to provide comprehensive sustainability information to global capital markets.
- To facilitate interoperability with disclosures that are jurisdiction-specific and/or aimed at broader stakeholder groups.

In June 2023, the ISSB published two global corporate sustainability reporting standards: International Financial Reporting Standard S1, the General Requirements for Disclosure of Sustainability-related Financial Information; and IFRS S2, Climate-related Disclosures.[80] The latter requires greenhouse gas (GHG) emissions to be measured in accordance with the GHG Protocol Corporate Standard (2004), for example.[81]

Figure 4 shows the sectoral breakdown of global greenhouse gases in 2016.

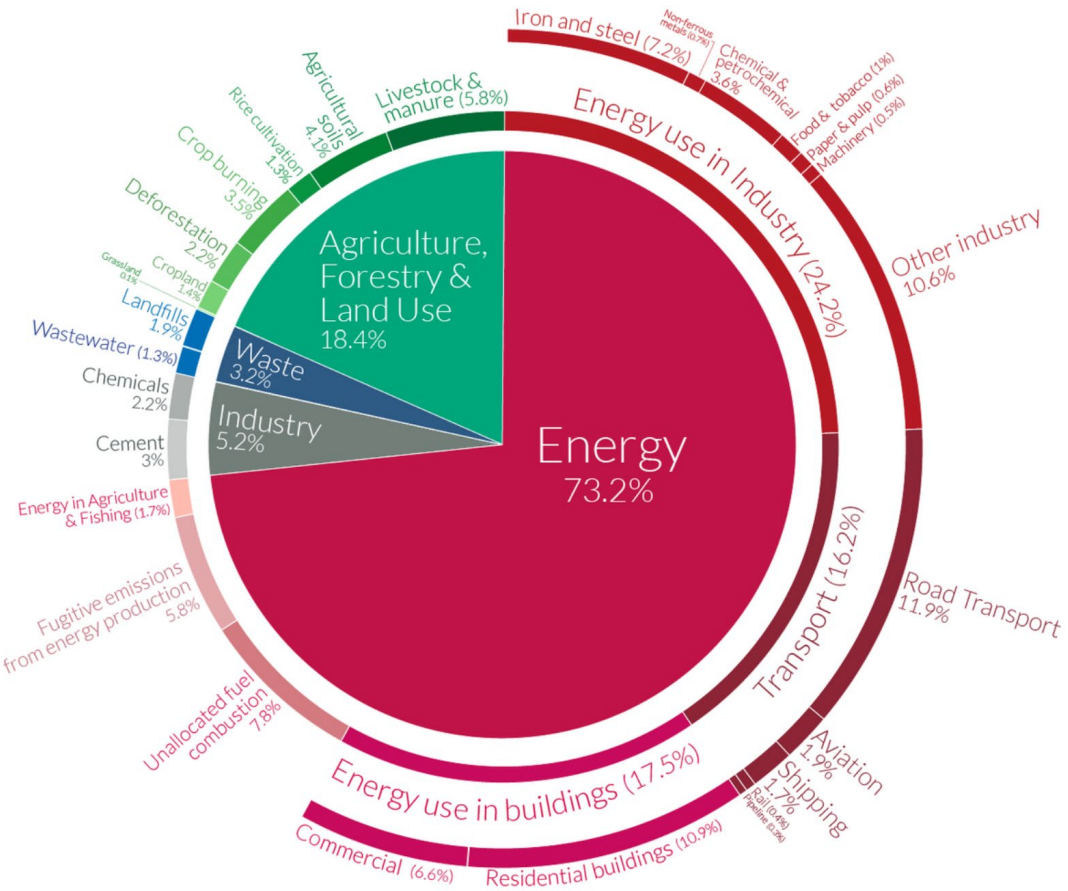
[78] The ISSB focuses on investors and the financial markets. The standards published by the ISSB currently only include climate and sustainability, but the board is considering expanding the disclosures to include human capital and rights; https://www.ifrs.org/groups/international-sustainability-standards-board/; https://www.ifrs.org/groups/international-sustainability-standards-board

[79] In 2022, the ISSB took over responsibility for the SASB (Sustainability Accounting Standards Board) Standards for companies reporting on sustainability; https://sasb.ifrs.org/standards/

[80] FRS S1 requires disclosure of all material information about sustainability-related risks and opportunities that could reasonably be expected to affect the entity's prospects (i.e., cash flows, access to finance, or cost of capital) over the short, medium, or long term and is centred around the familiar pillars of: governance; strategy; risk management; and metrics and targets. Value chain coverage is required as well as industry specific disclosures. IFRS S2 is climate specific: it builds on the information required by IFRS S1 and requires additional climate-related disclosures, including GHG emissions data, scenario analysis, transition plan information and certain industry based metrics.

[81] https://www.ipe.com/issb-releases-robust-inaugural-sustainability-reporting-standards/10067384.article

Figure 4: Global greenhouse gas emissions by sector, 2016



Sources: OurWorldinData.org, Climate Watch, World Resources Institute (2020), https://www.visualcapitalist.com/a-global-breakdown-of-greenhouse-gas-emissions-by-sector/

Transition planning

In April 2022, the Transition Plan Taskforce (TPT) was launched by the UK Treasury to develop the 'gold standard for private sector climate transition plans'. The TPT Framework applies three guiding principles: ambition, action (involving implementation and engagement strategies) and accountability (covering metrics, targets and governance). TPT has engaged globally with financial institutions, real economy corporates, policymakers, regulators and civil society to develop its materials. In April 2024, TPT published finalised guidance to help asset owners develop credible climate transition plans. It also published guidance on how entities should approach climate adaptation, nature and the 'just transition' in their climate plans.[82] TPT said: 'The primary responsibility of asset owners is to secure the financial futures…of their beneficiaries in line with their fiduciary

[82] A just transition would involve fairness and equity in the transition to a net zero sustainable economy; https://impact-investor.com/special-report-pension-funds-grapple-with-the-just-transition

duty (where applicable), contractual obligations and duties imposed by financial regulators. …In order to do this, an asset owner should explain how it integrates climate into its investment decisions, manager selection and contracts, and engagement activities. …Taking a strategic and rounded approach helps asset owners consider a wide range of decarbonization levers available to them and, where possible, avoid a strategy of "paper decarbonization", which is characterized by actions that decarbonize an entity's portfolio in ways that may not necessarily contribute to the actual decarbonization of the economy'.[83] In June 2024, the IFRS Foundation took over responsibility for transition plan disclosure resources developed by TPT, marking 'an important milestone in the creation of global norms for transition plan disclosure'. The TPT's remaining role was to support the UK's Transition Finance Market Review.[84]

Transition finance has been defined as 'investments meant to decarbonize high-emitting and hard-to-abate industries such as steel, aviation and shipping. This capital is also aimed at addressing potential social impacts associated with decarbonization, including unemployment and loss of tax revenue for local governments'.[85] Frédéric Ducoulombier, Research Programme Director at the EDHEC Climate Institute shows that transition finance is one of the three types of investments needed for achieving net-zero:[86]

- Climate solutions: Investments in activities central to a net-zero economy, including low-emissions energy, clean transportation, energy efficiency and waste management.
- Transition investments: Support for decarbonizing high-emission sectors lacking low-emission substitutes, such as adopting low-carbon processes, retrofitting industrial facilities in hard-to-abate sectors….or decommissioning unsustainable fossil fuel power plants and other carbon-intensive facilities.
- Carbon sinks: Investments to offset unavoidable emissions through nature-based or technological solutions, such as restoring ecosystems, enhancing soil and ocean carbon absorption, and advancing carbon capture technologies.

In October 2024, the UK government launched the British Infrastructure Taskforce (BIT) 'as part of a new approach that involves government working with business to design policy that will unlock private investment, including by building business confidence in UK infrastructure investments'.[87] BIT will offer insights that deliver long-term solutions

[83] https://transitiontaskforce.net; https://transitiontaskforce.net/wp-content/uploads/2023/10/TPT_Disclosure-framework-2023.pdf; https://www.ipe.com/latest/uk-launches-climate-transition-plan-guidance-for-asset-owners/10072621.article
[84] https://www.ipe.com/news/ifrs-foundation-takes-over-tpts-transition-plan-disclosure-resources/10074144.article
[85] https://trellis.net/article/what-transition-finance-and-why-it-matters/
[86] https://climateimpact.edhec.edu/charting-pathway-transition-finance-lessons-eu-framework
[87] https://www.gov.uk/government/news/government-launches-british-infrastructure-taskforce

for job creation, growth, and environmental goals. Members of BIT include PIC, Phoenix Group, M&G, Blackrock, abrdn, the National Wealth Fund (NWF), and IFM Investors.[88]

IFM Investors has helped to accelerate pension fund investment in Australia's energy transition and wants to do the same in the UK via BIT. It has put forward a number of recommendations that will help enable the right policy settings to drive investment. A key recommendation is resolving the backlog in grid connection requests from renewable power providers, particularly from remote sites as more renewables come online; it is now holding back clean energy development and wider economic growth. Nadeem Hussain, Co-CIO at the £30bn local authority pool LGPS Central, said he would be willing to invest in renewable power providers and data centres, but 'Investors must often bid for grid connectivity years in advance of building the wind or solar development. We ask our managers to ensure the grid connection is secure before we invest because the last thing you want is to cancel a project because there is no grid connectivity. We are [also] open to investing more in data centres but the rapid growth in the sector means many are now securing whatever energy source they can which might not be renewable. We think this is a short-term solution'. Another recommendation is faster planning approvals 'which are essential to nurturing clearer project pipelines and making UK infrastructure more competitive on the global stage', according to Jonathan Ord, head of investments, GLIL Infrastructure. Another recommendation is regulatory certainty. Hussain says 'Infrastructure investors don't want to see a regulatory change that materially impacts the economics of a project during their ownership'. A further recommendation relates to risky investment in large capex projects and early-stage investment in new construction. Luba Nikulina, chief strategy officer at IFM, says: 'Investors require mid-to-long-term power purchase agreements and/or extension of Contracts for Difference terms beyond 15 years to reflect longer project lives. The sharper risks in the next phase of the energy transition in carbon capture, low carbon fuels and floating offshore wind will also require much greater revenue certainty mechanisms. First-of-a-kind projects carry a unique combination of risks, including permitting sites for new technologies, technology maturity and scale, construction and supply chain risks, revenue uncertainty and risks associated with changes to policy and regulation'.

Nikulina hopes to use her seat on BIT to persuade the government to adopt these recommendations: 'successful engagement rests on understanding the government's priorities and finding common ground to crystalise mutual benefits. Open lines of communication and a preparedness for the long haul are key, as well as an understanding that policy makers can't solve risks like inflation and supply chain constraints. I believe

[88] IFM Investors is a Melbourne-based investment manager which invests on behalf of institutions worldwide, including pension, superannuation and sovereign wealth funds, universities, insurers, endowment funds and foundations; https://www.ifminvestors.com/en-gb/about-us/

we can achieve the best outcomes when we work together and signalling our investment objectives can drive policy change'.[89]

In January 2022, the McKinsey Global Institute published a report called *The net-zero transition: What it would cost, what it could bring*.[90] It estimated that capital spending on physical assets for energy and land-use systems in the net-zero transition between 2021 and 2050 would amount to about $275trn or $9.2trn per year. The required spending would be front-loaded, rising from 6.8% of GDP in 2021 to as much as 8.8% of GDP between 2026 and 2030 before falling. The report points out that 'While these spending requirements are large and financing has yet to be established, many investments have positive return profiles (even independent of their role in avoiding rising physical risks) and should not be seen as merely costs. Technological innovation could reduce capital costs for net-zero technologies faster than expected'.

Pension scheme responses

The UK

Pension schemes

While climate change has been in the news for around 30 years, only in the last few years has it begun to impact the pensions industry. For example, UK listed companies and asset managers, such as pension funds, were required to report on climate change risk by 2022, in line with recommendations made by the Financial Stability Board's Taskforce on Climate-related Financial Disclosures (TCFD).[91] The UK Pensions Regulator and

[89] https://www.top1000funds.com/2025/01/meet-the-investors-trying-to-de-risk-uk-transition-infrastructure/

[90] https://www.mckinsey.com/capabilities/sustainability/our-insights/the-net-zero-transition-what-it-would-cost-what-it-could-bring

[91] The corporate disclosure recommendations are based on a framework of:

- Governance: the organization's governance around climate-related risks and opportunities.
- Strategy: the actual and potential impacts of climate-related risks and opportunities on the organization's businesses, strategy and financial planning.
- Risk management: the processes used by the organization to identify, assess and manage climate-related risks.
- Metrics and targets: which metrics and targets are used to assess and manage relevant climate-related risks and opportunities.

Pension scheme trustees face similar obligations:

- Governance
    - Trustees must establish and maintain oversight of the climate-related risks and opportunities relevant to the scheme.
    - Trustees must establish and maintain processes to satisfy themselves that any person responsible for the scheme's governance activities takes adequate steps to identify, assess and manage climate-related risks and opportunities.

Department for Work and Pensions have established the Pensions Climate Risk Industry Group (PCRIG) to produce guidance for pension schemes on 'climate-related practices', to ensure they are effectively governed in respect of the effects of climate change. Further, asset managers and other financial services firms are required to report publicly on how they manage climate risks.

Speaking at COP26, Thérèse Coffey, the UK secretary of state for work and pensions, said that 'pensions can be a superpower that delivers prosperity for people and the planet in our

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- Strategy
    - Trustees must, on an ongoing basis, identify climate-related risks and opportunities which they consider will have an effect over the short-, medium- and long-term on the scheme's investment and funding strategy.
    - Assess the impact of the above risks and opportunities.
    - As far as they are able, trustees must undertake scenario analysis, considering the impact on assets and liabilities of two scenarios under which global temperatures rise.
    - One scenario to be consistent with 1.5-2 degrees warming.
    - Analysis is to be carried out in the first year in which the regulations apply, and then every three years thereafter.
- Risk management
    - Trustees must establish and maintain processes for the purpose of enabling them to identify, assess and effectively manage climate-related risks.
- Metrics and targets
    - Trustees must select a minimum of three metrics, two of which are prescribed; one giving total greenhouse gas emissions of the scheme's assets ('absolute emissions metric'), and one giving total carbon dioxide emissions per pound of assets invested ('emissions intensity metric').
    - As far as they are able, trustees must obtain Scope 1, Scope 2 and Scope 3* greenhouse gas emissions data for the scheme's assets, to calculate their metrics and to identify and assess climate related risks and opportunities. (In the first scheme year in which the requirements apply, trustees are not required to collect and report on scope 3 emissions).
    - Trustees must set a target for at least one of the metrics, and subsequently measure performance relative to that target on an annual basis.

*Scope 1: all direct emissions from the activities of an organization or under its control (e.g., business operations).
Scope 2: indirect emissions created from the production of electricity/energy purchased and used by the organization.
Scope 3: all other indirect emissions from activities of the organization (from sources the organization does not directly control, e.g., supply chain or customer emissions when using a company's product).
Sources: https://www.fsb-tcfd.org/; https://www.willistowerswatson.com/en-GB/Insights/2021/09/reporting-pension-scheme-climate-risks-what-how-when

The World Resources Institute has now introduced Scope 4 emissions to refer to the emission reductions that occur outside of a value chain or the life cycle of a product, sometimes called avoided emissions, e.g., the energy or emissions that have been saved as a result of the new climate or energy-saving technology associated with a product or service. Scope 4 emissions also include homeworking emissions, e.g., the emissions created to keep utilities on, laptops running, and to maintain central air conditioning or heating systems; https://greenly.earth/en-gb/blog/company-guide/what-are-scope-4-emissions.

race to net zero'. Her department launched a consultation on proposals to require occupational pension schemes that already fall within the scope of climate disclosure regulations to publish a 'Paris alignment' metric to show the extent to which their investment portfolio is aligned with the 1.5°C Paris Agreement. The UK government also published *Greening Finance: A Roadmap to Sustainable Investing* which includes a new economy-wide Sustainability Disclosure Requirement (SDR) which would apply to occupational schemes. This aims to tackle greenwashing via the implementation of a Green Taxonomy', which will set out clear criteria for economic activities to meet in order to be considered sustainable. The Pension Schemes Act 2021 introduced new climate reporting obligations on UK schemes, together with annual implementation statements in respect of scheme assets.

The UK Pensions and Lifetime Savings Association (PLSA) which represents pension funds in the UK also supports the TCFD recommendations as well as measures to increase climate reporting and regulatory obligations throughout the investment chain, together with clarifying definitions of climate-aware investment. Related to this is ESG which are the three central factors in measuring the sustainability and societal impact of an investment in a company or business. In the UK, this is implemented via the Stewardship Code. The PLSA wants to work with the investment industry and regulators to develop principles for ESG asset management funds to adhere to on ESG generally, or specifically with regard to climate.[92]

Sustainability reporting (or sustainability disclosure) of non-financial performance data relating to ESG was first developed by the Global Reporting Initiative (GRI) in 2000. The Global Sustainability Standards Board (GSSB), set up in 2016, is responsible for setting globally accepted standards for sustainability reporting. The GSSB operates to oversee the development of the GRI Standards 'according to a formally defined due process'. The GRI Standards allow third parties to assess the environmental impact from the activities of a company and its supply chain. The Universal Standards for reporting came into effect in January 2023.[93]

In November 2021, the UK Pensions Regulator published a climate adaptation report into the climate risks most relevant to occupational pension schemes which found that too few schemes were giving enough consideration to climate-related risks and opportunities. Only 43% of defined contribution schemes surveyed took account of climate change when devising their investment strategy, while 51% of defined benefit schemes had not spent any time or resources assessing financial risks and opportunities associated with climate change.[94]

[92] Richard Butcher (2020) The PLSA is here to help overcome barriers as industry embraces climate-aware investment, *portfolio institutional*, November.
[93] https://www.globalreporting.org/about-gri/governance/global-sustainability-standards-board/
[94] Further climate change disclosures in the offing as world leaders meet at COP26, *XPS Insights*, November 2021.

In 2022, a pension consultant offered this advice to trustees considering a net-zero target:[95]

- Define your beliefs and priorities
- Set your overall net-zero objective
- Review your current portfolio
- Engage with your investment managers and define a net-zero pathway
- Consider sustainable funds
- Establish ongoing engagement and monitoring.

Charles Counsell, TPR's chief executive, said: 'Climate change is a risk to long-term sustainability [that] pension trustees need to consider when setting and implementing investment strategy, while many schemes are also supported by employers whose financial positions and prospects for growth are dependent on current and future policies and developments in relation to climate change'.[96] In February 2024, the Financial Markets Law Committee, which advises the UK markets on financial law, said pension trustees may consider climate change when making investment decisions, alleviating long-standing concerns that incorporating key ESG factors could be a breach of fiduciary duty – which is to act in the best financial interests of scheme members.[97]

Ashley Hamilton Claxton, head of responsible investment at Royal London Asset Management, argues that 'ESG is here to stay. Covid-19 has accelerated the trend towards greater awareness of sustainability and the interconnectedness between our economy, environment and society'. However, standards differ in different parts of the world. In the EU, for example, ESG is part of the fiduciary duty of fund managers, whereas in the US, the fiduciary duty is purely a financial duty.[98]

In February 2022, the UK Employer Covenant Practitioners Association (ECPA) published a report which argued that climate change is 'progressively impacting' the covenant of a range of employers sponsoring DB schemes, from affecting future cashflows to representing a 'fundamental risk' to scheme longevity. The report said that DB schemes should consider the impacts of climate change through sectoral analysis, including technological evolution, in order to identify 'red flags for their sponsor'. It added that covenant practitioners sit in the middle of the impact on the sponsor and the impact on

[95] Carbon Reduction Pathways: How your pension scheme investments can become Net Zero aligned now, *XPS*, July 2022.
[96] Susanna Rust (2019) UK to explore mandatory climate reporting for pension funds, companies, *IPE*, 2 July; https://www.ipe.com/uk-to-explore-mandatory-climate-reporting-for-pension-funds-companies/10032058.article. Susanna Rust (2020) UK pension trustees presented with guide to climate-related risks, *IPE*, 12 March; https://www.ipe.com/news/uk-pension-trustees-presented-with-guide-to-climate-related-risks/10044243.article
[97] https://www.pensionpolicyinternational.com/u-k-pension-funds-may-consider-climate-change-financial-markets-law-committee/
[98] Romil Patel (2020) Spinning on a sustainable axis, *funds-europe*, November 2020.

other aspects of the scheme such as funding and investment. They will need to work with an increasing number of stakeholders and face a 'steep' regulatory trajectory.[99]

In June 2022, the UK Department for Work and Pensions, in collaboration with the Behavioural Insights Team, Aviva, Smart Pension and Hargreaves Lansdown, launched a 'green nudge' trial, designed to encourage pension scheme members to learn more about making greener pension choices. The trial would test the impact of behavioural nudges and messages on increasing saver engagement with the sustainability of pension investments and how it could translate into greener pension decision-making. Around 160,000 pension scheme members were involved. The DWP said: 'Through the productive long term investment power of pensions, we can help the UK get to net zero and deliver both investment returns and a sustainable planet'.[100] The findings were published in October 2024: general engagement with pensions is low; scheme members were more engaged with the financial performance of their pensions than the environmental performance of the investments and that light-touch communication-based nudges are not a promising avenue to shift pension investments towards more environmentally sustainable funds; and given the low consumer engagement with the sustainability of their pensions, in order to make meaningful progress towards aligning pension investments with environmental sustainability, interventions further upstream would be needed; this will require further research to understand the role of key players including employers, pension providers, trustees and government, in increasing the environmental sustainability of investment funds, with a focus on default arrangements.[101]

In May 2023, UK consultancy LCP introduced a new tool – LCP Beacon – to help pension scheme stakeholders improve their understanding and engagement with sponsor-related climate risks and opportunities to ensure DB pensions are protected. The tool enables trustees to analyze company business plans and forecasts, linking what was promised to a sponsor's stakeholders around net zero and climate risk mitigation goals and the cost of implementation.[102] In March 2024, Aon introduced RI-360i, a tool to help institutional investors understand and manage risks, and build responsible investment portfolios. It can help to identify, understand, and effectively manage sustainability issues, such as climate risk, and their impact on investment portfolios. It can also evaluate alternative managers who may align more closely with the investor's objectives on responsible investment.[103]

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[99] https://www.professionalpensions.com/news/4044614/climate-change-fundamental-risk-scheme-longevity

[100] https://www.pensionpolicyinternational.com/new-uk-trial-seeks-to-nudge-people-into-making-greener-pension-choices/

[101] *Applying Behavioural Insights to Green Pensions*; https://assets.publishing.service.gov.uk/media/66fbf73de84ae1fd8592ec18/Applying-Behavioural-Insights-to-Green-Pensions.pdf

[102] https://www.ipe.com/news/lcp-sets-up-climate-risk-tool-for-pension-scheme-stakeholders/10066769.article

[103] https://www.ipe.com/news/aon-launches-enhanced-responsible-investment-solution/10072350.article

In December 2023, UK consultancy XPS reported that UK pension schemes were still holding assets that were misaligned with the climate transition. It reviewed the Taskforce on Climate-related Financial Disclosures of 35 pension large schemes, with total assets of £344bn. It said that that progress has been made among schemes to manage climate risk, since most schemes had changed their investment mandates to include climate-aware objectives and to finance climate solutions more directly. However, it also said that there was 'room for improvement', since most schemes had focused specifically on carbon emissions reduction, leaving other aspects of climate transition underrepresented. XPS estimates that UK pension schemes' asset holdings have a weighted average of reported Implied Temperature Rise of 2.8°C, whereas the Paris Agreement limits the temperature rise to 1.5°C, explaining XPS's conclusion that UK pension schemes are currently misaligned with the climate transition. The TCFD also requires schemes to stress test the financial impacts of physical risks in a high global warming scenario every three years. The XPS analysis found that 56% of £5bn+ schemes did not conduct the test in 2023 and many that did said that they did not find meaningful conclusions. In the light of these findings, XPS recommends that: scheme trustees undertake ongoing training to understand the latest TCFD developments, speak to their pension consultants on enhancing their climate strategy, assess the transition alignments across their portfolios, and consider increasing range of funds with embedded climate objectives.[104] In February 2024, a study by sustainability research organization Profundo of the top 20 UK DC workplace pension scheme providers, with combined assets of £500bn, found that 85% had 'inadequate' or 'poor' climate plans in place. Further, despite almost all having publicly set net zero targets, not one provider was deemed to be taking a leadership role on climate action. The main failures related to fossil fuels (coal, oil and gas) and deforestation and land use.[105]

In October 2025, the 'Sterling 20' group comprising 20 of the UK's largest pension providers and insurers was formed to collectively invest in sustainable regional economic development, affordable housing, infrastructure and modern high-growth industries, such as AI and fintech. The initiative follows the Mansion House Accord in May 2025 in which workplace pension providers committed to invest at least 5% of default fund assets (c£25bn) in UK private markets by 2030. Legal & General pledged £2bn by 2030 to fund 10,000 affordable homes and create 24,000 jobs nationwide, while NEST, which provides pensions for one third of the UK workforce, will invest £500m through Schroders Capital. In addition, AustralianSuper, Australia's largest pension fund, announced a £500m UK living platform focused on rental housing and planned to invest £8bn in the UK over the next five years.[106]

In December 2025, the Universities Superannuation Scheme (USS) and Transition Risk Exeter issued *The Policy Challenges of the Energy Transition*, which urged asset owners to focus more on collaborating and engaging at a macro level with governments and

[104] https://www.ipe.com/news/uk-schemes-misaligned-with-climate-transition-says-xps-study/10070610.article
[105] https://www.ipe.com/news/majority-of-uk-pension-providers-found-to-have-inadequate-or-poor-climate-plans/10071725.article
[106] https://impact-investor.com/uks-pension-sector-to-drive-sustainable-regional-growth

regulators to help to bring about policy change, rather than spend time on reducing portfolio emissions.[107] The policy document pointed out that, while the easiest way for investors to reduce emissions from their portfolio investments is to sell high-emitting assets to other owners, this does nothing to advance the low carbon transition or reduce the systemic risk of climate change that threatens all investors' long-term returns. Further, emissions are a lagging indicator. By contrast, investment in renewables, such as solar and wind, is a leading indicator of the low carbon transition. The document argued that 'A fundamental mistake is to assume that any effect on the economy must be marginal, involving only small changes within the existing system, rather than recognising that it is system stability that is at stake. …Only decisive action by governments can substantially reduce these risks and accelerate the growth of the clean energy economy'.

In the UK, this requires specific actions, according to the report:

- Early-stage policies should include support for research and development of new technologies, and measures such as targeted subsidies and public procurement to enable their first deployment.
- In the middle stage of a transition, regulations can be even more powerful in driving the reallocation of investment on a large scale. For example, zero emission vehicles (ZEV) mandates have proven outstandingly effective in growing markets for electric vehicles in California, Canada and China. Yet in the UK, demand for electric cars is constrained by inadequate charging infrastructure and expensive upfront and insurance costs.
- In the buildings sector, the 'clean heat market mechanism' is designed to shift investment from gas boilers to heat pumps, supported by heat pump subsidies. However, this effort is undermined by government levies.
- In the late stage of a transition, a deeper restructuring of markets is often needed to make best use of the new technologies. For example, in the UK expensive gas sets the electricity price 98% of the time, despite generating only 40% of the power.

Pension risk transfer providers

SDG/ESG considerations have begun to impact the investments held by PRT providers in the UK. For example, they are investing in social housing. Not only does this meet one of the SDGs, it also provides a regular income stream to pay pension annuitants from an investment that generates higher returns than UK government bonds. Similarly, in March 2022, the Aon MasterTrust and Aon's Group Personal Pension Plan seeded the UBS Global Equity Climate Transition Fund with £700m. The fund offers cost-efficient and broad-based exposure to global equity markets, providing investors with the ability to mitigate climate-related investment risks while aiming to have a positive effect on society.[108] As

[107] https://www.top1000funds.com/2025/12/uss-paper-urges-governments-to-do-more-to-support-climate-policy/

[108] https://www.ipe.com/news/aon-mastertrust-pension-plan-seed-ubs-climate-fund/10058957.article

another example, in July 2022, Railpen, the UK railways pension scheme, and the Alberta Investment Management Corporation (AIMCo) bought a grid-scale battery energy storage platform in the UK from investment firm Constantine for £400m. Railpen said: 'This acquisition marks Railpen's first direct investment into battery storage and reflects our ambition to drive positive change through our portfolio, working with management to develop the critical infrastructure needed to support the UK's transition to net zero'.[109]

The European Union

The EU has had a funding instrument for the environment and climate action, called the LIFE Programme, since 1992.[110] Since then, it has co-financed more than 6,500 projects aimed at tackling biodiversity loss, reducing emissions, and protecting natural resources. These projects will help the EU meet its 2050 climate-neutral goal, support green innovation, and enhance citizens' quality of life. The LIFE Programme has also invested in 19 projects addressing the growing impacts of climate change, such as heatwave adaptation, sustainable farming, and carbon capture through peatland restoration. Its budget is managed by CINEA, the European Climate, Infrastructure and Environment Executive Agency. The budget for the period 2021 to 2027 was €5.43bn.[111]

In December 2020, the European Insurance and Occupational Pensions Authority (EIOPA) published a discussion paper on a methodology for including climate change in the Solvency II standard formula when calculating natural catastrophe underwriting risk.[112] The frequency and severity of natural catastrophes and extreme weather, such as heat waves, heavy precipitation, droughts, top wind speeds and storm surges, is expected to increase due to climate change. EIOPA wants to ensure the financial resilience of (re)insurers covering natural catastrophes, implying that the solvency capital requirements for natural catastrophe underwriting risk need to be appropriate in light of climate change.[113]

In April 2022, EIOPA launched its first stress test of the impact of climate change on European pension scheme investments. It included not only an assessment of the effects of a rise in inflation, but also a climate risk stress which will test schemes' resilience against a climate change scenario developed with the European Systemic Risk Board and the European Central Bank. The scenario involves a disorderly transition to climate neutrality due to delayed policy action, specifically, that new climate policies are not introduced until

[109] https://realassets.ipe.com/news/railpen-aimco-to-pump-400m-into-uk-battery-energy-storage-projects/10061353.article
[110] https://cinea.ec.europa.eu/programmes/life_en
[111] https://www.innovationnewsnetwork.com/eu-invests-e358m-in-new-life-programme-projects-to-drive-climate-action/63460/
[112] EIOPA launches discussion paper on a methodology for integrating climate change in the standard formula, *Pensions Policy International*, 4 December 2020; https://pensionpolicyinternational.com/eiopa-launches-discussion-paper-on-a-methodology-for-integrating-climate-change-in-the-standard-formula
[113] For more details about the impact on insurance of climate risk, see Garrido et al. (2024).

2030 and this leads to an abrupt carbon price increase which affects the entire economy. The stress test will focus on both the impact on pension fund investments and the financial situation of scheme sponsors.[114]

In December 2022, EIOPA reported the findings from this stress test. The test covered 187 pension funds from 18 EU member states with €2trn of assets (65% of total assets in DB and DC schemes). The funds were tested for resilience to a sharp rise in carbon prices caused by a sudden disorderly transition to carbon neutrality resulting from delayed policy actions. The funds held 6% of their share and 10% of their corporate bond investments in carbon intensive industries such as mining, electricity, gas and land transport. The stress test resulted in a fall in asset values of 12.9%. EIOPA concluded that the funds were 'materially exposed' to transition risks.[115]

In 2021, the Task Force on Climate-related Financial Disclosures defined the following types of transition risks:[116]

- Policy (and legal) risk stems from changes in policy regulations (e.g., the European Green Deal, launched in 2019), which aim to promote adaptation and constrain actions that contribute to adverse impacts. For instance, implementing carbon-pricing mechanisms to target the reduction of greenhouse gas emissions, or measures to increase water efficiency for sustainable practices, can result in increased operational costs. These changes can reduce the long-term value of certain infrastructure assets, particularly those that rely on high-carbon activities, leading to 'stranded assets' risks.

- Technology risk arises from emerging technologies and innovations such as renewable energy and carbon capture and storage, which can change the competitive landscape and production/distribution costs of certain organisations, and disrupt parts of the existing business models.

- Market risk refers to shifts in supply and demand for certain products and services, considering both climate risks and opportunities into account.

- Reputation risk arises when public and stakeholder perceptions shift regarding an organisation's stance on the transition to a low-carbon economy.

The EDHEC Climate Institute offers a definition of climate risk for investors. [117] It defines 'climate transition risk as a situation in which climate policies and regulations are introduced late and abruptly, or when technological shocks occur, negatively affecting the

[114] https://www.ipe.com/news/eiopa-launches-climate-risk-focussed-2022-pension-fund-stress-test/10059031.article
[115] https://www.pensionpolicyinternational.com/climate-change-could-cost-pension-funds-billions-eu-watchdog-says/
[116] https://scientificratings.com/wp-content/uploads/2025/11/scr_ipe_supplement_nov2025.pdf (Box 2, p.3)
[117] https://scientificratings.com/wp-content/uploads/2025/11/scr_ipe_supplement_nov2025.pdf (Box 1, p.13)

performance of fossil fuel and high-carbon firms, and thus the value of their financial contracts. In this context, investors cannot fully anticipate the potential shocks to performance and assets. Losses from stranded assets, which are exposed to fossil fuels, could then cause implications for financial stability (e.g., revenue loss, lower profits, need for higher returns to compensate investors). Therefore, assessing potential financial losses that investors may face is essential to mitigate these risks'. Transition risks are particularly important for infrastructure projects. According to a study by EDHEC Infra & Private Assets,[118] a disorderly scenario could result in substantial value losses for infrastructure investments, amounting to nearly $600bn by 2050.

In February 2024, EIOPA set out four principles that should be observed when insurers and pension entities make sustainability claims:[119]

- Principle 1 states that sustainability claims 'should be accurate, precise, and consistent with the provider's overall profile and business model, or the profile of its products'. To ensure the accuracy of sustainability claims, all relevant information should be disclosed without omission.
- Principle 2 states that sustainability claims should be kept up to date, and any changes should be disclosed in a timely manner and with a clear rationale.
- Principle 3 states that sustainability claims should be substantiated with clear reasoning and facts. In line with Principle 2, any change to the sustainability profile of a product must be adequately substantiated.
- Principle 4 states that sustainability claims and their substantiation should be accessible and understandable.

In October 2023, the EU adopted the 'Fit-for-55' package which aims to reduce greenhouse gas emissions by 55% by 2030. In November 2024, the EU conducted a 'Fit-for-55' stress test on banks, insurers, investment funds and pension funds, and found that, in the worst-case scenario, the pension funds experienced losses of 21.5%, considerably more than the other three institutions. In this scenario, transition risks manifest themselves in the form of a 'run-on-brown' shocks, whereby investors sell off the securities of carbon-intensive firms, combined with 'other standard macro-financial stress factors'. This results in significant decreases in market values, especially of corporate and sovereign bonds, which constitute around half of insurers' and pension funds' investments. However, the increase in yields reduces pension fund liabilities which helps to ameliorate the negative impact.[120]

In April 2025, EIOPA launched its fifth stress test of occupational pension funds, assessing the impact of two adverse economic scenarios on the liquidity position of pension funds,

[118] Amenc, N., F. Blanc-Brude, B. Jayles, A. Gupta, D. Marcelo and J. Orminski (2023) Highway to Hell: Climate Risks Will Cost Hundreds of Billions to Investors in Infrastructure Before 2050, EDHEC Infra & Private Assets; https://www.edhecinfraprivateassets.com/wp-content/uploads/2023/12/Highway-to-hell.pdf
[119] https://www.pensionpolicyinternational.com/eu-sustainability-and-greenwashing-in-insurance-eiopa-publishes-draft-opinion
[120] https://www.ipe.com/news/pension-funds-assets-down-by-up-to-215-in-climate-stress-scenario/10126438.article

in the one case, sharp increases and, in the other case, sharp declines in interest rates. EIOPA said: 'In the "yield curve up" scenario, EU interest rates increase sharply as market participants anticipate economic developments related to the abrupt escalation of geopolitical tensions. These geopolitical tensions cause disruptions in trade and a sharp rise in commodity prices, leading to a large upward revision in inflation expectations. In this context, the scenario assumes EU's vulnerability to trade restrictions that cause the euro to depreciate. In the second, "yield curve down" scenario, EU interest rates plummet as market participants internalise an unexpected prolongation of geopolitical tensions, triggering a loss of confidence in financial markets'. The results were published in December 2025. They confirmed that European occupational pension funds generally had sufficient liquidity buffers to absorb shortfalls. However, a potential liquidity risk was identified: the scenarios highlighted that liquidity risks, particularly those arising from margin calls related to derivatives positions, could pose a threat.[121]

In December 2025, the EU agreed a legally binding target to cut greenhouse gas emissions by 90% from 1990 levels by 2040, allowing up to 5% of the reductions to be met through foreign carbon credits. The deal requires an 85% cut from European industries and keeps the EU on track for net zero emissions by 2050.[122]

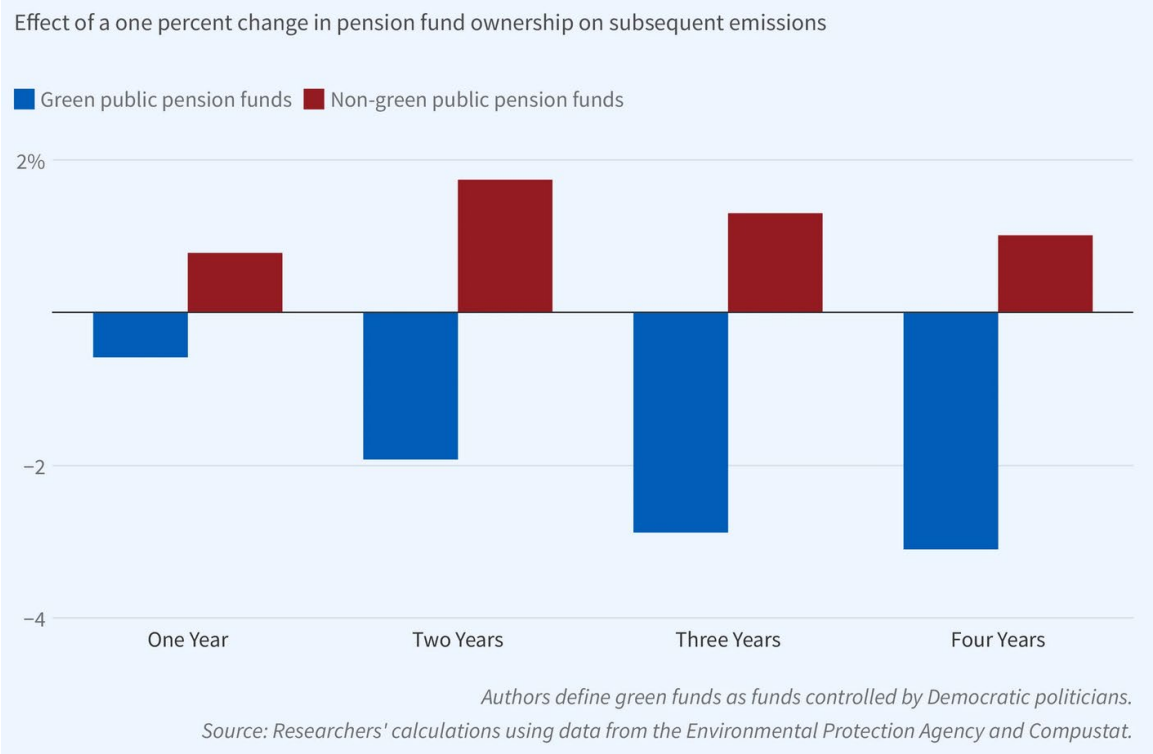
The US

In January 2024, Matthew E. Kahn, John Matsusaka, and Chong Shu published a study entitled *In Divestment and Engagement: The Effect of Green Investors on Corporate Carbon Emissions* (NBER Working Paper 31791).[123] The study analyzed whether US public pension funds affect the level of greenhouse gas emissions at the companies they own. It categorized public pension funds based on the political affiliation of the leaders who control them through governance or board trusteeship. Those under Democratic control were labeled 'green', while those under Republican control were labeled 'non-green'. The study's hypothesis was that that Democrats generally favor carbon emission reductions more than Republicans. It analyzed emissions data from 2010–21 for 5,241 facilities across 685 publicly traded companies, along with data on pension fund stock holdings for 24 of the US's 50 largest public funds. These funds collectively managed over 88% of total public pension assets in the US. Companies reduced their greenhouse gas emissions as the ownership stake of green pension funds rose. A 1 percentage point rise in shares owned by green pension funds was associated with a 3.1% decline in carbon emissions over four years, and a 5.2 percentage point increase in the probability of some carbon emission reduction over this period. Increased ownership by non-green funds was

[121] https://www.eiopa.europa.eu/browse/financial-stability/occupational-pensions-stress-test/occupational-pensions-stress-test-2025_en
[122] https://www.msn.com/en-us/news/world/eu-strikes-deal-on-climate-target-to-cut-emissions-by-90-by-2040/ar-AA1S4eK3
[123] https://www.nber.org/digest/202401/role-green-investors-reducing-corporate-carbon-emissions; https://www.nber.org/papers/w31791

not associated with any decline, and may be associated with an increase in emissions. See Figure 5.

Figure 5: Pension fund ownership and corporate greenhouse gas emissions



The study considered three ways in which increased green ownership could potentially affect emissions: managerial reactions to investor ownership, pressure exerted by investors through shareholder proposals, and persuasion of managers by pension shareholders. It found that emission cutbacks depend in part on the proactive engagement of green funds, suggesting that managers do not respond without some shareholder involvement. It rejected the shareholder proposal channel since it found no increase in shareholder environmental proposals calling for companies to scrutinize and report on environmental concerns after a surge in green ownership. The study concluded that persuasion carries more weight than confrontational pressure in driving emission reduction.

Global

In November 2024, Ortec Finance published its first global pension fund climate risk report, *Climate Risks Facing the Pension Industry Worldwide*, which analyzed publicly available data from around 140 pension funds in the US, Canada, the UK, the Netherlands and Switzerland using its climate scenario modelling framework. It considered seven climate scenarios, including the climate tipping into high-warming states (involving a global average rise in temperature of 3.7°C). It found that North American pension fund

returns could decline up to 50% by 2040 under a high-warming scenario, UK funds by less than 30% by 2040, and Dutch and Swiss funds by much less due to their lower geographical exposure to extreme climate events and substantial allocations to less vulnerable assets. Transition risks are expected to be the dominant climate risk driver compared to physical risks during the 2025–2030 period for pension funds worldwide. A 'disorderly' transition ('drastic and uncoordinated policy changes' designed to reach net zero quickly) would result in average losses of 14% over the next five years. Doruk Onal, climate risk specialist at Ortec Finance, warned that the decline in investment returns has serious implications: 'For pensioners, reduced returns could lead to lower retirement benefits and financial insecurity. Sponsors, including corporations and government bodies, might face increased contributions to cover shortfalls, impacting their financial health. Employees could also be affected by lower pension fund performance, leading to potential adjustments in retirement planning and expectations'.[124]

Large pension schemes

We consider examples of some large pension schemes' climate change considerations that have been publicly reported.

In May 2024, Japan's Government Pension Investment Fund published a study examining the impact of it engagement program. It used a proprietary dataset of 26,792 engagements across 21 externally managed funds between 2017 and 2022. The study analyzed how asset managers select engagement targets and assess their impact on corporate performance. There were three key findings: (1) engagements focus on business strategy, financial strategy, climate change, board structure, capital efficiency, and disclosure; (2) targeted firms tend to be large-cap companies with lower controlling shareholder ownership and higher disclosure activity; and (3) engagements yield measurable outcomes: climate-related engagements reduce Scope 2 GHG intensity[125] and enhance firm valuation (Tobin's Q, price-to-book ratio), while governance-related engagements increase total shareholder returns (TSR), independent board members, and reduce cross-shareholdings. The study concluded: 'These findings underscore the role of universal owners in influencing corporate behavior, demonstrating that structured engagement can drive meaningful change in corporate governance, sustainability, and financial performance'.[126]

In March 2023, TPT (The Pensions Trust) Retirement Solutions, one of the UK's largest workplace pension plans, announced that it had introduced climate change considerations into its investment decisions. Cliff Speed, TPT's chief investment officer, said: 'Climate

[124] https://www.ipe.com/news/pension-fund-returns-could-suffer-with-climate-change-impact/10126581.article; https://www.pensionpolicyinternational.com/how-climate-change-will-impact-pension-fund-investment-portfolios/

[125] Scope 2: indirect emissions created from the production of electricity/energy purchased and used by the organization.

[126] Government Pension Investment Fund Evaluation Project on the Effects of Engagement, May 2024; https://www.gpif.go.jp/en/investment/20240521_engagement_report_en.pdf

change has the potential to reduce the security of our members' retirement benefits and represents a systemic risk to the long-term value of our investment portfolio. At the same time, the investment required to transition to a net-zero economy presents an opportunity to support the expansion of climate solutions. For us, this means taking an approach to managing our investment risks and opportunities on behalf of our members in line with our fiduciary duty'. In 2016, TPT made its first allocation to renewable energy generation and renewable supporting technologies. It also invested in two additional renewable energy strategies in 2021. It is on the global steering group of the Paris Aligned Investment Initiative, a global forum representing investors (known as Paris Aligned Asset Owners (PAAO)[127]) with $34trn in assets aligning their portfolios and activities to the goals of the Paris Agreement.[128]

In March 2024, the People's Pension, a £26bn UK multiemployer DC scheme, announced that it had moved £15bn from developed markets equities to a strategy based on the EU's Climate Transition Benchmark (CTB) methodology and would now follow regional MSCI Climate Change Indexes. The methodology involves an immediate 30% reduction in financed emissions, additional portfolio decarbonization by 7% each year, and divestment from companies that produce thermal coal within the assets covered by the new strategy. It said the primary aim was 'to manage the long-term risks posed to members' investments by climate change and a green transition, that aren't currently being priced by the market' which in turn meant 'members can be confident their investments are working toward the goals of the Paris Agreement'.[129] In April, the People's Pension introduced a new responsible investment policy that required fund managers to have a commitment to net zero and adequate resources committed to stewardship; failure to do so could trigger a review and possible transfer of assets to other managers.[130]

A 2024 survey of UK pension funds by AlphaReal, a real assets manager, found that a majority (90%) of pension funds planned to increase their allocation to renewable energy in the next year: 28% reported they would increase their allocations to 21% or more of the portfolios they manage, while 39% said they would increase their allocations to between 16% and 20%.[131]

In August 2023, a study by Columbia University, the World Bank and the Sustainable Finance Institute examined the portfolios of five of the world's largest pension funds: the Japan Government Pension Investment Fund (GPIF, assets of $1.5trn), the Norway Government Pension Fund Global (GPFG, $1.4trn), the Netherlands' Stichting Pensioenfonds (ABP, the Dutch civil service pension scheme), $465bn), the Canada

[127] https://www.parisalignedassetowners.org/
[128] https://www.ipe.com/news/uk-workplace-pension-scheme-plans-investment-in-climate-solutions/10065832.article
[129] https://www.ipe.com/news/peoples-pension-shifts-15bn-to-eu-climate-transition-benchmark-strategy/10071987.article
[130] https://www.pensionpolicyinternational.com/uk-peoples-pension-ramps-up-esg-expectations-of-asset-managers
[131] https://www.pensionpolicyinternational.com/uk-pension-funds-turn-to-renewable-energy-investment/

Pension Plan Investment Board (CPPIB, $420bn), and the New York State Common Retirement Fund (NYSCRF, $242bn). All invest in renewable energy and all assess the environmental sensitivity of any new investments. GPIF, the world's largest public pension fund, is reducing its holdings of carbon-based companies, invests in two low-carbon-oriented stock indexes, and issues green bonds to raise capital to invest in renewable energy and low-carbon companies. GPFG's revenues come from North Sea oil and gas wells, but it has divested from companies that do not meet its climate or ethical standards. ABP planned to reduce its portfolio's carbon footprint by 40% by 2025. CPPIB is heavily invested in real estate and infrastructure (which includes the ownership of 295 'green-certified' buildings in 25 countries) and has issued $109bn in euro-denominated green bonds. NYSCRF has divested from investments in shale oil and gas and has pledged to have a net-zero portfolio by 2040 by investing in its own low-carbon index. With the exceptions of ABP and GPIF, the report noted that the other funds 'fail to define their objectives in numeric terms'.[132]

In December 2023, the California Public Employees' Retirement System (CalPERS), the largest US public pension fund, announced plans to invest $100bn in climate solutions by 2030 (the CalPERS Sustainable Investments 2030 strategy), as part of its aim of cutting emissions from its portfolio investments to net zero by 2050, while securing long-term financial returns for its members. CalPERS said it wanted to address the major risks that financial markets and companies face as a result of the changing climate, such as business interruptions and damage to assets as a result of hurricanes or flooding It also wanted to participate in the 'booming new clean economy, creating new markets, and investing in the next batch of winners as this shift continues to accelerate exponentially – and avoiding being left behind with dwindling markets, outmoded business models, and stranded assets'. According to the International Energy Agency, a record $1.8trn was invested in clean energy in 2023, more than was invested in fossil fuel energy.[133] In January 2025, CalPERS, with $502.9 billion in assets, revealed that it was more than halfway towards its $100bn goal, with around $53bn committed to climate adaptation, transition, and mitigation efforts.[134] In March 2025, CalPERS called for a shift in climate disclosure narratives, emphasizing that companies need to highlight opportunities alongside risks. It noted that the past decade has focused heavily on risk disclosure, and companies should be more vocal about their positive climate initiatives, particularly in areas such as green revenues.[135] In December 2025, CalPERS announced that it had invested $5bn in a customized public equity Climate Transition Index that tilts towards companies that have a transition plan and reduces exposure to those that do not. Companies' weighting in the index is determined by

[132] https://www.pensionpolicyinternational.com/how-5-of-the-worlds-largest-pensions-funds-invest-to-combat-climate-change/
[133] https://www.pensionpolicyinternational.com/the-largest-u-s-pension-fund-just-rolled-out-a-climate-transition-plan-focused-on-risk-and-opportunity/
[134] https://www.top1000funds.com/2025/01/calpers-goes-big-on-the-green-transition
[135] pionline, 12 March 2025

the amount of green revenue they generate. High emitters are included in the index if they also have renewable energy assets or use carbon capture technology, for example.[136]

However, a survey of 24 US public pension funds conducted for a report called *The Hidden Risk in State Pensions: Analyzing State Pensions' Responses to the Climate Crisis in Proxy Voting* found that 'too few state pensions are taking adequate steps to address climate-related financial risks and protect their members' hard-earned savings, raising serious concerns about their execution of fiduciary duty'.[137] On the other hand, a study by Kahn et al. (2024) found that ownership and active constructive engagement from US public pension funds were more effective than confrontational tactics, such as voting or shareholder proposals. In particular, they found that companies reduced their greenhouse gas emissions when stock ownership by 'green' funds (where the majority of trustees were Democrats or were located in states with a Democratic governor) increased, and did not alter their emissions when ownership by 'non-green' funds (e.g., those in Florida or Texas) changed. The authors concluded that widespread disinvestment from companies currently in the fossil fuel business could be misguided and lead to unintended consequences.[138]

In December 2023, the Dutch pension fund Pensioenfonds Metaal & Techniek (PMT) announced it had divested from 40 oil and gas companies, but remained invested in nine European companies (Shell, Aker BP ASA, BP, Enbridge, Eni, Equinor, Galp Energia, Neste and OMV) with 'sufficiently convincing plans' for the energy transition and carbon reduction. The 40 companies sold did not have sufficiently ambitious and substantiated CO_2 reduction targets to commit to the Paris Agreement goals. Although the retained companies were not currently operating in line with the goals – which applies to the entire global economy – they made progress during the two-year engagement program with the fund and will be continuously monitored to confirm sufficient progress. PMT insists the companies must stop developing new oil fields by 2025, but can continue to develop new gas fields due to the global scarcity of natural gas. PMT's strategy is to keep talking to polluters and 'not simply exclude companies or a sector'. This contrast with two other large Dutch pension funds, ABP and PME, which have divested from the entire fossil sector.[139]

In March 2024, ABP announced that it would invest a total of €30bn in energy transition and non-listed impact investments targeted at biodiversity solutions, innovation and affordable housing. It said that it had identified climate and biodiversity 'as the key themes influencing societal and economic changes, presenting risks and opportunities in the

[136] https://www.top1000funds.com/2025/12/calpers-bets-on-outperformance-from-growing-climate-allocation

[137] https://www.pensionpolicyinternational.com/us-too-few-public-pension-funds-address-climate-in-proxy-voting-report/

[138] Matthew E. Kahn, John G. Matsusaka and Chong Shu (2024) Measuring the unintended consequences of public pension fund disinvestment from fossil fuel companies, CEPR, 26 January; https://cepr.org/voxeu/columns/measuring-unintended-consequences-public-pension-fund-disinvestment-fossil-fuel

[139] https://www.pensionpolicyinternational.com/dutch-pension-fund-pmt-sells-most-fossil-fuel-holdings/

investment portfolio'. It also said that it would stop investing in companies 'where climate or biodiversity damage is inherently linked to their business activities, with no realistic prospect of improvement' which potentially included companies involved in the meat, cacao, coffee, palm oil, animal feed or paper and wood industries.[140]

In February 2025, PGGM,[141] the investment manager that invests on behalf of five Dutch pension funds (in particular, the healthcare pension scheme PFWZ), announced it had taken a 49% stake in Carbon Collectors, a Dutch company involved in carbon capture. This was part of a €1bn investment that will be allocated to climate-related start-ups.[142]

In March 2025, the £78bn Universities Superannuation Scheme (USS), the UK's largest pension fund, announced that was going to spend more time on engagement with government and corporates than producing emissions reports. Between 2019 and 2023, it reduced the carbon emissions of its asset portfolio by 35%. It did this by tilting to climate-friendly assets, reducing its exposure to companies poorly positioned to adapt, and investing directly in renewables. Despite this, global emissions have continued to increase. USS argues that the carbon reporting burden was distracting from more useful strategies like engagement to encourage others to act as long-term players. It added that policy change was a precursor to meaningful corporate change and it wanted to help create a landscape and economic framework within which corporates and consumers can choose lower carbon options.[143]

In March 2025, a survey by consultant XPS of 48 pension schemes' task force on climate-related financial disclosure (TCFD) reports found that 75% of schemes had adopted net-zero targets in 2024, an increase from 60% in 2023. In addition, 69% had made asset allocation changes to address climate risks, while 42% had some direct investment in climate solutions. In total, the schemes surveyed had £400bn in assets.[144]

In April 2025, Local Pensions Partnership Investments (LPPI), the £27bn investment pool for three funds in the UK Local Government Pension Scheme – Lancashire County Pension Fund, the London Pensions Fund Authority and the Royal County of Berkshire Pension Fund – launched a £500m LPPI Environmental Opportunities Fund, a private markets fund focused on decarbonisation investment opportunities, in particular, climate mitigation, climate adaptation, and the protection, restoration, and sustainable management of nature.[145]

[140] https://www.ipe.com/news/abp-pledges-30bn-for-new-impact-investments/10071989.article
[141] https://www.pggm.nl/en/about-us/about-pggm/
[142] https://impact-investor.com/pggm-buys-stake-in-dutch-carbon-capture-company/
[143] https://www.top1000funds.com/2025/03/uss-calls-time-on-emissions-reporting
[144] https://www.pensionpolicyinternational.com/uk-three-quarters-of-pension-schemes-have-now-adopted-net-zero-targets/; https://xps-13503-s3.s3.eu-west-2.amazonaws.com/files/1717/4306/7339/XPS_Group_TCFD_in_Review_Year_3_002.pdf
[145] https://www.ipe.com/news/local-pensions-partnership-launches-climate-solutions-fund/10129778.article

In April 2025, Border to Coast Pensions Partnership agreed to invest £40m in a UK life science fund managed by UBS Asset Management's Real Estate & Private Markets and £40m in a renewables impact fund managed by Quinbrook Infrastructure Partners (the Quinbrook Renewables Impact Fund (QRIF) II fund). The former fund has assets in the 'golden triangle' region encompassing Cambridge, Oxford and London. The latter fund will invest in projects, such as the 2,000-acre Mallard Pass solar farm on the Rutland/Lincolnshire border, which will generate sufficient energy to power 92,000 UK homes, and battery storage facilities aimed at decarbonising commercial vehicles.[146]

In April 2025, Pensioenfonds ING, the pension fund of Dutch bank ING, appointed Achmea Investment Management as a strategic advisor for impact investing, with an emphasis on investments in climate, health and nature themes in private markets. This aligns with a call from the Netherlands Advisory Board on impact investing for the country's pension funds, asset managers, insurance companies and banks to allocate at least 10% of their assets under management to impact investments by 2025.[147]

In May 2025, the Canada Pension Plan, Canada's largest pension fund, revealed in its annual report that it had dropped its net-zero commitments: 'forcing alignment with rigid milestones could lead to investment decisions that are misaligned with our investment strategy. To avoid that risk – and to remain focused on delivering results, not managing legal uncertainty – we have made a considered decision to no longer maintain a net zero by 2050 commitment', a promise first made in 2022. It said that this was partly in response to the anti-greenwashing rules contained in Canada's Competition Act which requires entities to prove the environmental claims they make: 'Recent legal developments in Canada have introduced new considerations around how net-zero commitments are interpreted. In particular, there is increasing pressure to adopt standardized emissions metrics and interim targets, many of which don't reflect the complexity of a global investment portfolio like ours'. However, John Graham, CEO of the Canada Pension Plan Investment Board, added: 'Nothing's changed on what we're actually doing. We think it is really important to incorporate climate and incorporate sustainability into the portfolio when we take a long-term perspective and as a long-horizon investor'.[148]

In November 2025, CalPERS announced that it had $60bn in climate solution investments, with a target to reach $100bn by 2030. It said 'our real focus is on returns and we believe by targeting this segment, we can generate outperformance'. It highlighted global opportunities in renewable energy across emerging markets like India and Vietnam, as well as developed economies like Japan which has a $1trn Green Transformation strategy.[149]

[146] https://realassets.ipe.com/news/border-to-coast-invests-80m-in-uk-life-science-real-estate-and-renewables/10129920.article
[147] https://impact-investor.com/achmea-im-to-advise-ings-pension-fund-on-impact-investing
[148] https://www.ipe.com/news/canadas-largest-pension-fund-drops-net-zero-promise/10130676.article
[149] P&I Daily, pionline@e.crainalerts.com, 10 November 2025

Smaller pension schemes

In August 2024, a study by The Pensions Regulator in the UK of 3,500 schemes found that many smaller schemes only had minimum compliance with ESG aspects of statements of investment principles (SIPs) and implementation statements (ISs). Trustees often failed to demonstrate ownership of their policies or key activities in respect of ESG and where they delegated activities to managers, they often failed to explain or demonstrate oversight of ESG activities. Further, where schemes are invested in pooled funds, a number of trustees highlighted they had limited ability to influence underlying managers on decisions related to ESG. TPR said scheme trustees should aim to fully demonstrate their engagement with material ESG considerations whether climate impact, nature loss or social factors and invite challenge in the interest of protecting outcomes for savers.[150] In the same month, a study by Climate Safe Pensions found that, with $46trn in assets worldwide, pension funds were still amongst the largest institutional investors in fossil fuels, holding nearly 30% of fossil fuel industry shares.[151]

In March 2025, Scottish Widows *Responsibly Invested Pensions* survey revealed that 69% of employers in the UK offered a responsibly invested company pension, but only 44% have it as their default fund option for their DC scheme. This put the burden on employees to take action if they want to switch; however 61% of employees reported that had 'no idea' how to change their default, highlighting a need for employers and advisers to educate workers on this issue. The survey also found that more employees have become interested in how environmental, social and governance 'friendly' their company pension scheme is: 17% employees class their pension's environmental or social impact as a top priority, rising to 25% for those aged 18-34. The survey said employers were taking a range of approaches to embedding responsible investment into their pensions: 53% were allocating pensions to specific sustainable funds, 46% were invested in impact strategies, and 45% were focused on investing in companies cutting carbon emissions.[152]

UN-supported initiatives relating to asset owners, asset managers, insurers and banks

We now consider some UN-supported initiatives relating to asset owners, asset managers, insurers and banks.

Principles for Responsible Investment

[150] https://www.ipe.com/news/tpr-report-missed-opportunity-as-trustees-focus-on-minimum-esg-compliance/10074997.article
[151] https://www.pensionpolicyinternational.com/pension-funds-should-protect-our-future-not-destroy-it/
[152] https://www.pensionpolicyinternational.com/uk-two-thirds-of-employers-embrace-responsible-pensions-less-than-half-have-it-as-their-default/

One of the earliest, established in 2005, was the Principles for Responsible Investment (UNPRI or PRI),[153] an international network of financial institutions whose aim is to implement six 'Principles':

- Principle 1: We will incorporate ESG issues into investment analysis and decision-making processes.
- Principle 2: We will be active owners and incorporate ESG issues into our ownership policies and practices.
- Principle 3: We will seek appropriate disclosure on ESG issues by the entities in which we invest.
- Principle 4: We will promote acceptance and implementation of the Principles within the investment industry.
- Principle 5: We will work together to enhance our effectiveness in implementing the Principles.
- Principle 6: We will each report on our activities and progress towards implementing the Principles.

In April 2024, UNPRI issued ten priorities for embedding sustainability in pension systems:[154]

1. The policy framework is comprehensive and consistent

   Policy makers develop a comprehensive, consistent and supportive policy framework that provides clarity for pension funds as they seek to address sustainability risks and opportunities, including system-level risks, when they pose a threat to achieving their financial objectives. Policy and regulatory frameworks ensure that:

   (i) There is clarity regarding the duties and obligations of pension funds to incorporate ESG factors into investment decisions and stewardship activity, and to consider taking action to pursue sustainability outcomes that are instrumental to fulfilling financial objectives in line with members' and beneficiaries' preferences.
   (ii) The long-term investment horizon and fiduciary duties of pension funds are recognized, incentivized and protected through appropriate parameters in investment decision-making, product choice and the tenure of pension fund trustees and senior executives, leading to decision-making that prioritises long-term goals.

[153] https://www.unpri.org/
[154] Progress and priorities: reviewing sustainability in key pension systems; https://www.unpri.org/private-retirement-systems-and-sustainability/progress-and-priorities-reviewing-sustainability-in-key-pension-systems/12285.article

2. Policy and regulation distinguish between addressing exposure to sustainability-related risks, tackling underlying drivers of such risks and pursuing sustainability outcomes in parallel with financial objectives

   Pension funds are enabled to move beyond ESG integration at a risk-return level and pursue sustainability outcomes. Standards and guidance should clarify when pension funds may be required to consider addressing system-level risks relevant to financial objectives, as well as when and how they might pursue sustainability objectives in the best interest of members and beneficiaries.

3. Pension funds, investment managers and intermediaries produce standardized reporting on sustainability objectives

   Standardized reporting provides information about the extent to which pension funds have met stated sustainability objectives and taken action to achieve those objectives. Similarly, investment managers and relevant intermediaries in the investment value chain align their reporting to support pension funds. Reporting by pension funds is in a format that is accessible to members and beneficiaries.

4. There is appropriate guidance on the sustainability claims of pension funds

   Regulators provide guidance to pension funds on how to demonstrate the sustainability claims of their offerings and ensure that their disclosures indicate the types of strategies that facilitate these claims. This is a key factor in ensuring that members and beneficiaries have confidence in the sustainability characteristics of their products. Such guidance should not create unnecessary restrictions on the types of strategy that can be considered sustainable, providing adequate incentives to innovate.

Market structure

5. Pension funds have scale or can otherwise access the benefits of scale

   Policy makers and regulators encourage fund consolidation where there are benefits to the market within which the funds are operating. However, the impacts of consolidation on sustainability objectives and strategies should be properly considered. In the absence of consolidation, policy makers and regulators encourage pooling of investments or resources, including encouraging sharing of resources on stewardship activities.

6. Suitable, sustainable investment products are available and accessible

   Pension funds can access investment products with their desired sustainability characteristics, at appropriate cost and scale, to achieve their sustainable investment objectives.

Investment practices

7. Members and beneficiaries are educated about and engaged with regarding their sustainability objectives

   Pension fund members and beneficiaries are appropriately educated about and regularly and systematically engaged with regarding their sustainability objectives. Where appropriate, the views of members and beneficiaries are reflected in pension fund sustainability strategies.

8. Trustees and fiduciaries are capable and skilled, with sustainability knowledge

   Trustees and fiduciaries are equipped to meet high professional standards and receive sustainability-related training.

9. Trustees and fiduciaries are willing to move beyond traditional pension fund investment strategies and identify, implement and support the development of appropriate benchmarks to take action to pursue sustainability outcomes in keeping with their fiduciary duties

   This includes provision of adequate incentives and market settings for moving, where appropriate, from traditional benchmarks focused on short-term, portfolio-level risks, towards benchmarks that allow the measurement of a scheme's impact on system-level risks and the impacts of system-level risks on funds over longer time frames.

10. Service providers are adequately incentivized to support the pursuit of pension funds' sustainability objectives

    Service providers (notably investment managers and consultants) are adequately incentivized, able and willing to provide products and services that support pension funds' sustainability objectives. This includes protecting against the adverse impacts of market concentration, such as the potential for conflicts of interest or impacts on the principal-agent relationship due to the size of intermediaries relative to the pension fund clients they serve.

In March 2025, figures from the PRI – based on the reports of more than 3,000 of its signatories which represent nearly $90trn in assets under management – indicated that between 2023 and 2024, there was an increase in the proportion of asset owners, from 14% to 19%, that did not include any responsible investment clauses in their contracts with managers. In addition, fewer asset owners required their managers to adopt their exclusion criteria, incorporate material ESG factors into investment and stewardship activities, or

report on their responsible actions over the period. More than 50% of respondents are based in Europe, 23% in North America and 10% in Asia.[155]

In December 2025, the PRI announced that, in 2026, it will reduce signatories' responsibilities in their annual mandatory reporting, by reducing the number of questions asked from 240 to 40. It said: 'The reporting system has been very important, and it's been such a critical element of the growth of responsible investment around the world, but at a time when there are now so many other mandatory requirements and voluntary codes, our signatories were drowning under the amount of work they had to do. … [Nevertheless], the simplified assessment will be just as rigorous'.[156]

Net-Zero Asset Owner Alliance

The UN-convened Net-Zero Asset Owner Alliance (NZAOA)[157] was established in 2019 by Allianz, Caisse des Dépôts, La Caisse de dépôt et placement du Québec (CDPQ), Folksam Group, PensionDanmark and Swiss Re – with Alecta, AMF, CalPERS, Nordea Life and Pension, Storebrand, and Zurich Insurance joining shortly after. Members commit to transitioning investment portfolios to net-zero greenhouse gas emissions by 2050. In May 2021, four UK pension asset owners joined the Alliance – Phoenix Group, L&G, Rothesay and Prudential (UK) – bringing the total membership to 42 and combined assets of $6.6trn.[158] By October 2023, assets had grown to $9.5trn[159] and there were 88 members, of which around 60 were European pension funds and insurers, with new joiners such as Danica Pension, the BT Pension Scheme and AXA.

In November 2023, NZAOA published its engagement expectations for investment managers wanting to win and retain mandates from its members: 'asset managers must adopt a consistent, transparent, and outcomes-oriented climate engagement strategy, which recognises that climate change poses systemic risks to asset owner portfolio returns. [Such an approach would be] critical for asset managers' continued ability to win mandates of clients committed to net zero'. Managers were recommended to get climate engagement processes and standards verified or assured. In addition, asset managers would be expected to explain their approach, objectives and deadlines for securing real-world change for each engagement they undertake, as well as 'transparently share their expectations of issuers and, importantly, their successes and learnings from engagement'.[160] In February 2024,

[155] https://www.ipe.com/news/drop-in-asset-owners-including-responsible-investment-clauses-manager-contracts/10129674.article
[156] https://www.top1000funds.com/2025/12/pri-slashes-reporting-burden-to-preserve-code-relevance-among-signatories/
[157] https://www.unepfi.org/net-zero-alliance/
[158] https://www.pensionpolicyinternational.com/uk-pension-asset-owners-join-net-zero-asset-owner-alliance/
[159] *Insurance Asset Management*, 19 October 2023.
[160][160] https://www.ipe.com/news/net-zero-engagement-asset-owners-publish-rules-for-managers/10070072.article

NZAOA launched a call for action by investment managers by sending a clear message that serving asset owner clients was only possible through climate stewardship. Investment managers needed to ensure their net-zero pledges were being taken up by senior leadership or they would start losing out on mandates.[161]

In April 2024, NZAOA released the fourth edition of the Target-Setting Protocol, covering all private assets, requiring the halving emissions by 2030 and ensuring 20% of AUM are in green investments by 2030.[162] In September 2024, NZAOA announced that that there had been a 6% annual reduction in greenhouse gas emissions registered by its 88 members (90% of which are either insurers (62%) or pension funds (28%)) since 2018 which meant that the group was on target for achieving net zero emissions by 2050. Eighty members have set targets for investments in 'climate solutions' which contribute to real-world decarbonization.[163] Mark Lyon, deputy CIO of the UK's Border to Coast pension pool, explains how this annual reduction is being achieved: '[It requires some annual rebalancing of the portfolio]. Many of the new managers we're choosing tend not to invest in high-emitting, old-economy stocks like energy and materials because they're more focused on growth. The rest has been achieved by the companies themselves. We own more than 1,000 companies, and the top 60 or 70 account for more than half our emissions. So, if we get those companies to transition, we can see big changes almost immediately. And that's what's happened'. Ravien Sewtahal, senior investment manager at the Dutch pension fund PFZW, said 'some of the decarbonisation has come from the scheme's decision to sell almost all its oil and gas stocks, which it believes will reduce financial risks over the longer term. The board has an intrinsic motivation to change things in the real world because we know it will be much easier to make returns for our participants if the planet is not on fire or under water. …[PFZW] recently launched a strategy to make direct investments into European companies providing solutions to the climate crisis and supporting the transition to a low-carbon economy through things like new heating and cooling systems. That was a really big step in telling our participants that we're contributing to real-world change not just by encouraging big companies to decarbonise, but by financing good investment ideas that will help make it possible. …Now we have the flexibility to invest in more climate solutions, as long as they create real-world impact, stay close to our overall investment beliefs and fit within our risk management constraints. The new model also creates synergies and awareness within our broader organisation around climate transition investing'.[164]

Also in September 2024, the London Stock Exchange Group (LSEG) published a Decarbonization in Portfolio Benchmarks report in association with NZAOA. It found that between 2016 and 2022, the weighted average carbon intensity of the FTSE All-World

[161] https://www.ipe.com/news/asset-owners-warn-managers-to-take-climate-pledges-seriously/10071464.article
[162] *Insurance Asset Management*, 18 April 2024.
[163] https://www.pensionpolicyinternational.com/net-zero-asset-owner-alliance-unveils-milestone-emissions-cuts/; https://www.ipe.com/news/net-zero-asset-owners-have-successfully-decarbonised-in-line-with-15c/10076517.article
[164] https://www.ipe.com/special-reports/pension-funds-outline-progress-towards-net-zero/10076568.article

equity index had declined by 4.1% annually on a revenue basis (Weighted Average Carbon Intensity (WACI)) and 5.1% on an ownership basis (Enterprise Value Including Cash (EVIC), the sum of market capitalization plus total debt). Similar rates occurred in corporate fixed income, with the FTSE WorldBIG Corp index decarbonizing at 3.9% (WACI) or 1.4% (EVIC) p.a. over the same period. At a benchmark level, 90% of the equity benchmark by index weight and 85% of the corporate fixed income universe now disclose their Scope 1 and 2. Scope 3 disclosure remains more limited due to poor data quality.[165]

In January 2025, NZAOA requested information about asset managers' carbon dioxide removal investments. It said that phasing in investments in carbon removal solutions, both nature-based and technology-based, 'cannot wait', particularly 'if decarbonisation falters': 'That is why the Alliance is publishing this request for information, seeking to contribute to capacity building and knowledge sharing, and ultimately investment scaling in this space', while recognizing there were limitations to carbon dioxide removal solutions with commercial viability and uncertainty about long-term demand.[166]

In October 2025, NZAOA called on governments to change the regulation of the market for Carbon Dioxide Removals (CDR) to make it easier for its members to invest in the market in order to achieve their long-term climate commitments. NZAO bans members from using carbon removals to achieve portfolio decarbonisation targets before 2030, requiring them instead to focus on reducing the emissions of their underlying portfolio companies. However, members will be able to use the CDR market to meet their post-2030 net-zero targets, allowing them to 'net out' residual portfolio emissions. NZAOA wanted global governments to pursue 'CDR positive policies', including adding carbon removals in regulated markets. It also wanted governments to add CDR targets into their official climate commitments under the Paris Agreement. Further, it called for the adoption of shared definitions and standards, along with a robust certification process for CDR credits, more global trading infrastructure, and insurance options to make projects more bankable.[167]

In November 2025, NZAOA reported that members channelled 8% ($743bn) of their total assets under management into climate solutions, of which 30% was done via listed equity portfolios, 26% via corporate bonds and only 7% via private assets. Members had achieved 78% of their targets for engagement with portfolio companies, asset managers, sectors and value chains. NZAOA said it would expand into private markets in the initiative's next

[165] https://www.lseg.com/content/dam/lseg/en_us/documents/sustainability/lseg-decarbonisation-portfolio-benchmarks-report.pdf
[166] https://www.ipe.com/news/net-zero-asset-owner-body-issues-carbon-dioxide-removal-info-request/10128439.article
[167] https://www.ipe.com/news/asset-owners-urge-policymakers-to-regulate-carbon-removals-market/10133473.article

phase. It also planned to phase in decarbonisation targets for private markets under its target-setting protocol.[168]

Net Zero Asset Managers initiative

The Net Zero Asset Managers initiative (NZAM) was launched in December 2020 – as a formal partner of the UN's Race to Zero Campaign[169] – and aims to galvanize the asset management industry to commit to a goal of net zero emissions.[170] At the time of COP26, NZAM announced that 35% of their assets under management were being managed in line with net-zero emission targets.[171] Morningstar reported that in 2021 there were 860 mutual funds and exchange-traded funds (ETFs) with a climate-focused mandate with total assets of $408bn, double the previous year.[172] Climate Impact Consistent (CIC) Indices have been introduced for net-zero investors. They weight each company in proportion to its net-zero alignment, as measured through its carbon emissions intensity, its emissions disclosure/quality, its forward-looking emissions targets and their credibility, and its revenues from climate solutions.[173] By mid-2024, NZAM had around 325 members with $57.5trn in assets under management.[174]

At the COP26 meeting, BlackRock, then a NZAM member, announced that it had raised $673m in public and private sector money for a new infrastructure fund which would invest in climate-related projects in emerging markets.[175] The International Energy Agency estimates that investment in energy transition in emerging markets needs to rise to $1trn a year by 2030 if the world is to reach the net-zero target by 2050.[176] In 2023, British International Investment (BII), the UK's development finance institution, signed an agreement with ILX, an Amsterdam-based manager of an emerging market private debt fund, to co-finance up to $500m of debt to support long-term sustainable development in developing and low-income countries in Africa, Asia, and the Caribbean, through investing in sectors, such as renewable energy, infrastructure, financial services, manufacturing and agribusiness.[177] In 2023, there were around 400 private debt impact funds and more than two-thirds were lending to emerging markets. Although the total was only 3% of private credit globally, there was growing recognition of the potential for financial returns that

[168] https://www.ipe.com/news/asset-owners-to-step-up-net-zero-engagement-with-private-markets/10133766.article
[169] https://unfccc.int/climate-action/race-to-zero-campaign
[170] https://www.netzeroassetmanagers.org/
[171] https://www.ipe.com/news/average-35-of-assets-initially-in-scope-for-net-zero-manager-targets/10056078.article
[172] https://www.investmentweek.co.uk/news/4048291/assets-climate-focused-funds-soar-usd408bn-2021
[173] *IPE*, 17 May 2021.
[174] *Insurance Asset Management*, 24 July 2024.
[175] *Financial News*, 7 March 2022.
[176] *Financial News*, 7 March 2022.
[177] Lauren Mills (2024) Bridging the SDG funding gap with private debt impact funds, *Impact Investor Guide 2024.*

create positive social and environmental outcomes, according to Vincent Lemaitre, head of ESG for private debt at Tikehau Capital.[178]

However, in December 2022, Vanguard, the world's second largest fund manager and the world's largest manager of index funds, announced: 'After a considerable period of review, we have decided to withdraw from NZAM so that we can provide the clarity our investors desire about the role of index funds and about how we think about material risks, including climate-related risks – and to make clear that Vanguard speaks independently on matters of importance to our investors. [The move] will not affect our commitment to helping our investors navigate the risks that climate change can pose to their long-term returns'.[179] The move followed pressure from some investors and Republican politicians in the US to decrease reliance on ESG criteria when making investments, on the grounds that this negatively impacts the ability of companies such as Vanguard to maximise returns for shareholders, requires disinvestment from fossil fuel at a time when energy security is paramount, and violates anti-trust rules. Index funds face a particular issue since they, by definition, invest in all securities in proportion to their market value and do not discriminate on the basis of the economic activities of the companies issuing those securities. Further, there are no commonly agreed sustainable investment benchmark indices in which index funds could invest. As a result, Vanguard has committed less than 5% of its assets under management with net-zero goals.[180]

Larry Fink, the CEO of BlackRock, the world's largest fund manager, said he has stopped using the term ESG because it had become too politicized and 'entirely weaponized… by the far Left and by the far Right'. Former DWS[181] Group Sustainability Officer Desiree Fixler has said: 'Beyond politics, there are plenty of other factors fuelling the anti-ESG movement. Lacklustre fund performance, too much red tape and greenwashing have left a sour taste. There's been pervasive greenwashing in the market, and people are fed up with having to pay more for green products which it turns out aren't very green'.[182] In 2022, Texas blocked state entities, such as pension funds, from investing with BlackRock on account of its 'boycotting' of the oil and gas sector; in 2021, BlackRock had reduced its exposure to oil and gas stocks by around 15% to $552bn. However, BlackRock said it continued to invest in fossil fuels and promised to invest even more in Texas: in February 2024, it announced a $10bn private investment in Texas' power grid, enabling the construction of new power plants, including natural gas plants.[183] Despite this, in March, the Texas Permanent School Fund announced that it would divest $8.5bn from BlackRock

[178] https://impact-investor.com/bridging-the-sdg-funding-gap-with-private-debt-impact-funds
[179] https://www.investmentweek.co.uk/news/4061376/vanguard-quits-net-zero-asset-managers-initiative
[180] https://impact-investor.com/vanguard-exit-unlikely-to-trigger-mass-defections-from-net-zero-initiative/
[181] DWS is a fund manager which is 80% owned by Deutsche Bank.
[182] https://www.fnlondon.com/articles/its-time-to-dismantle-this-circus-esg-has-served-its-purpose-say-blackrocks-tariq-fancy-and-dwss-desiree-fixler-20230821
[183] https://www.ai-cio.com/news/blackrocks-fink-strikes-truce-with-texas

over what that State Board of Education's chairman termed BlackRock's ESG-oriented commitment to harm Texas' oil and gas industry.[184]

In January 2024, the responsible investment campaign group Share Action[185] accused larger asset management companies of failing to vote on environmental resolutions. Its research showed that on environmental resolutions assessed, only 3% passed in 2023 compared with 32% in 2021; on social resolutions, majority support fell from 15% to 4%. Voting behaviour was also different in different jurisdictions. European asset managers supported 88% of shareholder proposals on environmental and social issues, while support in the UK and US averaged 64% and 25%, respectively. In terms of the so-called 'big four' asset managers, Blackrock, Fidelity, Vanguard and State Street, their average support for environmental resolutions fell from 39% to 14% between 2021 and 2023, while their support for social resolutions fell from 29% to 13%. Blackrock, supported only 8% of resolutions. Share Action also said that asset managers which have signed up to Climate Action 100+[186] with a mandate to protect the environment 'are at the same time voting down resolutions at AGMs that would improve environmental protections in what can only be described as greenwashing'.[187] There was also evidence of a growing backlash to ESG investing amongst investors. According to data from Morningstar, sustainable funds in Europe collected $76bn in new money in 2023, about half the sum of $149bn they collected in 2022. ESG bond funds collected 36% more in management fees during 2023, generating $216.8m for fund groups, compared with a 380% increase in fee income for 2022. ESG equity funds experienced an increase in management fees of 18% in 2023 to just over $1bn, down from 290% in 2022.[188] In February 2024, JP Morgan Asset Management, PIMCO and State Street Global Advisors (SSGA) left Climate Action 100+, while BlackRock transferred its participation to its international arm. BlackRock said: 'The new Phase 2 approach of CA100+ will require signatories to make an overarching commitment to use client assets to pursue emissions reductions in investee companies through stewardship engagement. In our judgment, making this new commitment across our assets under management would raise legal considerations, particularly in the US'. Phase 2, which began in June 2023, involved 'enhanced investor engagement' and a '[marked shifting of] the focus from corporate climate-related disclosure [Phase 1] to the implementation of climate transition plans'.[189]

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[184] https://www.ai-cio.com/news/truce-is-over-texas-school-fund-to-ax-8-5-billion-in-blackrock-investments

[185] https://shareaction.org/

[186] Climate Action 100+ is an investor-led initiative to ensure the world's largest corporate greenhouse gas emitters take appropriate action on climate change in order to mitigate financial risk and to maximize the long-term value of assets. Members of Climate Action 100+ are expected to ask their portfolio companies to 'take action to reduce greenhouse gas emissions across the value chain' and 'implement transition plans to deliver on robust targets'; https://www.climateaction100.org/

[187] https://www.portfolio-institutional.co.uk/esg-hub/asset-managers-under-fire-for-not-voting-on-esg-resolutions/

[188] https://www.fnlondon.com/articles/esg-fees-stall-as-managers-battle-sustainable-fund-slowdown-20240201

[189] https://www.ipe.com/news/climate-action-100-reacts-to-us-asset-manager-exits/10071828.article

In March 2024, Reclaim Finance released a report which analyzed 430 funds labelled as sustainable by five of the world's largest passive investors: BlackRock, DWS, Legal & General Investment Management, UBS Asset Management and Amundi. It found that 70% of the funds were exposed to companies that continued to expand their fossil fuel production. Collectively, the investors had holdings of $227bn in fossil fuel developers in 2023, with more than 50% of this in their passive funds. Reclaim Finance said it wanted regulators to introduce minimum standardized mandatory criteria for funds making sustainability claims and a ban on passive funds holding fossil fuel firms being marketed as sustainable.[190]

Also in March 2024, a report by PitchBook entitled *The State of Private Market ESG and Impact Investing in 2024* noted that some asset managers were engaged in 'greenhushing', i.e., retreating from their public ESG commitments. These managers were de-prioritizing some of their ESG and impact investing programs due to concerns about potential backlashes from opponents of green and sustainable investment strategies and because of possible reputational damage in the face of claims of greenwashing. The report also found that there was no evidence that ESG strategies meant lower returns. Further, fundraising was lower in 2023 compared with 2023.[191] Other asset managers have been accused of 'engagement washing', i.e., not delivering meaningful change due to poor quality engagement or, alternatively, exaggerating the impact of their ESG engagement with the companies in which they invest.[192]

To counteract the politicization of ESG, Blackrock announced that it was switching from ESG investing to 'transition investing' which supports 'strategies that focus on preparing for, being aligned to, benefitting from and/or contributing to the transition to a low-carbon economy'. Larry Fink said: 'We believe the next 10 years is going to be a lot about infrastructure. There is a high demand for capital to fund the world's transition to clean energy. If we are going to decarbonize the world ... capital and infrastructure is going to be very necessary and supply/demand imbalance creates compelling investment opportunities for our clients'.[193]

In January 2025, a BlackRock investment stewardship note announced that the fund manager would not use its stewardship and voting power to achieve specific real-economy decarbonisation goals: 'its team cannot – and does not try to – direct a company's strategy or its implementation [when it comes to climate change]. It is not our role to engineer a

[190] https://www.fnlondon.com/articles/blackrock-lgim-and-dws-sustainable-passive-funds-exposed-to-fossil-fuels-20240320

[191] https://www.funds-europe.com/greenhushing-impacting-private-markets-esg-activity; https://www.fnlondon.com/articles/greenhushing-esg-fund-marketing-names-20240325

[192] *Insurance Asset Management*, 12 April 2024; https://www.impactive.pro/blog/what-is-engagement-washing-and-how-to-avoid-it

[193] https://www.blackrock.com/sg/en/investment-strategies/sustainable-transition-investing; https://www.portfolio-institutional.co.uk/esg-hub/blackrock-transition-investing-a-primer-on-the-what-the-why-and-the-how-2/; https://raoglobal.org/blog/blackrocks-shift-from-esg-investing-to-transition-a-bold-move-towards-sustainable-transformation

specific decarbonisation outcome in the real economy. [Its duty was solely to] advance our clients' long-term financial interests. …The money we manage is not our own – it belongs to our clients, many of whom make their own asset allocation and portfolio construction decisions'.[194] In the same month, BlackRock announced its withdrawal from NZAM, saying that its membership 'caused confusion regarding BlackRock's practices and subjected us to legal inquiries from various public officials'.[195] Shortly after this, NZAM announced it had suspended activities: 'Recent developments in the US and different regulatory and client expectations in investors' respective jurisdictions have led to NZAM launching a review of the initiative to ensure NZAM remains fit for purpose in the new global context'. NZAM signatories will be consulted while the initiative tracks signatory implementation and reporting. In the meantime, NZAM has removed from its web site the list of signatories and commitment statements, which also include signatories' net-zero targets and case studies. At the time, NZAM reported that 325 signatories with $57.5trn in assets under management that had made a commitment to achieving net-zero portfolios by 2050.[196] In the same month, Northern Trust Asset Management (with $1.6trn under management) announced its withdrawal from NZAM and Climate Action 100+ (of which it was a founding signatory), citing confidence in its ability to independently manage material risks and engage with portfolio companies.[197] In August 2025, finance officials from 21 US states wrote to 25 asset managers expressing 'deep concern' over their sustainability efforts, and giving them 1 September to 'demonstrate [their] commitment to a fiduciary model grounded in financial integrity [rather than] political advocacy'.[198]

In April 2025, German prosecutors fined DWS Group €25m for 'negligent infringement' relating to ESG statements made between mid-2020 and January 2023, following a previous $19m SEC penalty. The fund manager's claims of being a 'leader' in ESG and 'ESG is an integral part of our DNA' 'did not correspond to reality', according to the prosecutors. DWS admitted that its past marketing was 'sometimes exuberant, but has subsequently improved internal documentation and control processes. The prosecution was triggered by Desiree Fixler's 2021 allegations of greenwashing. It resulted in significant organizational changes including the resignation of the CEO.[199]

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[194] https://www.ipe.com/news/blackrock-distances-itself-from-real-economy-decarbonisation-efforts/10128091.article

[195] https://www.ft.com/content/f0fb9841-db1d-442e-a757-1a1327497fb1. In 2024, 11 Republican-led states filed a case against BlackRock, Vanguard and State Street, alleging they had conspired to constrain coal supplies and further a 'destructive, politicised environmental agenda'; https://www.ft.com/content/dc34dffe-c92f-4743-8991-f0ec173d083b

[196] https://www.ai-cio.com/news/net-zero-asset-managers-initiative-pauses-activities-following-blackrock-exit

[197] https://www.pionline.com/esg/northern-trust-am-leaves-climate-action-100-and-net-zero-asset-managers-initiative

[198] https://www.ipe.com/news/net-zero-banking-alliance-plans-to-ditch-members-in-bid-to-shake-off-legal-attacks/10132359.article

[199] https://www.reuters.com/sustainability/german-asset-manager-dws-fined-25-mln-eur-greenwashing-case-2025-04-02/

In October 2025, NZAM announced a 'new chapter', in which its members will no longer have to set climate targets or commit to align with net zero by 2050. This is in response to the growing number of asset managers facing legal action from US politicians opposed to financial institutions making pledges to support the goals of the Paris Agreement. Members told NZAM to loosen membership requirements or face further member losses. NZAM said it would be more explicit about the need for members to consider their fiduciary duties and deliver 'better investment outcomes'. In future, members will be allowed to pursue their own net zero approaches without any reference to reaching net zero by 2050, thereby reflecting 'diverse jurisdictional realities and accommodate signatories from a wider range of markets'. China and the US are among the major countries that are not targeting net zero by 2050: China is aiming for carbon neutrality by 2060 and the US has withdrawn completely from the Paris Agreement. NZAM said it would resume its activities fully in January 2026 with an updated list of members.[200] These changes were not sufficient to stop State Street Investment Management withdrawing from NZAM in the same month.[201]

In January 2026, Royal London Asset Management rejoined NZAM, citing the updated Commitment Statement's allowance for a 'more flexible and globally applicable foundation for climate-aligned investing'.[202] Also in January 2026, a group of 40 asset owners – including AP2, AP3, Border to Coast Pensions Partnership, ERAFP and FRR, Strathclyde Pension and the University Pension Plan Ontario – released a statement recommending that their asset managers should continue to participate in or join NZAM: 'As owners of capital, we will continue to engage with our asset managers regarding their commitment to the NZAM initiative. The updated Commitment Statement presents an opportunity for asset managers to reaffirm their commitment to supporting investing aligned with the global goal of net zero emissions. This sends an important and public signal to the asset owner community and the wider market on how they are managing climate-related financial risks and opportunities on behalf of their clients'.[203]

Net-Zero Insurance Alliance

The Net-Zero Insurance Alliance (NZIA), also convened by the UN Environment Programme (UNEP), was launched in 2021 and has developed the foundational concepts and frameworks to support its members as they work towards decarbonizing their insurance and reinsurance underwriting portfolios.[204] However, in 2023, a number of major insurers pulled out of NZIA, including Munich Re, Zurich, Hannover Re, Swiss Re, SCOR, Allianz, AXA and Lloyd's of London. Political pressure from some US states and the threat of anti-trust claims have persuaded these companies to leave. Prior to leaving, John Neal, CEO of Lloyd's of London, called on NZIA to make its membership rules less prescriptive or risk

[200] https://www.ipe.com/news/net-zero-asset-managers-initiative-unveils-new-chapter/10133397.article
[201] https://www.ft.com/content/4fb50d00-9b64-4dbf-b6d5-07b8deceb582
[202] https://funds-europe.com/rlam-rejoins-net-zero-group-as-others-deliberate/
[203] https://www.ipe.com/news/asset-owners-point-asset-managers-towards-continued-nzam-involvement/10134935.article
[204] https://www.unepfi.org/net-zero-insurance/

falling apart. AXA said it would focus on its own sustainability goals. The remaining members, which include Aviva, Generali and NN, are trying to overhaul NZIA, while remaining 'fully committed to the net-zero transition and [are] engaging with a broader community of stakeholders on the evolution of the NZIA'. A report by Insure our Future found that European insurers, including Lloyd's of London, Zurich and Swiss Re, underwrote more around a third of US coal production. Lloyd's of London is the world's biggest fossil fuel underwriter, earning an between $1.6bn and $2.2bn in annual premiums in 2022. Hortense Bioy, global director of sustainability research at Morningstar, said 'Some insurers have taken steps to align their business with the goals of the Paris Agreement and commit to becoming net zero by 2050, but many haven't. Underwriters face mostly physical risks, and their job is to price and manage these risks. Modelling weather events and physical hazards is their core expertise, and supposedly something they can do better than banks or asset managers. They are already factoring in the fact that as temperatures rise and physical risks increase as a result, more assets will become increasingly difficult, if not impossible, to insure'.[205]

Net-Zero Banking Alliance

The Net-Zero Banking Alliance (NZBA) was also launched in 2021 under the UNEP.[206] Participating banks commit to:

- Transition the operational and attributable greenhouse gas (GHG) emissions from their lending and investment portfolios to align with pathways to net-zero by 2050 or sooner.
- Within 18 months of joining, set targets for 2030 or sooner and a 2050 target, with intermediary targets to be set every 5 years from 2030 onwards.
- Banks' first 2030 targets will focus on priority sectors where the bank can have the most significant impact, i.e., the most GHG-intensive sectors within their portfolios, with further sector targets to be set within 36 months.
- Annually publish absolute emissions and emissions intensity in line with best practice and within a year of setting targets, disclose progress against a board-level reviewed transition strategy setting out proposed actions and climate-related sectoral policies.
- Take a robust approach to the role of offsets in transition plans.

However, in April 2024, the European Central Bank released a White Paper (*Business as Usual: Bank Climate Commitments, Lending, and Engagement*) which indicated that global banks with climate-related targets had done little to change their business practices

[205] https://www.reinsurancene.ws/axa-and-allianz-have-announced-their-exit-from-the-nzia/; https://www.fnlondon.com/articles/major-insurers-risk-falling-behind-on-climate-change-as-net-zero-coalition-fights-for-survival-20240201

[206] https://www.unepfi.org/net-zero-banking/

to meet their goals: 'Climate-aligned banks do not change their lending or loan pricing differentially compared to banks without climate commitments, suggesting they are not actively divesting. …Further, we find no evidence of a change in interest rates charged by climate-aligned banks to high-emission firms'. The White Paper concluded: 'Our results cast doubt on the efficacy of voluntary climate commitments for reducing financed emissions, whether through divestment or engagement. More broadly, it suggests that voluntary private-sector initiatives may have relatively little impact on decarbonization'.[207]

In January 2025, Morgan Stanley withdrew from the Net-Zero Banking Alliance, saying that its 'commitment to net zero remains unchanged. We aim to real-economy decarbonisation by providing our clients with the advice and capital required to transform business models and reduce carbon intensity. We will continue to report on our progress as we work towards our 2030 interim financed emissions target'. It followed withdrawals by other top US investment banks, including JP Morgan, Goldman Sachs, Citigroup, Wells Fargo and Bank of America in response political pressure and antitrust concerns following the 2024 US general election.[208] In response to these withdrawals, GFANZ (the Glasgow Financial Alliance for Net Zero) has lowered its requirements for membership, saying it will now focus on green investment opportunities instead of decarbonisation: 'GFANZ going forward will allow any financial institution working to mobilise capital and lower the barriers to financing energy transition to participate' and become an 'independent principals group, led by CEOs and leaders from financial institutions'. Prior to this, GFANZ expected its members to align their financial activities with the goals of the Paris Agreement which, according to the Intergovernmental Panel on Climate Change, would require them to stop financing oil and gas projects in the US. This was not be acceptable to the new Republican government under Donald Trump who has promised to 'drill, baby, drill'. According to Bob Eccles, visiting professor at the University of Oxford's Saïd Business School, said: 'This new pressure from Trump has given a lot of these guys a reason to leave GFANZ. Some of them were just looking for an excuse. They all signed up too quickly, and didn't think through what this would actually mean for them. This whole finance-centric theory of change is flawed. It's not the role of banks and investors to get rid of fossil fuel companies'.[209] In April 2025, the NZBA announced a series of changes to its framework and principles, including removing a mandatory requirement for banks to align lending and capital markets activities with the goal of limiting global warming to 1.5°C. In October 2025, the NZBA formally ceased operations, when its members voted to transition from a membership-based group to a guidance framework.[210] At its height in 2024, the NZBA had 140 banks representing $74trn of assets.[211]

[207] https://www.ecb.europa.eu/pub/pdf/scpwps/ecb.wp2921~603e225101.de.pdf; https://www.ai-cio.com/news/ecb-research-finds-climate-aligned-banks-all-talk-no-action/
[208] https://www.investmentweek.co.uk/news/4392139/morgan-stanley-leaves-net-zero-banking-alliance
[209] https://www.pensionpolicyinternational.com/sustainable-finance-is-braced-for-its-toughest-year-yet/
[210] https://www.reuters.com/sustainability/cop/net-zero-banking-alliance-stop-operations-after-member-vote-2025-10-03/
[211] https://www.esgtoday.com/net-zero-banking-alliance-drops-requirement-to-align-financing-with-1-5c/

Multi-national and multi-industry initiatives

There are also some multi-national and multi-industry initiatives outside the UN's remit.

Carbon Disclosure Project and the Science Based Targets initiative

First is CDP (Carbon Disclosure Project) which was established in 2000 as an international non-profit organization based in the UK, Japan, India, China, Germany, Brazil and the US to help companies, cities, states, regions and public authorities disclose their environmental impact. It aims to make environmental reporting and risk management a business norm, driving disclosure, insight, and action towards a sustainable economy.[212]

The Science Based Targets initiative (SBTi) was established in 2015 as a collaboration between CDP, the UN Global Compact, the World Resources Institute (WRI) and the World Wide Fund for Nature (WWF). It aims to help companies set emission reduction targets in line with climate sciences and Paris Agreement goals. It is funded by IKEA Foundation, Amazon, Bezos Earth Fund, We Mean Business coalition, Rockefeller Brothers Fund and UPS Foundation. In 2021, it launched the world's first net zero standard, together with a framework and tools for companies to set science-based net zero targets.[213] According to SBTi, by 2024, net zero pledges covered 92% of global GDP and 88% of global emissions.[214] In April 2024, it proposed using 'environmental attribute certificates'[215] (which include emission reduction credits) for offsetting certain emissions. This was criticized by those who said SBTi should be prioritising emissions reductions. Others, such as Varma, the Finnish mutual pensions insurance company, said: 'the inclusion of carbon credits in the SBTi framework introduces a new component that, if managed with rigorous oversight and strict criteria, could serve as an additional tool, …while ensuring that the emphasis on direct reductions remains at the forefront of our sustainability efforts'.[216]

In July 2025, SBTi launched a standard that 'provides clear, actionable science-based guidance for banks, asset owners and managers, private equity firms and other financial institutions to align their lending, investment, insurance, and capital markets activities with avoiding the worst impacts of climate change and achieving net-zero by 2050 at the latest'.

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[212] https://www.cdp.net

[213] https://sciencebasedtargets.org/

[214] https://impact-investor.com/special-report-pension-funds-grapple-with-the-just-transition

[215] The SBTi defines environmental attribute certificates as 'instruments used to quantify, verify and track the environmental benefits associated with climate mitigation activities or projects. Environmental attribute certificates are used in different chains of custody models with varying traceability, e.g., from models where the activity issuing the certificate is traceable throughout the value chain to models where the certificate is traded separately from the underlying activity, not allowing traceability of the activity issuing the certificate to the value chain. Trading of these certificates may allow buyers to make claims, while also providing financial incentives to interventions that reduce greenhouse gas emissions, promote renewable energy or achieve other sustainability objectives'; https://sciencebasedtargets.org/resources/files/call-for-evidence-environmental-attribute-certificates.pdf

[216] https://www.ipe.com/news/time-for-sbti-to-stand-aside-says-allianz-si-head-amid-offsets-fallout/10072848.article

Investors had to publicly commit to reaching net zero by 2050, provide near- and long-term targets, and report annually on their progress.[217] They also had to assess and disclose their exposure to deforestation by 2030. The standard includes a new category for investments in climate solutions, and clearer expectations around engagement, disclosure and the use of transition finance. It also banned project finance or insurance for new oil and gas expansion activities from 2030. Sarah Ben-Moussa at Greenly said: 'for many financial institutions, investing in, primarily, oil and gas, that's going to be a big ask without a transition plan in place'. In addition, the standard moved towards measuring climate progress in dollars, not tonnes of carbon emissions. Under the Financial Institutions Net-Zero Standard, the focus of portfolio eligibility changed from the materiality of the emissions to financial materiality: any activity that generates more than 5% of an investor's total revenues must be covered by the decarbonisation target. Traditionally, decarbonisation targets applied only to portfolios – usually corporate bonds and equities – with a significant level of financed emissions. But the new standard includes sovereign bonds, derivatives, and the capital markets activities of banks. SBTi gives investors the choice between reducing the emissions intensity of the portfolio until it converges with a credible transition pathway, or demonstrating an increase in allocation to assets that support the transition. In the second case, investors must first sort their investments into pre-defined categories, including 'in transition', 'climate solutions', 'net-zero aligned' and 'not aligned'. Each category comes with a requirement to increase the proportion over set timeframes.[218]

Institutional Investors Group on Climate Change

Second is the Institutional Investors Group on Climate Change (IIGCC) which was established in 2001 as a forum for collaboration between pension funds and asset managers on issues related to climate change.[219] In 2005, it and the Carbon Trust worked with Mercer to develop a guide for pension trustees to support them in understanding and addressing climate risk. In 2012, IIGCC established the Global Investor Coalition (GIC) to collaborate on joint international projects focused on climate policy, corporate engagement and investment practices. In May 2019, IIGCC helped to establish the Paris Aligned Investment Initiative (PAII), an investor-led forum to support investors in aligning their portfolios and investment activities to the goals of the Paris Agreement.

In April 2021, IIGCC published the Net Zero Investment Framework (NZIF) for decarbonizing institutional investors' assets. In November 2023, it published a 'users guide' to defining, measuring and investing in climate solutions, building on the NZIF. It estimated that $120trn of investment will be required by 2050 in order to keep the world below 1.5°C. Danielle Boyd, head of climate strategy implementation at IIGCC, said that: 'Without a concerted effort to increase investment into climate solutions, the decarbonization part of that approach is unlikely to happen. But there's a big gap in what

[217] https://www.ipe.com/news/sbti-launches-standard-for-investors-net-zero-targets/10131809.article
[218] https://www.ipe.com/analysis/the-verdict-on-sbtis-new-standard-for-investors/10132545.article
[219] https://www.iigcc.org/

this actually means for investors, so this guidance tries to help investors understand how to identify climate solutions, how to measure their impacts, and how to engage with data providers and companies on these issues'. The guidance discussed climate solutions in public equities and corporate fixed income portfolios (together with emissions performance criteria) and their role in corporate transition plans.[220] In February 2024, IIGCC introduced the Cumulative Benchmark Divergence (CBD) which measures the difference between the decarbonization trajectory implied by a company's emissions target and a climate benchmark over the whole pathway to net zero. This is designed to help investors better identify transition risk in their assets and portfolios.[221]

In June 2024, IIGCC released NZIF 2.0.[222] This introduced a Portfolio Decarbonization Reference Target to aid portfolio alignment and investment in climate solutions. It also included guidance for other asset classes, such as sovereign bonds, private equity, and real estate infrastructure. Suggested actions included investor engagement with issuers and other actors in the investment value chain to advance the global decarbonization agenda, such as pressing data providers to increase the quality and consistency of consumption emissions disclosures, 'land use, land-use change, and forestry' (LULUCF), methane emissions reporting, and to develop indicators to better assess criteria set out by the guidance.[223]

In September 2024, IIGCC finalized materiality-based guidance for investors about addressing Scope 3 emissions in investments, including checking their portfolios' exposure to key 'hotspots', such as particular categories of value chain emissions related to the energy sector, industrials and materials, banking, consumer products and services, and food producers. It pointed out that an asset's value chain emissions, e.g., from the use of a company's products, are material to the mitigation of financial risks associated with climate change and should be taken into consideration by investors. It said investors should develop a bespoke strategy to approaching Scope 3 emissions in the context of what is material to their individual portfolios and this should be communicated transparently.[224]

In March 2025, IIGCC launched a consultation on the Climate Resilience Investment Framework (CRIF) which is intended to encourage more investors to factor climate risk into their investment strategies by outlining the benefits of managing physical climate risks from a financial materiality perspective: 'Reducing physical climate risks across value-chains and encouraging investment in adaptation solutions is part of this framework promotion of systemic resilience as part of the overall objective of climate resilience goals'. The CRIF is designed to complement the Net Zero Investment Framework (NZIF), but also

[220] https://www.ipe.com/news/iigcc-publishes-investor-guidance-on-climate-solutions/10070079.article
[221] https://www.ipe.com/news/iigcc-unveils-new-corporate-climate-target-assessment-tool/10071691.article
[222] https://www.iigcc.org/hubfs/2024%20resources%20uploads/IIGCC_NZIF%202.0_consultation_2024.pdf
[223] https://www.ipe.com/news/iigcc-finalises-update-to-key-net-zero-guidance-for-investors/10074138.article
[224] https://www.ipe.com/news/iigcc-finalises-materiality-based-scope-3-guidance-for-investors/10075466.article

has differences: including target setting as process-based, not outcome-based, reflecting the nuances of climate resilience; encouraging a shift in focus from merely assessing environmental impacts to actively incorporating climate resilience into investment strategies; and integrating the Physical Climate Risk Assessment Methodology (PCRAM)[225] into existing investor processes.[226]

In August 2024, the €59bn Danish pension fund PKA withdrew from NZAOA (which it joined in March 2021), citing resource strain. It said that instead it would 'focus on the Institutional Investors Group on Climate Change and its Paris Aligned Asset Owners (PAAO) initiative, to maximize the impact of our resources and collective efforts in climate and biodiversity'. NZAOA and PAAO are Glasgow Financial Alliance for Net Zero (GFANZ) asset owner initiatives that are co-ordinated by IIGCC. This was the fourth departure from NZAOA. The Australian super fund CBUS left in September 2022, the German insurer HanseMerkur left in May 2023, and the Church of England Pensions Board left in June 2023. All said they wanted to concentrate on one asset owner initiative.[227]

Global Impact Investing Network and Catalytic Capital Consortium

Third is the Global Impact Investing Network (GIIN) which was established in 2009. It is 'dedicated to increasing the scale and effectiveness of impact investing. [It] builds critical infrastructure and supports activities, education, and research that help accelerate the development of a coherent impact investing industry'. Its members (around 4,000) from 60 countries included asset owners, asset managers, and service providers (with total AUM of $1.5trn in 2024).[228] Related to this is the Catalytic Capital Consortium (C3). 'Catalytic capital' is defined as 'investment capital that is patient, risk-tolerant, concessionary, and flexible. It is an essential tool to support impact-driven enterprises and organizations that lack access to capital on suitable terms through the conventional marketplace. The aim of catalytic capital is to unlock impact and additional investment that would not otherwise be possible, strengthening communities, expanding opportunity and economic growth, and fueling innovation that advances the wellbeing of people and the planet, while laying the groundwork for mainstream investors to participate in transformative investments'. C3 seeks to address the annual funding shortfall of $2.5trn in developing countries that is preventing the world from reaching the UN Sustainable Development Goals.[229] According to Mónica Vásquez del Solar, head of strategy and impact at Social Nest Foundation, 'These investments are made by investors willing to take on greater risk, those capable of investing in for example early-stage startups, more transformative business models, or early-stage investment vehicles that face challenges in securing their first round of funding.

[225] https://www.mottmac.com/en/insights/topics/pcram-the-industry-methodology-for-climate-resilient-infrastructure-investment/
[226] https://www.ipe.com/news/iigcc-launches-climate-resilience-framework-consultation/10129263.article
[227] https://www.pensionpolicyinternational.com/danish-pension-fund-leaves-net-zero-asset-owner-alliance/
[228] https://thegiin.org/
[229] https://www.macfound.org/programs/field-support/impact-investments/catalytic-capital-consortium/; https://catalyticcapitalconsortium.org/

Without these investors, entrepreneurs and impact fund managers would find it impossible to build a track record that might allow them to scale their models and maximize impact'.[230]

In October 2025, GIIN's *State of the Market 2025* report revealed strong growth in impact-related private equity investments, with pension funds supplying the largest pool of impact capital, followed by insurance companies and family offices. AUM in impact assets within a sample group of 429 respondents increased to $448bn in 2025 from $249bn in 2024, and $129bn in 2019. Further, 72% of investors expressed satisfaction with the financial performance of their impact portfolios, while 90% reported satisfaction with their impact performance. Impact investors were predominantly based in high-income countries (85%), particularly in North America and Western Europe, and tended to invest domestically. Energy was the most targeted sector, with 57% of respondents making at least one investment, followed by agriculture and forestry with 55%, and financial services and healthcare, which both received 51%. Private equity allocations grew from $15.2bn to $79.5bn, while private debt and public debt rose also saw big increases. Real assets nearly doubled, reflecting a shift toward tangible, climate-aligned investment.[231]

Network for Greening the Financial System and Climate Financial Risk Forum

Fourth is the Network for Greening the Financial System (NGFS) set up in 2017.[232] This is a network of 114 central banks and financial supervisors which aims 'to help strengthen the global response required to meet the goals of the Paris Agreement and to enhance the role of the financial system to manage risks and to mobilize capital for green and low-carbon investments in the broader context of environmentally sustainable development. To this end, the Network defines and promotes best practices to be implemented within and outside of the Membership of the NGFS and conducts or commissions analytical work on green finance'.[233] [234] Related to this is the Climate Financial Risk Forum (CFRF), an industry forum jointly convened by the UK Prudential Regulation Authority and Financial Conduct Authority.[235] On 17 January 2025, three days before the inauguration of Donald Trump as the 47th President of the United States, the US Federal Reserve Board announced its withdrawal from the NGFS, on the grounds that 'the work of the NGFS has increasingly broadened in scope, covering a wider range of issues that are outside of the Board's statutory mandate'. [236]

[230] https://impact-investor.com/viewpoint-the-transformative-power-of-catalytic-capital
[231] https://impact-investor.com/giin-report-impact-investing-surges-despite-global-headwinds
[232] https://www.ngfs.net/en
[233] https://www.ngfs.net/en
[234] NGFS identifies seven different transition scenarios: Current Policies, Nationally Determined Contributions, Fragmented World, Delayed Transitions, Low Demand, Below 2°C, and Net-Zero 2050. Of these, only the Low Demand and the Net-Zero 2050 scenarios are compatible with the 1.5°C global warming goal.
[235] https://www.bankofengland.co.uk/climate-change/climate-financial-risk-forum
[236] https://www.federalreserve.gov/newsevents/pressreleases/bcreg20250117a.htm

Climate Finance Leadership Initiative

Fifth is the Climate Finance Leadership Initiative (CFLI) formed in 2019 by Michael R. Bloomberg in his role as UN Special Envoy on Climate Ambition and Solutions, at the request of the UN Secretary General, António Guterres, to 'support a global mobilization of private finance in response to the challenge of climate change' both in industrialized countries and the Global South. It brings together leading private sector institutions (including corporates, commercial and investment banks, insurers, asset managers, and asset owners), policymakers and development finance institutions. Founding members included Allianz Global Investors, AXA, Bloomberg, Enel, Goldman Sachs, Japan's Government Pension Investment Fund (GPIF), HSBC, and Macquarie. [237]

Mirova and Robeco fund manager-led initiative to standardize the calculation of avoided emissions

Sixth is a fund manager initiative to establish a standardized method for calculating avoided emissions in commercial environmental projects, such as electric car manufacturing. The initiative is led by Mirova and Robeco, and includes Edmond de Rothschild, Natixis CIB, Lombard Odier, Comgest, Man Group, Sienna IM and Caisse des Dépôts. It aims to develop a standardized toolkit to calculate avoided emissions and then to encourage data providers to introduce avoided-emissions (i.e., low-carbon) solutions based on the metrics. The toolkit will also be used by fund managers with exposure to asset classes, such as infrastructure and project financing. Two consultancies, I Care by Bearing Point and Quantis, were appointed in January 2024 to build the database and toolkit. The database will initially consider 80 low-carbon solutions, such as biomass energy, recycled plastic and low-carbon concrete. As an example, the group said that if it is relevant to take into account all the resources and the recyclability of components that come into play in the production of an electric vehicle, it is also relevant to understand and measure the carbon emissions that can be avoided by an electric vehicle in a transport sector still very dependent on thermal engines. Lucian Peppelenbos, climate and biodiversity strategist at Robeco, said: 'Avoided emissions are the missing piece of the puzzle when it comes to facilitating transition finance. At a global level, much more capital needs to go into climate solutions. This metric can help to direct capital flows towards companies that provide the most effective climate solutions'. Fees will be 'reasonable' to encourage widespread market use.[238]

Allianz's dashboard to track the transition pathway to net zero

Seventh is SAMEpath, a dashboard released by Allianz in January 2024 to track the transition pathway to net zero by 2050 across more than 50 industries. The tool outlines

[237] https://www.bloomberg.com/cfli/about/

[238] https://www.funds-europe.com/news/fund-managers-select-consultants-to-create-missing-piece-of-climate-finance-puzzle; https://www.responsible-investor.com/investor-backed-avoided-emissions-data-project-kicks-off/

the emissions reductions required to hit targets, as set out in the 2015 Paris Agreement. It has a number of functions, including customized searches on climate scenarios, the identification of climate transition risks across sectors and the economy, and the carbon price required to achieve a reduction in emissions. The tool can form the basis for business, investment and underwriting decisions worldwide.[239]

International Organization of Securities Commissions' initiative for companies world-wide to adopt sustainability-related financial disclosure standards

Eighth is the International Organization of Securities Commissions (IOSCO) which cover 95% of the world's securities markets. In December 2023, it announced that around 130,000 companies world-wide would adopt the sustainability-related financial disclosure standards, across both trading and capital raising, developed by the International Sustainability Standards Board. Erkki Liikanen, chair of the IFRS trustee board, said: 'By endorsing the ISSB standards, securities regulators around the world are working to achieve the consistency and comparability of information that capital markets demand'.[240] However, in contrast to the double materiality approach of the EU, the ISSB has adopted a single materiality approach, where companies report only on the impact of a sustainability topic on their business. There are also differences between securities commissions at the national level. For example, in March 2024, the Securities and Exchange Commission (SEC) released the first climate disclosure rules for US corporates to 'provide investors with consistent, comparable, and decision-useful information, and issuers with clear reporting requirements'.[241] The disclosures are less onerous than the original proposals, e.g., only large public companies are required to calculate and report certain greenhouse gas emissions, and then only if they are considered 'material'; value chain greenhouse gas emissions are excluded; and the climate expertise of the board of directors does not have to be reported. This differs from both EU requirements and the new IFRS S2 rules.[242]

Accounting for Sustainability

Ninth is Accounting for Sustainability (A4S)'s 2024 Sustainability Principles Charter for the UK bulk annuity process which establishes guiding principles for the bulk annuity process focusing on transparency, decision making, reporting and engagement, and collaboration.[243] This is an initiative that has brought together schemes, insurers and

[239] https://www.investmentweek.co.uk/news/4168121/allianz-unveils-dashboard-track-transition-net-zero
[240] https://www.fnlondon.com/articles/more-than-100000-firms-to-use-new-sustainability-disclosure-standards-says-global-securities-chair-issb-iosco-20230725
[241] https://www.pensionpolicyinternational.com/how-sustainability-disclosures-and-regulations-benefit-investors/
[242] https://www.theguardian.com/business/2024/mar/06/us-sec-climate-change-emissions-disclosure
[243] There are four key principles:
1. Transparency: Transparency of values, principles and investment beliefs in relation to sustainability, as well as ongoing commitments that may guide future policy and practice affecting sustainability approaches.

advisers. Founding signatories include pension schemes (Cancer Research Pension Scheme, Church of England Pensions Board, HSBC Bank Pensions Scheme, Railpen, and Railways Pension Scheme), insurers (Aviva, Just Group, Legal & General, Pensions Insurance Corporation, Standard Life, and Rothesay), and advisers and trade bodies (Cardano, Aon, Hymans Robertson, LCP, Mercer, Redington, the Pensions and Lifetime Savings Association and the Pi Partnership Group). The motivation for the charter was concern over whether bulk annuity transactions would maintain the sustainability strategies established by pension schemes. and how they would then be transferred over in a bulk annuity process.[244]

In February 2025, signatories of the Sustainability Principles Charter agreed to adopt the Bulk Annuity Sustainability Survey (BASS), reducing the number of surveys used by different advisers to assess insurers' sustainability credentials for the bulk annuity process from 10 to 1. The aim is to improve the efficiency of the process and the range of information available for comparing insurers' responses on sustainability.[245]

Net Zero Engagement Initiative

Tenth is the Net Zero Engagement Initiative (NZEI) which launched in March 2023. NZEI's aim is to 'build on and extend the reach of investor engagement beyond the Climate Action 100+ focus list, including more companies that are heavy users of fossil fuels, contributing to demand for its products. The objective is to help investors align more of their portfolio with the goals of the Paris Agreement, as set out by their net zero commitments. …Under the [IIGCC's] Net Zero Investment Framework (NZIF)…investors should engage, or classify as aligned, assets that account for 70% of financed emissions in material sectors. ...The central ask of investor engagement via NZEI is a corporate net zero transition plan'.[246] In May 2024, IIGCC released guidance (*Net Zero Investment Framework for the Private Debt Industry*) to the private debt industry (involved in direct lending, venture/growth debt, opportunistic credit, structured credit, fund financing and private placements) on establishing a cohesive framework for setting and delivering net

2. Decision making: Evidence and understanding of how sustainability considerations are incorporated into investment analysis and decision-making processes, and investment stewardship activity.
3. Reporting and Engagement: Ongoing reporting and engagement to key stakeholders on sustainability commitments beyond the point of transaction.
4. Collaboration: Commitment to ongoing engagement across the pension sector as responsible investment best practice evolves.

Source: https://www.accountingforsustainability.org/en/about-us/our-networks/asset-owners-network/bulk-annuity-sustainability-principles-charter.html.

[244] https://www.ipe.com/news/pension-insurers-charter-commits-to-sustainable-pension-risk-transfers/10071329.article; https://www.accountingforsustainability.org/

[245] https://www.ipe.com/news/sustainability-principles-charter-signatories-adopt-bulk-annuity-sustainability-survey/10128685.article

[246] https://www.iigcc.org/net-zero-engagement-initiative

zero commitments. The guidance includes a 'three-way engagement model' between lenders, portfolio companies (PCs) and private equity (PE) sponsors, includes climate disclosures in loan documentation, and encourages the consistent sharing of standardized climate/ESG data.[247]

Just transition networks

Eleventh are a number of just transition networks. For example, in 2022, a dozen UK pension funds, led by the Church of England Pensions Board, established the Emerging Markets Just Transition Investment Initiative to support climate transition in emerging markets. Similarly, in 2023, the Impact Investing Institute established the Just Transition Criteria in collaboration with 21 global financial institutions.[248] At the UK Impact Investor Forum 2024, pension funds emphasized the importance of taking into account the just transition in their investment strategies, given the risks to members' future health and economic wellbeing associated with global warming and the energy transition. This meant looking beyond maximizing investment returns to consider the long-term interests of members.[249] Another example is Pensions for Purpose which was established in 2017 and is part of 'the global movement for an inclusive, equitable, and regenerative economy'.[250] It is a public B Corp[251] and meets B Lab's standards for social and environmental impact. In January 2025, it published *Integrating Nature & Biodiversity into Investment – An Asset Owner Perspective*.[252] This found that 65% of asset owners were incorporating nature and biodiversity into their sustainability strategies, while a further 20% plan to do so. Bruna Bauer, research manager at Pensions for Purpose, said: 'One key issue is that nature and biodiversity are still primarily viewed through the lens of risk mitigation rather than opportunity. It's essential to highlight the financial value of preserving and restoring ecosystems'.[253]

International collaboration between pension funds

Twelfth, pension funds have begun to collaborate internationally to deliver net zero. An example is 'Mobilising pension capital for net zero: A policy blueprint for the UK'. This is a joint venture by a around a dozen large UK and Australian funds, pension-fund-owned investors, and the Pensions and Lifetime Savings Association (PLSA). It was set up in October 2024 in response to a new UK government which has plans to rapidly increase

[247] https://www.iigcc.org/resources/nzif-private-debt-industry; https://www.portfolio-institutional.co.uk/esg-hub/climate-change-investor-group-sets-out-private-debt-framework/
[248] https://impact-investor.com/special-report-pension-funds-grapple-with-the-just-transition
[249] https://impact-investor.com/impact-investor-forum-leading-pension-funds-on-managing-a-just-transition/
[250] https://www.pensionsforpurpose.com/; https://www.pensionsforpurpose.com/knowledge-centre/press/2018/09/01/a-history-of-pensions-for-purpose-so-far/
[251] https://www.bcorporation.net/en-us/certification/
[252] https://www.pensionsforpurpose.com/assets/uploads/2025-01-30-Impact-Lens-Biodiversity.pdf
[253] https://www.pensionpolicyinternational.com/asset-owners-increasingly-aware-of-risks-of-biodiversity-loss-report-says/

clean power. The government wants to work with the private sector to double onshore wind, triple solar power, and quadruple offshore wind by 2030. It also wants to expand new net zero technologies, such as hydrogen and carbon capture and storage. This will require tens of billions of pounds of investment annually. The signatories to the blueprint collectively represent £1.7trn in pension savings from around 30 and 10 million workers in the UK and Australia, respectively. Many are already major investors in the infrastructure of each country. The blueprint's 20-point plan seeks an active and coordinated approach by government, investors and industries across planning, climate, energy, fiscal and industrial decarbonization policy. This would help unlock further investment in the UK's net zero transition, drive economic growth and deliver appropriate risk-adjusted returns on workers' retirement savings. The objective is a pipeline of investable projects in which pension fund capital can participate in line with their fiduciary duty to members. Gregg McClymont, executive director for public affairs Europe at IFM Investors, one of the signatories to the blueprint, said: 'Our recommendations are led by the call for the government to take a long-term approach with respect to energy transition investments. … Such an approach will encourage the co-investments which will be an important part of energy transition finance. … [T]he blueprint's broader aim is to deepen dialogue between government and pension capital on the financing of the energy transition. After all net zero will be reached project-by-project, sector-by-sector over the next 25 years'.[254]

Industrial Transition Accelerator

Thirteenth is the Industrial Transition Accelerator (ITA), whose aim is to 'galvanize leaders from across industry, finance, and governments to scale the decarbonization of heavy-emitting industries. Backed by a vast network of climate innovators, industry leaders and technical experts, the ITA seeks to unlock investment and drive solutions across six critical sectors that account for roughly 30% of global emissions: aluminum, cement, chemicals, steel, shipping, and aviation'.[255] It wants governments to implement measures that stimulate the demand for green products. It estimates that such measures could unlock up to $1trn in green investments by 2030 and drive the development of over 500 sustainable industrial facilities in sectors, such as steel, aluminium, and aviation.[256] The ITA was launched at COP28 in December 2023.

The OECD's Climate Adaptation Investment Framework

Fourteenth is the OECD's Climate Adaptation Investment Framework (CAIF) which 'aims to support governments' efforts to unlock investment in adaptation to build resilience to climate change. Building upon the foundation of the OECD's Policy Framework for

[254] https://www.ipe.com/analysis/viewpoint-pension-funds-must-be-at-the-centre-of-the-uk-investment-debate/10076163.article
[255] https://ita.missionpossiblepartnership.org/
[256] https://funds-europe.com/cop29-uk-launches-carbon-market-integrity-priciples

Investment and the Foreign Direct Investment (FDI) Qualities Policy Toolkit, it identifies the key domestic policies that are particularly relevant for enabling climate change adaptation investment. The scope of the CAIF includes both public and private investment, given that both sources will be critical for climate adaptation. …Increased public and private investment will be needed in activities that help to reduce harms or realise any potential opportunities due to the impacts of climate change ('adaptation investments'), such as the development of climate-resilient infrastructure, food systems and supply chains. Adaptation investments are economically and socially worthwhile. The benefits will be context specific, but there is a large volume of economically worthwhile investment opportunities: one study identified USD 1.8 trillion of adaptation investments, with benefit-cost ratios ranging from 2:1 to 10:1'.[257]

University-based research programs on climate change and solutions

A number of universities have begun programs of research on climate change and solutions. Examples are Princeton University's Net-Zero America Project,[258] MIT's Climate Pathways Project,[259] with its En-ROADS online climate solutions simulator,[260] and the London School of Economics and Political Science (LSE)'s Grantham Research Institute on Climate Change and the Environment.[261] In 2017, the Global Research Alliance for Sustainable Finance and Investment (GRASFI) was established by a network of global research universities 'in order to promote rigorous and highly impactful academic research on sustainable finance and investment'.[262]

Another example is the EDHEC Climate Institute established by EDHEC Business School. In 2025, it published a new framework for probabilistic climate scenario analysis in a study entitled *How to Assign Probabilities to Climate Scenarios* by Riccardo Rebonato, Lionel Melin, and Fangyuan Zhang. Using a large meta-dataset of 5,905 Social Cost of Carbon (SCC) estimates from 207 academic studies, the study utilized two methodologies: one based on expert assessments of carbon pricing, and the other on a maximum-entropy approach that requires minimal prior assumptions. These approaches produced consistent estimates of the likelihood of different climate outcomes by 2100. The key findings from the study are:

- A 35-40% chance that temperatures will rise beyond 3°C by 2100, a level with severe implications for global stability and risk management.

[257] https://www.oecd.org/en/publications/climate-adaptation-investment-framework_8686fc27-en.html
[258] https://netzeroamerica.princeton.edu/
[259] https://mitsloan.mit.edu/centers-initiatives/sustainability-initiative/mit-climate-pathways-project
[260] https://www.climateinteractive.org/en-roads/; https://en-roads.climateinteractive.org/scenario.html?v=24.1.0
[261] https://www.lse.ac.uk/granthaminstitute/
[262] https://sustainablefinancealliance.org/

- The 1.5°C target is technologically feasible, but highly improbable without rapid, radical policy shifts.

- A median warming estimate of 2.7°C, indicating significant departure from the Paris Agreement goals.

- Physical climate damages outweigh the economic costs of transition – underscoring the need for realistic climate finance frameworks.

To demonstrate the model's applicability, the authors aligned their framework with the structure of the Oxford Economics climate scenarios. They find that more than 90% of the probability mass is allocated to scenarios characterized by limited or delayed abatement. The authors conclude that without probabilities, scenarios are limited in their ability to inform risk-adjusted decision-making.[263]

A further example is The Green Finance Research Advances is an International Research Conference for academics and professionals, co-organized by Banque de France and Institut Louis Bachelier, with the participation of Institut de la Finance Durable and the Institute for Climate Economics-I4CE.[264]

Industry-based research programs on climate change and solutions

More recently, private-sector companies have started devoting resources to climate change research.

One example is scenario modelling by Club Vita. In December 2025, Amy Walker, an actuary at the firm, discussed Club Vita's updated *Hot and Bothered?* report. She pointed out that: 'Many of the climate-related events and health impacts we now face have never happened before and will not be captured by simply projecting historical trends. This is where narrative-based scenario modelling becomes essential. It is one of the most powerful tools we have to make sense of uncertainty. By exploring the impact of possible future events, we can stress test our assumptions while understanding how these events might play out over time. For longevity in particular, crafting scenarios can help us grapple with big-picture forces like climate change, shifting demographics, and evolving public health trends, all of which unfold over decades with little historical precedent'. She argued that scenario analysis can help pension funds and (re)insurers integrate the issues of climate change and resource constraints into their broader risk management frameworks.

The report discussed three scenarios (but did not apply any probabilities to the scenarios):

- Scenario 1: Sustained stagnation. Under this scenario, limited adaptation and mitigation lead to severe global impacts. Initially, there is a lack of response to resource and environmental risks until they cause significant societal harm. By the

[263] https://climateimpact.edhec.edu/publications/how-assign-probabilities-climate-scenarios
[264] https://climateinstitute.edhec.edu/events/green-finance-research-advances-gfra

time the world reacts, climate change has caused crop failures and food shortages. Extreme temperature fluctuations and prolonged heatwaves lead to increased mortality, especially among the elderly, many of whom are pushed beyond their 'frailty point', where heat exhaustion accelerates morbidity. Although current cancer vaccines show promise, their impact is hindered by manufacturing constraints and diet changes due to food scarcity. This results in an upward trend in both cancer and cardiovascular disease. Meanwhile, antibiotic resistance rises. Despite initial drug breakthroughs using artificial intelligence, the development of new antibiotics remains limited. Warmer climates also bring new infectious diseases to the UK, increasing infection rates back to levels not seen in over a century. Pandemics like Covid-19 become common, exacerbated by strained resources that undermine NHS capacity. As a result, the quality of care for age-related conditions, such as frailty and neurodegenerative diseases like Alzheimer's, deteriorates further.

- Scenario 2: Turbulent times. In this scenario, some adaptation occurs but progress is too slow to fully offset the limitations of finite resources and the climate impacts already locked into the system. This scenario can be viewed as largely following the current course, where political will for adaptation and mitigation exists, but progress moves slowly. This gradual pace of change leads to a range of consequences, including rising fuel prices and intensified competition for resources. In the UK, these pressures translate into financial strain and funding limitations for the NHS. At the same time, reduced access to and higher costs of imported food stocks negatively affect public health. Lower-income groups face challenges affording their basic needs, leading to stagnating life expectancy.

- Scenario 3: Rapid response. This more optimistic scenario envisions rapid (but plausible) response to climate change, driven by public awareness, technological innovation, and decisive legislative action. These efforts lead to meaningful environmental improvements and health benefits. Increased adoption of electric vehicles, public transport, and active travel methods (such as walking and cycling) lead to better health and cleaner air. At the same time, significant improvements in green energy availability and healthier diets also reduce greenhouse gas emissions. The UK invests in better protection against extreme temperatures, enhancing crop security and home insulation. This results in fewer cold and heat-related deaths, as well as more efficient emergency services. Improved diet, exercise, and air quality lead to lower incidences of cancer, cardiovascular disease, dementia, and respiratory diseases. Overall, these factors contribute to a smooth projection of longevity, consistent with a fast and orderly transition to a sustainable future including life expectancy increases.

The report then presented the impact of pension scheme liabilities under each scenario. Under sustained stagnation, liabilities fall by 9%. In turbulent times, liabilities fall by 1%. Under rapid response, liabilities rise by 7%. Walker, concluded: 'Scenario analysis is an effective way to try to quantify the potential impact of risk associated with climate change.

It also provides a more accessible way of visualizing the possible future effect of longevity risk and is a useful way to stress test risk management plans'.[265]

COP28 – December 2023

In December 2023, COP28, the 28th United Nations Climate Change Conference, took place in Dubai, United Arab Emirates. The outcome is the UAE Agreement or Consensus, a key component of which is the Global Stocktake, a progress report on climate change measures since the signing of the Paris Agreement in 2015 and what measures are needed to fill the gaps. The UAE Agreement has the following key components:[266]

- The pathway to 1.5°C

The agreement recognizes that to avoid breaching 1.5°C by 2050 requires global greenhouse gas emissions to peak before 2025, followed by deep, rapid and sustained reductions in emissions of 43% (relative to 2019 levels) by the end of 2030, by 60% by 2035, before reaching net-zero carbon dioxide emissions by 2050. Developed nations are expected to take a lead in the 'transition away' from fossil fuels and provide technological and financial support to help developing nations follow them. All countries are expected to develop updated national climate plans (called Nationally Determined Contributions (NDCs)) by 2025, taking account of different national circumstances, pathways and approaches.

- The future of fossil fuels

For the first time in a UN climate declaration, the agreement specifically references the need to reduce global reliance on all fossil fuels – coal, gas, and oil – in order to combat climate change, and, in particular, accelerate moves to 'phase-down unabated coal power'. This is in line with the 'ratchet' mechanism in the Paris Agreement which requires countries individually and collectively to continuously increase their efforts to transition away from fossil fuels in order to achieve the 2050 target. There are caveats, however. For example, the final text of the agreement 'recognises that transitional fuels can play a role in facilitating the energy transition, while ensuring energy security', which is seen as a concession to fossil fuel-dependent countries and new gas-fired power generation projects. There are also potential loopholes. For example, the call to transition away from fossil fuels exclusively refers to 'energy systems', thereby excluding any mention of non-energy uses of fossil fuels, such as plastics and transport.

- Fossil fuel subsidies

[265] https://lminvestor.com/still-hot-and-bothered/

[266] This section is drawn from: https://www.investmentweek.co.uk/news-analysis/4156897/cop28-agreed-climate-summit-dubai; https://impact-investor.com/cop28-pledges-aplenty-now-for-the-action

The agreement calls for 'phasing out inefficient fossil fuel subsidies that do not address energy poverty or just transitions, as soon as possible'. This follows on from COP26's recognition of the urgent need to transition public funds away from supporting carbon-intensive industries and towards clean energy solutions. The challenge is significant, however, since global subsidies for fossil fuel consumption exceeded $1trn in 2022, a record high according to the International Energy Agency. The term 'inefficient' has been criticised for being a potential loophole, given its ambiguity.

- Carbon capture, removal, and abatement

The agreement calls on countries to support global efforts to develop carbon capture and storage, carbon removals and abatement technologies 'particularly in hard-to-abate sectors' – although these are not defined.

- Renewables and clean technologies

The agreement calls for support for new targets to triple renewable energy capacity and double the annual rate of energy efficiency improvements by 2030.[267] These are accepted as challenging targets, but are believed to be achievable if supported by strong policy, investment and planning reforms. It also calls for the accelerated use of 'zero and low emission technologies, including inter alia, renewables, nuclear… and low carbon hydrogen production' to help reduce greenhouse gas emissions, and for the accelerated reduction in road transport emissions 'including through development of infrastructure and rapid deployment of zero and low emission vehicles'. There is also strong support for wind, solar, and energy storage systems that aid the transition away from fossil fuels, with the added bonus that their costs 'have fallen continuously'.

- Methane and non-CO_2 emissions

Methane has a far greater impact on global warming than CO_2. The agreement calls on countries to support global efforts to accelerate and 'substantially' reduce non-CO_2 emissions 'including in particular methane emissions' by 2030. This implicitly targets oil and gas producing countries and companies whose pipeline leaks and flaring are a key source of global methane emissions. It also calls on agriculture, another major contributor, to reduce methane emissions. Major global dairy companies, such as Danone, Kraft Heinz and Nestle, have committed to reporting on their success in reducing their own methane emissions. The Global Cooling Pledge was agreed by 63 countries at the conference with the aim of reducing other key greenhouse gases, such as hydrofluorocarbons (HFCs) and other F-gases which are used in air conditioning and refrigeration.

- Nature, agriculture, and food systems

[267] The International Renewable Energy Association estimates that an average of 1,000 gigawatts of renewable power capacity needs to be built globally every year until 2030; https://www.ft.com/content/6873d96e-3e40-45c6-9d84-8ce27b7b23e1

The agreement also includes text explicitly linking climate and nature, and offered support for the international goals set out in the Kunming-Montreal Global Biodiversity Framework (KMGBF),[268] adopted by 188 countries at the UN Biodiversity Conference COP15 in Montreal, Canada, in December 2022. The KMGBF commits the 196 countries that are signatories to the Convention on Biological Diversity (CBD) to develop National Biodiversity Strategies and Action Plans (NBSAPs) for achieving the 23 targets set by the KMGBF, which included protecting 30% of the land and oceans and recover 30% of the planet's degraded ecosystems by 2030 (the 30x30 target).[269] The text recognises the importance of 'conserving, protecting and restoring nature and ecosystems towards achieving the Paris Agreement goal, including through enhanced efforts towards halting and reversing deforestation and forest degradation by 2030'. It also emphasises the importance of 'ensuring social and environmental safeguards' for nature-based climate solution projects, and invites countries to 'preserve and restore oceans and coastal ecosystems' as a key climate mitigation action. However, while recognizing the vulnerability of food production to the negative impacts of climate change and the need to protect, conserve and preserve water systems, there is little reference in the text about how to transform food systems to reduce emissions and end deforestation.

- International trade

The text says that 'measures taken to combat climate change, including unilateral ones, should not constitute a means of arbitrary or unjustifiable discrimination or a disguised restriction on international trade'. The conference was concerned to avoid countries introducing protectionist measures in the name of climate change mitigation. One potential example of this is the 2022 US Inflation Reduction Act (IRA) which promised $370bn in energy infrastructure investment related tax credits over 10 years, although these would mainly benefit US businesses and tax-exempt organizations, like pension funds, which could take advantage of the tax credits from these investments.[270] Similarly, the EU's introduction of a Carbon Border Adjustment Mechanism (CBAM) in 2026 is concerning developing economies because it could involve import levies on their goods and services if they fail to meet EU climate regulations and standards. While the agreement did not explicitly oppose CBAMs, it did call for greater 'transboundary cooperation' to meet the Paris goals and for a recognition that developing economies 'have significant capacity constraints' when trying to decarbonize.

- Circular economy and sustainable lifestyles

[268] https://www.cbd.int/gbf/. Biodiversity is discussed in more detail below.
[269] https://www.unep.org/un-biodiversity-conference-cop-15, https://www.cbd.int/conferences/2021-2022
[270] https://www.pensionpolicyinternational.com/how-sustainability-disclosures-and-regulations-benefit-investors/

The text notes 'the importance of transitioning to sustainable lifestyles and sustainable patterns of consumption and production in efforts to address climate change, including through circular economy[271] approaches, and encourages efforts in this regard'.

- Carbon markets and offsetting

A carbon market trades carbon credits, in which the owners of projects delivering reductions in CO_2 from the atmosphere can sell credits for this which can then be purchased by CO_2 emitters and hence used to offset (i.e., compensate for) those emissions.[272] Article 6 of the Paris Agreement covered carbon credit trading between nations and organizations, but the terms have not been formally agreed, and hence the market is still largely an informal one. Indeed, COP28 deferred discussions again until COP29 in Azerbaijan. The main concerns relate to verification and transparency, i.e., ensuring that projects are delivering the promised emission reductions and preventing the issuance of unjustified credits. An example of a current practice that needs to end is 'double-counting', where both the selling and purchasing country or organization claim emissions reductions from the same credits. The absence of formally regulated markets reduces to some extent the incentive to invest in carbon offset[273] projects.

- Climate adaptation

The agreement established a new Global Goal on Adaptation, requiring countries to establish climate adaptation plans by 2025 and implement them by 2030, via their updated NDCs. The goals cover issues such as poverty eradication, gender equality, nature-based solutions, climate resilient agriculture and food systems, water security, and reducing

[271] The circular economy is discussed in more detail below.

[272] One carbon credit constitutes the reduction, avoidance or removal of one tonne of carbon dioxide or its carbon dioxide-equivalent (CO_2e). The reduction, avoidance or removal must be permanent, additional to that which was going to happen in any case, and be verifiable. Carbon pricing mechanisms covered around 20% of global emissions in 2023 (*Financial News*, 27 November 2023, Issue 1359, p9).

[273] The carbon offset market is believed to originate with US power company Applied Energy Services (AES) which had the idea of planting a forest to absorb the CO_2 produced by its Connecticut-based coal-fired power plant. Due to the cost of land in Connecticut, in 1989, it paid 40,000 farmers to plant trees in Guatemala. Carbon offsetting was sanctioned by the 1997 Kyoto Protocol and the UN Clean Development Mechanism. In 2020 – based on a proposal by former Bank of England governor, Mark Carney – the Taskforce on Scaling Voluntary Carbon Markets established to create a formal market for offsets. Today most carbon credits are bought from developers using brokers. Oil companies (e.g., BP and Shell) and the Saudi government have carbon trading desks. McKinsey has predicted that the value of voluntary offsets could rise from $2bn to $50bn in 2030. There is, however, concern that aggressive tactics might be used to relocate local and indigenous people in order to plant trees and create credits. Further, REDD ('reducing emissions from deforestation and forest degradation') projects have to demonstrate that they genuinely conserve forests by 'proving' that the forests would otherwise have been cut down. This is achieved by measuring forest loss in an unguarded reference area. A newspaper investigation in 2023 claimed that more than 90% of rainforest offsets certified by Verra, the world's largest certifier, did not involve genuine carbon reductions and that two-thirds of the carbon credits generated over a decade did not offset any significant pollution; https://www.telegraph.co.uk/environment/2024/04/21/carbon-offsetting-greenwashing-private-jet-celebrity/

climate impacts on health, ecosystems, biodiversity, and human infrastructure. However, there was lack of detail on how this was going to be financed.

- Climate finance, and loss and damage

COP28 agreed to set up a global Loss and Damage Fund, through which vulnerable countries facing climate impact costs could apply for financial support. At the conference, richer countries committed $792m to the fund. However, the annual cost of losses and damages from climate impacts for developing nations is estimated to be $400bn.

The agreement also lacked a clear financial program to support countries engaged in energy transition and climate adaptation activities. Many developing countries, including the Alliance of Small Island States (AOSIS), were concerned about the limited progress on climate finance, adaptation, and loss and damage. However, the text of the agreement only requires developed countries to 'provide such support voluntarily', although they 'should take the lead in mobilizing climate finance from a wide variety of sources' and that this 'should represent a progression beyond previous efforts'.

The COP27 global climate agreement signed in Egypt in November 2022[274] had estimated that the global transition to a low-carbon economy would require annual investments of $4-6trn, or approximately 4-6% of 2022 global GDP of $95trn.[275] Yet developed countries are still failing to reach an agreed goal to jointly raise $100bn in climate finance annually.[276]

Kieron Boyle, CEO of the Impact Investing Institute, who attended the summit said that key themes discussed by financial services industry leaders, regulators, and policymakers included the need for more effective capital, greater collaboration among financial market actors, governments and civil society, as well as improved risk-sharing mechanisms between the public and private sectors. Much of the heavy lifting in capital mobilization will need to be via mechanisms such as blended finance and catalytic capital. Funding and guarantees from developed world governments and multilateral development finance institutions to leverage much larger flows of private finance into climate change investments is seen as crucial, especially in low-income countries, where perceptions of high investment risk are blocking private capital flows.

On the opening day of COP28, the UAE announced that it would create a $30bn climate-related investment fund called Alterra,[277] with the aim of attracting $250bn of investment in carbon emissions reductions and climate resilience projects by 2030. The fund is seeking to make profits from these climate projects, rather than being a development initiative.

[274] https://unfccc.int/cop27
[275] https://www.statista.com/statistics/268173/countries-with-the-largest-gross-domestic-product-gdp/
[276] The International Energy Agency estimates that the public sector will have to contribute 30% of the total global climate finance needed, with the rest coming from the private sector;
https://www.ft.com/content/6873d96e-3e40-45c6-9d84-8ce27b7b23e1
[277] https://www.alterra.ae/

Launch partners include BlackRock, Brookfield and TPG. The UAE hoped its presence as an investor would be catalytic, giving others the confidence to invest too. A $5bn component of the total will be used to provide risk mitigation capital to incentivize investment flows into developing countries. One of the first projects will be the development of 6 gigawatts of clean energy capacity in India.

Existing funds received additional funding commitments: the Green Climate Fund[278] has pledges totalling $12.8bn from 31 countries; the Least Developed Countries Fund[279] and Special Climate Change Fund[280] have combined pledges of $174m; and the Adaptation Fund[281] has pledges of $188m.

2024 developments in sustainability

In January, the Institut Rousseau published a report entitled *Road to Net Zero* which estimated that the EU needed to invest €1.5trn per year (around 10% of GDP) in order to reach net zero by 2050. The main categories are transport (c€700bn), buildings, (c€425bn), energy production (c€180bn), and agriculture (c€160bn).[282] In February 2024, the Institute for Climate Economics (I4CE) estimated that, in order to meet its target of cutting emissions by 55% of 1990 levels by 2030, the EU must invest €813bn annually (or 5.1% of GDP) between 2024 and 2030; spending in 2022 was €407bn.[283] Also in February 2024, Bloomberg New Energy Finance (BNEF) estimated that global investment in clean energy was $1.2 trillion in 2021, $1.5 trillion in 2022, and $1.8 trillion in 2023. This was around three times as much as investment in oil and gas. Investment in clean energy in 2023 was $670bn in China, $300bn in the US, $341bn in the EU and $74bn in the UK. The increase in renewable energy at around 800 gigawatts (GW) annually was greater than the 700 GW annual increase in power consumption. The International Energy Agency forecasts that fossil use in electricity generation will decline in 2024 in absolute terms and this will continue in future years. The introduction of sodium-ion batteries is estimated to reduce grid storage costs by two thirds to $40 kWh by 2026. Goldman Sachs has estimated that the 2022 US Inflation Reduction Act (IRA) prompted $282bn clean-tech projects in the first year and will ultimately total $3trn.[284] Yet in the midst of this positive news, a study in *Science Advances* warns that the 'Atlantic meridional overturning circulation' (AMOC)[285] could be close to a tipping point as a result of Greenland ice melt diluting seawater salinity and weakening the Gulf Stream which brings warm wet weather to North West Europe. A collapse in AMOC could reduce precipitation and lower average

[278] https://www.greenclimate.fund/
[279] https://www.thegef.org/what-we-do/topics/least-developed-countries-fund-ldcf
[280] https://www.thegef.org/what-we-do/topics/special-climate-change-fund-sccf
[281] https://www.adaptation-fund.org/
[282] https://www.greens-efa.eu/en/article/study/road-to-net-zero; http://extranet.greens-efa.eu/public/media/file/1/8692; http://extranet.greens-efa.eu/public/media/file/1/8693
[283] *Financial Times Newsletters*, 21 February 2024.
[284] Ambrose Evans-Pritchard (2024) 2024 is the year when the world's green juggernaut becomes unstoppable, *Daily Telegraph*, 13 February.
[285] AMOC or Gulf Stream comprises the northward surface-level flow of warm salty water and the deep-level southward flow of colder water.

temperatures in NW European cities by 5 to 15°C. There could also be a global chain-reaction which destabilizes rainforests.[286]

The activities and pressures on institutional investors and banks is beginning to impact corporates themselves according to the 2024 ESG Risk & ROI Survey of chief financial officers released by accountants BDO. Of 600 CFOs questioned, 53% had embedded or were actively integrating sustainability into their core business strategy. BDO said CFOs 'have embedded sustainability and ESG factors into their overall operating and growth plans – to the benefit of their businesses, workers, stakeholders, and the environment. Driving sustainable value is a long-term game, but companies are also seeing immediate impact on their talent pipeline and workplace culture'.[287]

In February, the Japanese government started issuing transition bonds for its Green Transformation (GX) programme. This aims to raise JPY150trn ($1trn) for advancing sustainable technologies over the next decade.[288]

In 2024, the Just Transition Finance Lab was established at the LSE's Grantham Institute. Its executive director, Nick Robins, believes that institutional investors have a vital role to play: 'They remain key actors in signalling to the rest of the financial system the importance of climate action delivered through a just transition. More than this, pension funds are also pools of workers' capital, often with union and employee representation in their governance, bringing a direct link to the just transition agenda. …[However, there are] four main barriers – the lack of traction in financial decision-making, uncertainty about what good looks like, a lack of rules and incentives and insufficient leadership. The Lab's four objectives are designed to respond to each of these pain points, and our focus on financial instruments is starting with the bond and fixed income markets. [We have] partnered with the Climate Bonds Initiative to drive a more inclusive transition to net zero. The bond market has been one of the most impressive arenas for sustainable finance – green, social, sustainable and sustainably-linked – and Climate Bonds are a very effective market player with high integrity. …A transformation of the nearly $500trn global financial system is needed to bring the just transition to life'.[289]

According to Sandor Steverink, senior investment consultant at WTW in the Netherlands, Dutch pension funds have been analyzing the just transition in the context of the UN SDGs: '[They] have embraced the Sustainable Development Goals. These are part of the Paris Agreement on climate change which includes just transition as an important principle. ….[However], the pension funds are becoming more selective in the SDGs that they are focused on. …Only a limited number of these SDGs are investable, of which SDG 7

[286] René M. van Westen, Michael Kliphuis, and Henk A. Dijkstra (2024) 'Physics-based Early Warning Signal Shows that AMOC is on Tipping Course', *Science Advances*, 10(6);10.1126/sciadv.adk1189
[287] https://www.pensionpolicyinternational.com/esg-increasingly-part-of-core-business-cfo-survey-finds/
[288] https://emea.nikkoam.com/articles/2025/sustaining-the-future-march-2025
[289] https://impact-investor.com/special-report-pension-funds-grapple-with-the-just-transition

'affordable and clean energy' and SDG 10 'sustainable cities and communities' are the most concrete with the highest probability to meet the risk/return targets'.[290]

In April 2024, the UK Financial Conduct Authority published a consultation paper on extending the Sustainability Disclosure Requirements regime to the UK fund management industry which covers around 400 firms with £1.4trn of assets under management. They would be required to use four SDR investment labels for the portfolios they manage: Sustainability Focus, Sustainability Improvers, Sustainability Impact, and Sustainability Mixed Goals.[291] This will mainly impact DC pension plan members who choose their own investments. Fund managers were required to decide whether to adopt one of four sustainability labels by April 2025. However, only 80 funds (with £34.5bn in assets) had chosen a label by this date, whereas 325 funds (with £280bn in assets) had not selected a label. More than 50% of labelled funds have chosen Focus, followed by Impact, Improvers, and Mixed Goals. Further, all labelled funds are actively managed, with global large-cap equity strategies dominating.[292]

However, fund managers must meet strict guidelines to receive a label. For example, a focus fund can only invest in companies that support sustainability, such as solar, wind or hydrogen companies. As a result, many funds have revised their investment policy statements and dropped any mention of 'sustainable'. For example, Schroder British Opportunities Trust chose not to apply for a label and removed any mention of ESG from its investment policy. Fewer funds than expected applied for a label. Morningstar said the low take-up had 'surprised everyone', adding 'There's lower investment demand and also the environment and the anti-ESG sentiment coming from the US mean there is less appetite, despite the surveys saying that investors are interested in sustainability'. The FCA has acknowledged the slow uptake of labels under the Sustainability Disclosure Requirements (SDR) arguing that it is 'still early days for the regime. We recognise that changes to fund managers' investment approaches require significant effort and will take time to phase in. … We are now seeing more and more funds adopting the labels. We have always acknowledged that some firms might not want to use sustainability labels'. Nevertheless, withdrawals from ESG equity funds exceeded inflows for the first time in 2024, with around $48bn of net outflows. European ESG equity funds, which include UK funds, saw $1.6bn of net outflows in November in reaction to Donald Trump's pro-fossil fuel views.[293]

In May, the UK Sustainable Investment and Finance Association (UKSIF)[294] released a report which called for 'supportive policies and regulation' that could lead to a £100bn

[290] https://impact-investor.com/special-report-pension-funds-grapple-with-the-just-transition
[291] https://www.professionaladviser.com/opinion/4205980/extending-sdr-regime-portfolio-management
[292] https://corporate-adviser.com/sdr-fund-labelling-incomplete-as-deadline-passes/
[293] https://www.telegraph.co.uk/business/2025/01/05/why-the-city-is-turning-its-back-on-green-investing-trump
[294] UKSIF's mission is: empowering the financial services industry to move further and faster to ensure a sustainable and responsible financial system; supporting members in the transition to a sustainable future, as exemplified by Net Zero and UN Sustainable Development Goals; and advancing the UK and our

increase in sustainable investment. The UK's sustainable finance sector needed strengthening in three key areas: a 'clear and world-leading sustainability disclosure regime', which would include the adoption of International Sustainability Standards Board standards, the introduction of mandatory corporate transition plans and a UK Green Taxonomy, specifying the criteria for investments to be considered sustainable; clarifying the fiduciary duties of pension scheme trustees to enable them to factor in financially material ESG issues and manage associated risks and impact; and embed biodiversity into the regulatory framework.[295]

Portfolio managers have been responding to proposals like this to design climate-aware multi-asset portfolios. One example is Wellington Management which has developed a framework for integrating climate change and its capital-market effects into multi-asset portfolios, thereby enabling asset owners to incorporate climate objectives into their portfolios via the strategic asset allocation (SAA).[296] The framework consists of three pillars. The first focuses on incorporating climate-related inputs (including transition risks and physical risks) into the capital market assumptions (CMAs) underlying SAA decisions. The second is a climate-aware SAA approach, which adds relevant climate metrics to the asset allocation optimization process. The third pillar is implementation which involves selecting the specific climate-aware building blocks and strategies to meet the desired asset allocation.

In July, the Investment Delivery Forum (ID Forum), representing the UK's long-term saving industry, released an action plan to generate more private investment in support of public infrastructure spending from the UK's new National Wealth Fund (set up by the Labour Government elected on 4 July 2024). Insurance and pensions companies wanted the new government to make greater use of blended finance to attract the long-term private investment needed to help fund costly low carbon and other green infrastructure, such as electric vehicle charging networks, nuclear power development, floating offshore wind, carbon capture technology, and green hydrogen. In particular, they wanted public support from the National Wealth Fund to help mitigate the early-stage risks of investment in new infrastructure that private investors are currently unable to make due to regulatory rules designed to protect policyholders. Over the next 10 years, the UK's long-term savings industry has committed to channelling £100bn into 'productive assets', defined as those contributing to the real economy, expanding productive capacity, speeding up the energy transition or furthering sustainable growth. The plan would also track and report on investments made under the Solvency UK regulatory regime from January 2025. The ID Forum comprises seven insurance and long-term savings companies with an interest in

members in their leadership on sustainable and responsible finance and the integration of sustainability into all strategies and decision-making; https://uksif.org/

[295] https://www.portfolio-institutional.co.uk/esg-hub/uksif-unveils-proposals-for-regulators-to-boost-sustainable-investment/

[296] A blueprint for building climate-aware multi-asset portfolios, Wellington Management, March 2024; https://www.wellington.com/en/insights/climate-aware-multi-asset-portfolios

large-scale infrastructure investment: Aviva, Just, Lloyds Banking Group, M&G, Phoenix, Rothesay and Royal London.[297]

In September, a study from the University of Zurich and Dutch asset manager Robeco found that companies with a higher alignment to the United Nations Sustainable Development Goals were less likely to become embroiled in scandals. The study argued that 'This is imperative for investors: corporate scandals adversely affect market value and often have negative societal and environmental impacts. Aligning investments with the SDGs thus enables investors to enhance their financial and sustainability objectives'.[298]

In October, the cumulative issuance of Green, Social, and Sustainability (GSS) bonds exceeded $5trn, according to ESG data provider MainStreet Partners.[299] In the same month, Italian insurer Generali announced that it would no longer provide insurance for risks associated with oil and gas expansion, including new liquified natural gas (LNG) terminals and gas-fired power plants.[300]

In October, it was announced that China had reduced particulate air pollution by 41% between 2013 and 2022, adding an estimated two years to national life expectancy. Beijing province experienced the largest decline in pollution, dropping 54.1% over the period.[301]

In November, in a speech at the Mansion House in London, the UK finance minister, Rachel Reeves, announced the creation of a Transition Finance Council as recommended by the Transition Finance Market Review.[302] She also gave the Bank of England a mandate to support sustainable finance and updated the remit letters of key regulators and supervisory committees to refer to the need for investment in the green transition. In addition, there were proposals for strengthening the voluntary markets for carbon and nature credits. Pension funds will be expected to show how their assets are being aligned with net zero, in addition to protecting the fund's financial returns from climate change.[303]

In December, the UK Land, Nature and Adapted Systems (LNAS) Advisory Group (a spin off from the Green Technical Advisory Group (GTAG)) published a report (Framework to Develop a UK Green Taxonomy for Adaptation and Resilience) which provides guidance on how to define a taxonomy to help the UK economy adapt to climate change. It outlined a five-step framework to define adaptation and resilience, and to encourage the mobilisation of capital into adaptation investments. The report stated: 'As climate change impacts intensify, the UK faces escalating risks across all sectors of its economy. While

[297] https://impact-investor.com/insurers-outline-blended-finance-plan-for-uk-infrastructure/
[298] https://impact-investor.com/report-sdg-alignment-reduces-risk-of-future-scandals/
[299] https://funds-europe.com/green-bonds-drive-gss-bond-issuance-past-5tn
[300] *Insurance Asset Management*, 23 October 2024.
[301] https://epic.uchicago.edu/insights/chinas-air-quality-policies-have-swiftly-reduced-pollution-improved-life-expectancy/
[302] https://www.gov.uk/government/publications/transition-finance-market-review
[303] https://www.ipe.com/analysis/what-the-mansion-house-speech-means-for-green-finance-in-the-uk/10126456.article

building a net-zero economy remains crucial, adaptation and resilience must be elevated to be a parallel priority. Yet, adaptation investment continues to lag and current financial frameworks are not mobilising capital at the scale needed. …Green taxonomies have become useful tools for directing capital towards environmentally sustainable economic activities. However, their primary focus on mitigation to date has left the adaptation opportunity underdeveloped'. LNAS had previously published a report in October outlining how disclosures in relation to sustainable agriculture, fisheries, and aquaculture could be structured in a UK Green Taxonomy.[304]

Concern was being expressed about the energy and water cooling usage by data centres. With the massive growth of artificial intelligence, the International Energy Agency has estimated that data centres' total electricity consumption could double from 2022 levels to 1,000TWh in 2026, equal to Japan's 2024 total level of electricity demand. Google became the first tech company to commission new nuclear power plants for its data centres. Data centres have been trying to reduce their power usage effectiveness (PUE) factor by investing in closed-loop water consumption and recycling systems.[305]

Also in December, the Trustee Sustainability Working Group (TSWG) was launched with the aims of accelerating the implementation of good sustainability investment practice across the pensions industry and encouraging consultants and investment managers to consider the global financial risks from not transiting to a net-zero world quickly enough. The TSWG said that, while it believes pension regulation has helped to increase awareness of sustainability and climate change, there was now an 'over-emphasis on low level reporting' which had direct implications for the use of trustees' limited resources, especially for small and medium-size schemes. It also believed that much of the climate scenario modelling across the industry was not decision-useful, with the output often 'at variance with the science' and it wanted to encourage further work in this area.[306] In addition, it suggested that innovation was needed to ensure the assets schemes are investing in, such as global index tracking funds, remain resilient.[307]

In 2024, $910bn of green, social, and sustainability (GSS) bonds were issued globally, the highest volume in three years.[308] However, 88 global climate-themed funds (which cover low carbon, climate transition, green bond, climate solutions and clean energy/tech mandates) closed in 2024, up from 52 in 2023 and 18 in 2022. Hortense Bioy, head of sustainable investing research at Morningstar Sustainalytics, said that the main reasons for these closures were poor performance of renewable energy stocks and 'greenwashing concerns, political uncertainty and a growing anti-ESG sentiment' which lowered investor

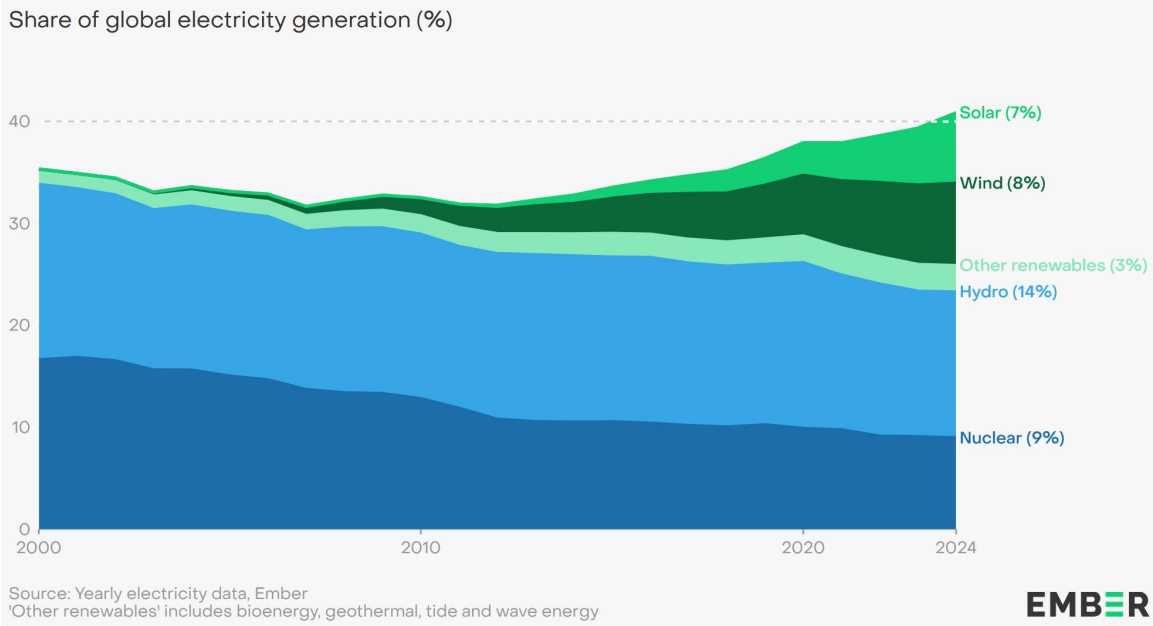
[304] https://www.ipe.com/news/uk-government-advised-on-climate-adaptation-taxonomy/10127948.article
[305] https://hub.ipe.com/asset-manager/pgim/greening-the-grid-data-centres-address-their-footprint/10076603.supplierarticle
[306] https://www.professionalpensions.com/news/4387713/trustee-sustainability-group-launched-bid-accelerate-change
[307] https://www.pensionpolicyinternational.com/uk-pension-trustees-urged-not-to-lose-sight-of-urgency-of-climate-issues/
[308] MainStreet Partners*, Insurance Asset Management*, 6 February 2025.

appetite for climate-based products: 'Clean energy stocks have had a volatile ride over the past six years. There was a boom followed by a four-year burst. So, I would not say they are a safe investment bet'.[309]

Article 9 (dark green) funds experienced net outflows in 2024, highlighting growing investor hesitation and sparking calls for a more accessible sustainable finance framework, according to European Fund and Asset Management Association (Efama) research. By contrast, Article 8 (light green) funds experienced net inflows in 2024, particularly in the money market and bond fund segments. Overall, their net assets held steady at around 51% of the total UCITS[310] and alternative investment funds market.[311]

In 2024, for the first time, more than 40% (40.9%) of global electricity generation was from clean sources, in particular from renewables and especially solar (which increased by 29% over 2023). However, heatwaves in 2024 caused an overall increase in electricity demand (by 4%) which resulted in a small increase in fossil generation, driving up power sector emissions to an all-time high – see Figure 6.[312]

Figure 6: Share of global electricity generation from clean sources, 2000-2024



[309] https://www.investmentweek.co.uk/news-analysis/4409034/green-investors-ditch-worst-case-scenario-trump-amid-rising-climate-fund-closures
[310] UCITS stands for 'Undertakings for Collective Investment in Transferable Securities'. These funds can be sold to EU retail investors and are subject to EU regulations.
[311] https://funds-europe.com/article-9-funds-saw-net-outflows-in-2024-efama
[312] https://ember-energy.org/latest-insights/global-electricity-review-2025/

The World Economic Forum's *Top 10 Emerging Technologies of 2024* report identified a number of technologies that could provide solutions for overcoming climate change. One example is elastocalorics which aims to power heat systems to work like muscles, leading to more sustainable ways of keeping cool. Modern heat pumps use elastocaloric materials, such as nickel and titanium – which emit heat when mechanical stress is applied and cool down when the stress is relaxed – and are more energy-efficient than traditional heating and cooling systems and also avoid using environmentally harmful refrigerant gases. Another technology uses microorganisms which can capture greenhouse gases from air or exhaust gases and convert them into biofuels and protein-rich animal feed, which have the potential to reduce global warming.[313]

COP29 – November 2024

In November 2024, COP29, the 29th United Nations Climate Change Conference, took place in Baku, Azerbaijan. The conference highlighted growing doubts about limiting global warming to 1.5°C, with 2024 set to breach 1.5°C for the first time and with the United Nations Environment Programme (UNEP) Emissions Gap Report, reflecting the slow progress in global climate action.[314] A new deal was agreed for developed nations to provide $300bn annually by 2035 to help developing nations prepare for the impacts of climate change and transition away from fossil fuels, but this is less than the $1.3trn annually the UN estimates is required for a successful transition, implying that the private sector has to make up the shortfall.[315] There was no progress on the commitment to reduce fossil fuel use, with discussions delayed until 2025; the 22-nation Arab Group would not accept any text in the deal which targeted specific sectors, including fossil fuels. There was a new agreement on a consistent mechanism for trading carbon credits internationally, with an accounting system for how a country selling a credit can deduct it from its national carbon inventory to prevent the same credit from being used twice. There was limited progress with the Loss and Damage Fund, established at COP27 to assist developing countries address emergencies such as sea-level rise, migration, reconstruction and recovery, such as the appointment of an Executive Director; to date, the total pledged financial support for the Fund exceeds $730m and is expected to start financing projects from 2025.[316] There was the launch of the Harmoniya Climate Initiative for Farmers which aims to streamline the implementation of climate-agriculture projects, building climate-resilient agri-food systems through innovation and technology; there was particular focus on areas such as regenerative farming practices, precision strip-till farming, enhanced-efficiency fertilisers, and water-saving technologies. Around 30 nations, including 8 of the top 10 methane emitters, endorsed the Global Methane Pledge to reduce global methane emissions by 30% by 2030.[317]

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[313] https://www.weforum.org/stories/2024/06/top-10-emerging-technologies-of-2024-impact-world/
[314] https://www.unep.org/resources/emissions-gap-report-2024.
[315] Some commentators have argued that this financing deal is 'too little, too late', see, e.g., Martin Wolf (2024) Climate change is a global problem – it requires a global solution, *Financial Times*, 27 November; https://www.ft.com/content/a0cfcf55-6b4d-4aeb-a3ec-b3db33575047
[316] COP29_Investment_Briefing, XPS Group, November 2024.
[317] https://funds-europe.com/cop29-climate-action-methane-pledge-agricultural-innovation

At COP29, the UN's Independent High Level Expert Group (IHLEG) on Climate Finance called for the direction of private finance towards emerging markets and developing countries (EMDCs) to meet net zero goals. It was set up at COP26 to assess net zero pledges from the private sector and other non-state entities. Its third report (Raising Ambition and Accelerating Delivery of Climate Finance) stated that: 'The transition to clean, low-carbon energy, urgently building resilience to the impacts of climate change, and protecting nature and biodiversity, requires a rapid step-up of investment in all countries. …This investment push will give a major boost to growth and development, and will lead to large, avoided costs and very substantial savings. But this new growth story can only be realized through a major transformation of the climate finance system based on concerted efforts to unlock investment opportunities and ramp up all pools of finance'. The report also highlighted the need to tackle supply-side regulatory and incentive barriers to remove both legal and organisational constraints to investing in EMDCs, especially for clean energy and green industrialisation: 'While supply-side regulation like the prudential regime for insurance and reinsurance undertakings in the EU, Solvency II, is still a critical barrier to insurers, pension funds arguably do not have the same legal or fiduciary constraints'.[318]

Also at COP29, the UK strengthened its climate commitments, by announcing a target 81% reduction in emissions by 2035. It also unveiled its 'Principles for Voluntary Carbon and Nature Market Integrity', establishing a framework to support high-integrity voluntary carbon markets (VCMs). The principles focus on using carbon credits to complement internal emission reductions, ensuring credit quality, transparent reporting, proactive planning, accurate environmental claims, and collaboration to build a trustworthy, efficient market. The principles aim to enhance market integrity by providing clear guidelines on claims transparency, biodiversity integration, and reporting standards. Mark Kenber, executive director of the Voluntary Carbon Markets Integrity Initiative (VCMI) said: 'The UK Government's principles align closely with the VCMI Claims Code, creating a robust framework for transparent and impactful carbon market participation… While these guidelines are essential, additional incentives will be crucial to encourage the private sector to confidently engage in carbon credits during this decisive decade'.[319]

In December 2024, the Finnish-based Upright Project launched an impact database quantifying the impact of around 1,000 private equity and venture capital funds and 20,000 portfolio companies, having previously introduced a similar data base for 35,000 mutual funds and ETFs in September 2024. Upright used natural language processing technology to investigate 300 million scientific articles, databases from the World Health Organisation and the Organisation for Economic Co-operation and Development, and company disclosures in order to assess funds' environmental, social, health, and knowledge impacts globally. For general partners at PE/VC firms, the databases provide tools to benchmark impact performance, enhance portfolio management, communicate effectively with

[318] https://www.ipe.com/news/un-expert-group-calls-for-major-financial-transformation-to-meet-climate-goals/10076864.article
[319] https://funds-europe.com/cop29-uk-launches-carbon-market-integrity-priciples

stakeholders, and future-proof value creation strategies. Mikael Homanen, head of scientific research, innovation and partnerships at Upright, said: 'It has [previously] been thought to be impossible to measure the impact of private equity because unlisted companies disclose little about their sustainability'.[320]

Also in December 2024, the UK's Sustainability Disclosure Technical Advisory Committee (TAC) published recommendations on how global sustainability reporting standards should be incorporated into UK national law. TAC recommended adopting the International Sustainability Standards Board's first two standards, subject to amendments about reporting timeframes: International Financial Reporting Standard S1 (which explains how an entity should prepare and report its sustainability-related financial disclosures) and International Financial Reporting Standard S2 (which explains how climate-related disclosures should be reported). The ISSB wanted entities to disclose their Scope 1 and 2 emissions in the first year of adoption, with Scope 3 emissions and all other sustainability metrics to follow in the second year. TAC has recommended that sustainability metrics should wait until the third year. The ISSB also wanted investors and banks to use the Global Industry Classification Standard (GICS) for reporting sectoral categories, but TAC said any classification system should be permitted under UK law. The UK was one of the first countries to publicly declare support for the ISSB when it was set up in 2021.[321]

2025 developments in sustainability

In January, a Texas federal judge ruled against American Airlines for prioritizing corporate and ESG interests over the financial interests of the participants in its DC pension plan in breach of its fiduciary obligations under the 1974 Employee Retirement Income Security Act. In a class action lawsuit, the judge has ordered both parties to demonstrate any direct connection between ESG investing and plan underperformance. The judge noted that 'BlackRock couched its ESG investing in language that superficially pledged allegiance to an economic interest. But BlackRock never gave more than lip service to show how its actions were actually economically advantageous to its clients'. BlackRock responded: 'We always act independently and with a singular focus on what is in the best financial interests of our clients. Our only agenda is maximizing returns for our clients, consistent with their choices'.[322] The ESG court ruling prompted a coalition of 22 Republican state financial officials to demand that the Securities and Exchange Commission and Department of Labor implement stricter anti-ESG investing guidelines for asset managers and retirement plans. At the same time, T. Rowe Price research suggested waning enthusiasm for ESG among DC plan consultants.[323]

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[320] https://funds-europe.com/worlds-first-private-equity-impact-database-goes-live
[321] https://www.ipe.com/news/uk-receives-official-advice-on-national-sustainability-reporting-standards/10127864.article
[322] https://www.pionline.com/esg/federal-judge-rules-american-airlines-violated-erisa-esg-investments-401k-plans; https://environmentenergyleader.com/stories/texas-judge-rules-against-american-airlines-esg-retirement-plan-investments,61906
[323] pionline, 31 January 2025.

In January, Donald Trump on becoming US President for the second time, signed an executive order withdrawing the US from the Paris climate accord. Some felt that this left a potentially huge void in global climate leadership, while others pointed to the success of global energy transition at the start of 2025. For example, the International Energy Agency's 2025 *World Energy Report* found that the decarbonisation market had doubled since 2018, exceeding $2trn annually which is twice the size of fossil fuel investments. Further, renewables deployment was 2.2 times higher in the years 2017-23 compared with 2010-16. In addition, there have been significant cost reductions across renewables: solar photovoltaic costs have fallen by 90%, onshore wind by 70%, and batteries by more than 90%. Similarly, a US study by Greenwheel Research in January 2025 entitled *The Energy Transition under Trump 2.0* concluded that:[324]

- Power demand growth is likely to drive deployment of grid infrastructure, gas power and renewables. Gas and renewables – particularly solar and onshore wind – are quick to build and economically attractive even without [federal] support.

- State-level policy may provide a significant backstop to rollback of federal support for clean technologies, particularly for renewables and battery storage, but potentially also for electric vehicles

- Further support for oil and gas production is not alone likely to stimulate growing output. Oil production is likely to be most significantly guided by international price dynamics. Growing domestic power demand and liquefied natural gas (LNG) exports are likely to boost US gas production in the coming years.

- Changes to US policy are not likely to materially alter the global trajectory for fossil fuel and clean technology production and demand, which are driven by wider dynamics and priorities.

Despite this, fossil fuels still supplied 80% of global energy demand and, for the first time ever, global warming rose to above the 1.5ºC target set by the Paris Agreement in 2024. China is emitting more carbon than all the developed nations (the US, Europe, Japan, Canada and Australia) combined. As a result, global warming will continue. The current path is off-trajectory for 2050 targets, while the Climate Action Tracker predicts a median temperature rise by 2100 of 2.7ºC on current policies. Aon's 2024 *Climate and Catastrophe Insights Report* indicated that global natural disasters in 2023 resulted in economic (including infrastructure) losses totalling $380bn. Earthquakes, flooding, severe convective storms and drought led to the biggest losses and significantly damaged both public and private infrastructure assets. However, insurance only covered 30% of losses, leaving a wide protection gap. Charlie Garrood, global head of infrastructure M&A and

[324] https://www.redwheel.com/uk/en/professional/insights/greenwheel-research-the-energy-transition-trump-2-0/#

transaction solutions at Aon, said that 'understanding how resilient infrastructure assets are to potential climate scenarios prior to investing is becoming increasingly important. If an asset does not have adequate resiliency, adaptation measures can lead to additional capex spend, increased operating costs and changes to asset availability, all of which directly impact valuation'.

Francesco Dell'Alba, associate investment director at Cambridge Associates estimates that 'We need to invest $4.6trn per annum in clean energy by 2030, yet we're currently at about one-third of that amount. There are positives such as the growth of renewables…. and progress in electrification. However, you can only electrify about half of total energy requirements, and little has been made to reduce emissions in the other half. To close the gap, a lot more needs to be achieved within hard-to-abate sectors that cannot be electrified, where progress has been slower. Key alternatives for those sectors, such as green hydrogen and carbon capture, have yet to demonstrate proof of concept, with most projects facing delays. Investments in the grid are also lagging and the share of clean-energy investments in emerging markets is too low'. McKinsey & Company estimates that $275trn will need to be invested in physical and energy assets between 2021 and 2050 as part of the net zero transition. Over the same period, the demand for power will increase globally. Ulrik Fugmann, co-CIO and head of investment in the environmental strategies group at BNP Paribas Asset Management said: 'As power demand continues to go up, driven by electrification, reshoring and build-out of data centres to support the development of artificial intelligence, there is an increasing need for low-cost and reliable energy sources'. Despite these challenges, some observers are optimistic about the future. For example, Dan Wells, partner at Foresight Group said: 'Even though emissions are still increasing in absolute terms, the market forces at work are now unstoppable and are pushing us in the right direction'. [325]

In January, the UK Sustainable Investment and Finance Association (UKSIF) recommended that the UK government incorporates the net zero transition in its growth plans: 'Long-term growth and sustainability are mutually reinforcing, given the material risks climate change poses to businesses across the UK and the huge opportunity the UK has to deliver the jobs and growth of the future as a leading sustainable economy'. This followed a speech by UK finance Rachel Reeves at the World Economic Forum in Davos saying that growth was the UK government's 'number one mission' and that this 'trumps' the government's net zero commitments.[326]

In February, the UK Confederation of British Industry (CBI) published a study which found that the UK's net zero economy was growing three times faster than the overall economy: '[There has been a] 10.1% growth in the total economic value supported by the net zero economy since 2023. In 2024, there were 22,800 net zero businesses, with small and

[325] https://realassets.ipe.com/analysis/energy-transition-the-state-of-play-as-trump-seeks-to-withdraw-from-paris-accord/10128310.article
[326] https://www.ipe.com/news/uksif-urges-government-to-incorporate-net-zero-transition-into-growth-plans/10128398.article

medium-sized enterprises (SMEs) making up 94% of the sector. Together, these businesses have pumped £28.8bn into the economy. …They also support 273,000 full-time jobs, outpacing employment in the telecommunications industry. …When you factor in supply chain activities, the sector's economic impact skyrockets to £83.1bn, supporting nearly 951,000 jobs across the UK – that's 2.9% of total UK employment. …Net zero jobs are 40% more productive than the national average, with wages 15% higher than the UK norm'.[327]

In February, The People's Pension, the UK's largest master trust, withdrew £28bn from State Street, because it wanted to prioritize sustainability, active stewardship, and long-term value creation. The trust awarded a £20bn equity mandate to Amundi and £8bn in fixed-income assets to Invesco, both of which supported The People's Pension's commitment to responsible investment. This followed a retreat from ESG initiatives by US firms under the Trump administration.[328]

In February, an Asset Owner Statement on Climate Stewardship was released urging asset managers to evolve and strengthen their climate stewardship strategies and highlighting the 'imperative' need for climate action. The statement aims to 'facilitate constructive conversations on climate stewardship and embed greater efficiencies into the stewardship chain, empowering asset manager stewardship teams to deliver on their asset owner climate objectives as part of their mandates'. It came from a group of 26 pension schemes from the UK, Europe, Australia and the US with assets of $1.5trn, including UK's Pension Protection Fund, The People's Pension, a number of UK Local Government Pension Scheme funds, Pensionskasse Basel-Stadt and SVVK-ASIR, a group of 11 Swiss pension and social security funds.[329]

In February, the International Sustainability Standards Board released research suggesting that investors had a significant and growing interest in improved disclosures on human capital issues: 'Investors of all types operating in all jurisdictions have a strong interest in information on human capital-related risks and opportunities, primarily driven by a desire to manage investment risk and enhance returns'. It added the human capital project to its workplan, mirroring a parallel project on biodiversity and ecosystem services. The research has also revealed increased investor concern around workforce dynamics, such as technological disruption and demographic shifts, which could significantly reshape future disclosures. The workflow will 'evaluate the necessity and feasibility of potential standard-setting'.[330]

[327] https://www.cbi.org.uk/articles/growth-and-innovation-in-the-uk-s-net-zero-economy/
[328] https://www.pensionpolicyinternational.com/uk-pension-fund-pulls-28bn-from-state-street-amid-esg-policy-divisions/
[329] https://www.europeanpensions.net/ep/Asset-managers-urged-to-strengthen-climate-stewardship-strategies.php
[330] https://www.ipe.com/news/issb-research-shows-growing-interest-on-human-capital-disclosure-demands/10129404.article

In March, a report, published by the UK Sustainable Investment and Finance association (UKSIF) and Transition Risk Exeter (TREX) (*Stranding: Modelling the UK's exposure to at-risk fossil fuel assets*[331]), estimated that £15.2bn (or 17% of a total of £88bn) in fossil fuel assets held by UK pension funds were at risk becoming stranded by 2040. The stranded assets relate to fossil fuel reserves which would lose economic viability before the end of their expected operational lifetimes due to climate policies, technological changes, or changing market conditions. This corresponds to 0.5% of the total of £3trn of UK pension assets. The report called for a clear regulatory framework to support sustainable finance and transition finance, including robust transition planning. It said that one of the essential components of an orderly transition would be a clear and credible regulatory framework to support sustainable finance and transition finance.

In March, the Financial Conduct Authority said its sustainability regulatory regime does not prevent investments in defence companies. This is in response to the UK and other European countries increasing military expenditure as a result of a reduced commitment by the US to European security following the election of President Trump. The regulations do not require financial institutions to treat defence companies any differently to other listed entities. They only have two main aims: 'to ensure information about investments claiming to be sustainable can be trusted and readily understood' and 'to improve the quality of sustainability-related information in the market'.[332] Also in March, António Simões, the CEO of Legal & General, said UK military companies should be considered ethical investments because countries need to defend themselves: 'There's no reason in principle why investing in defence companies cannot be consistent with responsible investing. Governments should promote peaceful and inclusive societies but countries also may need to defend themselves. This is a UN-type of principle. We've always said that defence companies, including UK defence companies, can be invested in'. Some fund managers avoid businesses that manufacture weapons, as this is regarded as 'unethical'.[333]

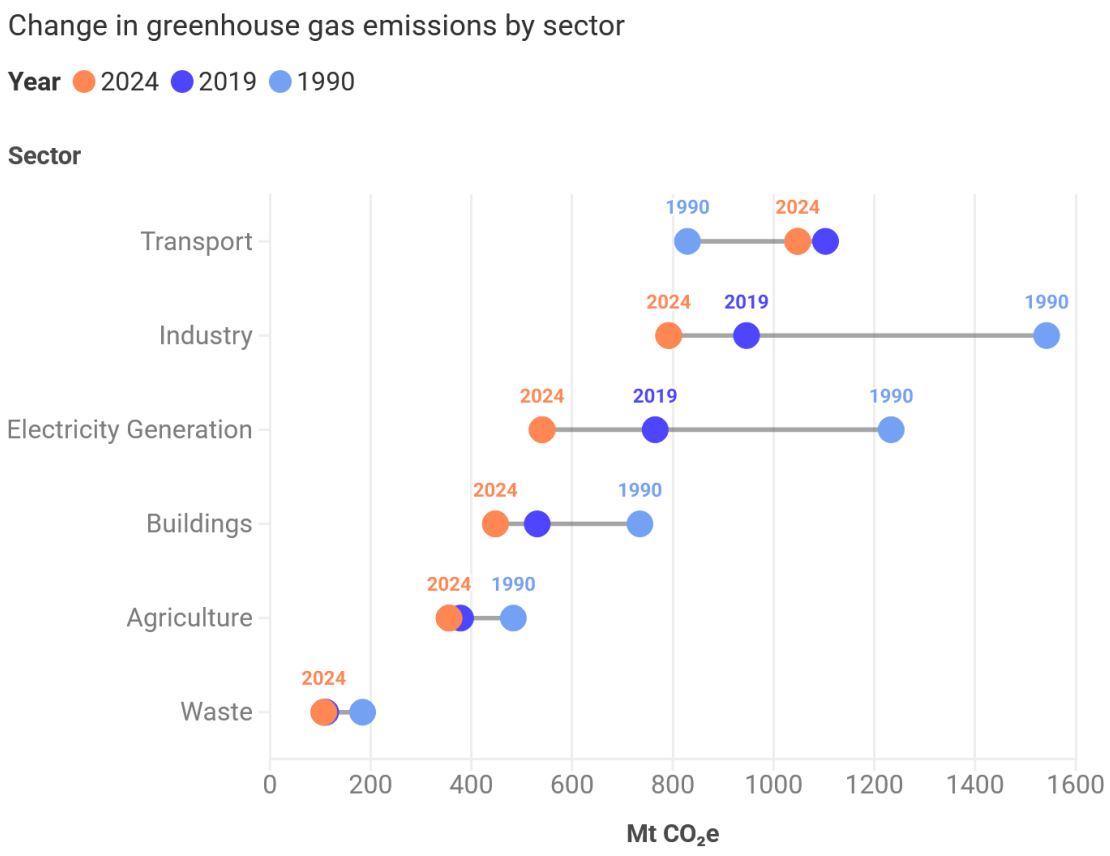
In March, Breakthrough Energy, the climate philanthropy organization founded by Bill Gates, announced that it was closing its policy and advocacy office. Gates conceded that global warming 'will not lead to humanity's demise'. He criticized the 'doomsday view of climate change' which focused 'too much on near-term emissions goals'. Instead, he called for a 'strategic pivot' in the effort against the climate crisis, with the emphasis shifting away from trying to limit rising temperatures in favor of efforts to prevent disease and poverty.[334]

In March, a report released by Transport & Environment showed the success of the EU's Green Deal in terms of reducing transport emissions in Europe. Road transport emissions

[331] https://uksif.org/wp-content/uploads/2025/03/UKSIF-Stranded-Assets-Report-March-2025.pdf
[332] https://www.investmentweek.co.uk/news/4410684/fcas-sustainability-rules-prevent-investment-defence-companies
[333] https://www.telegraph.co.uk/business/2025/03/12/city-must-back-defence-industry-to-protect-britain
[334] https://heatmap.news/climate/breakthrough-energy-layoffs?next_url=%2Fclimate%2Fbreakthrough-energy-layoffs; https://www.theguardian.com/us-news/2025/oct/28/bill-gates-climate-crisis-pivot

have decreased due to the increase in electric vehicles, but this has been partly offset by rising air travel – see Figure 7.[335]

Figure 7: Change in greenhouse gas emissions by sector in Europe



Source: UNFCCC, EEA, Stratas Advisors, Ember• Transport includes international aviation and maritime. Electricity Generation includes heat. 2024 values for Agriculture, Waste, Buildings, Industry are based on 5 year trends

In April, an academic study by Andrew Jackson and Tim Jackson (2025), by analysing the interactions between different industries, investment patterns and financial markets, provided evidence that a delayed and disorderly transition towards net zero emissions would threaten economic and financial stability, while increasing the economic risks and impacts from climate change. Under a disorderly transition scenario, fossil fuel firms that continue to invest in increased production would face huge stranded asset risks and costly write downs, which would, in turn, cause banks to increase interest rates on loans in an attempt to claw back lost capital. Higher interest rates would then create a vicious circle, making it harder for energy companies to raise capital to invest in a belated clean energy transition. There would also be a knock-on impact on the wider economy, with CPI

[335] https://www.transportenvironment.org/state-of-european-transport/state-of-transport-2025

inflation under an extremely disorderly transition scenario peaking at around 10% in 2030, before falling back to 5%.

By contrast, earlier shifts to reach net zero emissions are far more economically beneficial than delayed transitions that are likely to become more rapid and disorderly as governments and businesses seek to respond to escalating climate impacts during the second half of the century. Under a more orderly transition scenario, inflation could rise in the short term as investment in the net zero transition ramps up, but in the medium to longer term investment expenditures would start to fall back to a level consistent with maintaining low carbon infrastructure capital stocks. That would then likely lead to lower inflation as economies become less exposed to energy price shocks.

The study concluded that targeted investments in green technologies, a robust financial framework to support these investments, and a clear and credible transition pathway can enable a smoother transition while safeguarding economic stability. Andrew Jackson said: 'Our work shows how delayed and disorderly transitions could ultimately lead to a combination of increased inflation, higher interest rates, economic stagnation and financial instability. Avoiding these transition risks, as well as the physical risks from climate change, requires that governments take concerted action now and do not delay action on the transition any further. By prioritising an orderly transition that is well signposted, governments can mitigate the risks associated with delayed and disorderly transitions. We need a re-evaluation of current transition strategies to advocate for an approach that considers the economic and financial costs from delaying the transition as well as the upfront costs of the transition itself. Only by taking a holistic view of all these costs can we pave the way for a sustainable future without jeopardising economic and financial stability'.[336]

In April, an Aviva survey of 500 institutional investors found 60% considered sustainability to be a critical factor in private market investment assessments: 'The prime concern for majority of respondents (74%) was to prioritise financial returns with broad ESG integration, which demonstrates investors are not losing sight of the need to generate returns for clients. This matches a wider, global trend in impact investing, with 56% of investors globally seeking private market assets that achieve measurable ESG outcomes. …This trend reflects the growing appeal of investments that combine financial performance with positive societal and environmental impact, with increasing understanding of how these can fit into portfolios. …Larger companies tend to adopt more ambitious strategies, driven by their higher profiles and increased regulatory and stakeholder scrutiny. … When asked about decarbonisation plans, around half of respondents were still developing these for real estate, infrastructure and private corporate

[336] Andrew Jackson and Tim Jackson (2025) 'Macroeconomic, Sectoral and Financial Dynamics in Energy Transitions: A Stock-Flow Consistent, Input-Output Approach', *Ecological Economics*, 230: 108507, https://www.sciencedirect.com/science/article/pii/S092180092400404X; https://www.investmentweek.co.uk/news-analysis/4411151/economic-financial-instability-study-lays-bare-huge-risks-delaying-net-zero-goals

debt – with the percentages of actual implementation being only 29%, 27% and 15%, respectively'.[337]

In April, researchers in China reported that the water hyacinth – a South American species that has colonized waterways around the world, by forming dense mats – was very effective at absorbing microplastics. In a controlled test, within 48 hours, the hyacinths had removed up to 69% of the polystyrene microplastic particles present; after five days, they removed as much as 78%. The plants were still healthy two weeks after the exposure. They can also remove agricultural runoff and heavy metals.[338]

In April, the UK government established the Emerging Markets and Developing Economies (EMDE) Investor Taskforce, with the aim of raising private investment for tackling climate change and exploiting sustainable growth opportunities across emerging markets and developing economies. If successful, this could generate a tenfold return by 2100 and would increase the UK's financial and professional services sector's current £243bn economic contribution and £110bn in tax revenue, while also protecting and expanding its 2.4 million jobs. In addition, the taskforce will use practical solutions, such as capacity building and product innovation, to overcome hurdles that now hold back long-term private capital from climate, transition, and sustainable investment investments. These opportunities are present in regions including Latin America and the Caribbean, South and South East Asia, and Africa, according to the group. The EMDE Investor Taskforce comprises 15 financial services firms, as well as government expertise from HM Treasury and the Foreign, Commonwealth and Development Office. The firms include: Aviva Investors, HSBC, L&G, NEST, Ninety One, People's Pension, Pheonix Group, Private Infrastructure Development Group (PIDG), and S&P Global Ratings. According to the Institutional Investors Group on Climate Change, meeting global climate goals requires investment in mitigation and adaptation.[339]

In May, Ocean Panel (The High Level Panel for a Sustainable Ocean Economy)[340] (Ocean Panel), a global initiative of leaders from 18 countries, published a 'blue paper' (*The Future of the Workforce in a Sustainable Ocean Economy*[341]) in partnership with its secretariat, the World Resources Institute (WRI). The paper highlighted the challenges and opportunities for employment and economic growth in the transition to a sustainable blue economy by 2050. The report found that the formal ocean economy employed around 133 million people globally and with the right support in place that figure could grow by 51 million by 2050 to 184 million, an increase of 1.5% per year from a 2019 baseline. It also examined opportunities for action, including through the deployment of funding

[337] https://view.investmentweek.co.uk/aviva-investors-your-private-market-blueprint
[338] https://humanprogress.org/invasive-water-hyacinths-are-effective-at-removing-microplastics/
[339] https://www.investmentweek.co.uk/news/4413707/uk-government-financial-heavyweights-launch-global-taskforce-economic-growth-climate-changeg
[340] https://oceanpanel.org/
[341] https://oceanpanel.org/publication/ocean-employment/

mechanisms, such as green and blue bonds and impact investing. Tom Pickerell, global director of the ocean programme at the WRI, said that investment in the ocean economy has lagged investment elsewhere and that this needed to change: 'When it comes to the ocean economy, …we have not given it enough focus. Only 0.1% of funding channelled to the UN's SDGs goes to SDG14-Life below water. Investment is absolutely critical for so many different reasons, not least that over three billion people rely on blue foods for their survival. In terms of jobs, our report also found that there are possibly more than 250 million people, including informal and subsistence workers, in the ocean economy but we need better data'. The report identified seven key drivers of workforce change, such as climate change which will significantly affect employment in ocean economy sectors through changes to the abundance and distribution of fish stocks, increasing sea-level rise, the intensity and frequency of extreme weather events and algal blooms, and investment in offshore wind, tidal and solar energy projects. Pickerell said: 'There are climate-related biochemical reasons for investing in oceans and the ocean workforce. The oceans are responsible for 50% of oxygen produced on the Earth. It is also the biggest carbon sink in the world. So, we need to actively be managing the ocean and see it as an ally in the fight against climate change. Ocean-based climate solutions, such as wind power, blue foods or green carbon dioxide removal can contribute to about 30% of the emissions gap needed to maintain us on that 1.5ºC trajectory'. He added: 'There are three main channels for mobilizing and aligning finance. There's direct climate development finance that needs to be directed towards ocean workforce transitions and then there are the banks and private investors, who have a role to play in funding inclusive training, infrastructure and job creation in the coastal regions of the world, particularly in the Global South. The third channel was through public funding. That would derisk blue workforce programmes that can actually provide support for underserved populations'.[342]

In May, UK-based climate intelligence firm Carbon Responsible reported that traditional methods of estimating corporate carbon emissions were highly unreliable when it came to Scope 3 emissions.[343] Their research showed that commonly used Environmentally Extended Input Output (EEIO) models[344] could overstate Scope 3 emissions by as much as 2,480% compared to verified emissions data from a sample of FTSE 100 companies. By contrast, Carbon Responsible's AI-powered emissions engine (Ada) reduced inaccuracies to just 80%, achieving a 97% improvement in precision. The company said: 'This represents a step-change in emissions measurement capability. When you're 97% more accurate than the industry standard, you're no longer in the realm of estimation – you're capturing investment-grade data'. The EU's Corporate Sustainability Reporting Directive

[342] https://impact-investor.com/sustainable-ocean-economy-could-create-51-million-jobs-by-2050-report-finds

[343] That is, indirect emissions, namely greenhouse gas emissions from a company's activities that are not directly owned or controlled by the company. They can come from supply chains, investments and product usage, and can account for over 80% of a company's total carbon footprint.

[344] They rely on spend-based historic data that can be unreliable.

(CSRD) and the US SEC's climate rule both now require the use of auditable emissions data, rather than the outdated approaches currently used by EEIO models.[345]

In May, the UK's Pensions for Purpose and Impact Investing Institute released updated Impact Investing Principles for the UK pensions industry.[346] The updated principles encourage pension schemes to set impact goals that represent the needs and values of their beneficiaries, such as housing, climate change mitigation or community wellbeing. The new framework also aims to establish stronger accountability by linking impact priorities with incentives and clearer reporting, encouraging schemes to focus on outcomes, rather than just intentions. Some of the revisions reflect changing legal views of fiduciary duty, which mean that beneficiaries in the UK can now reasonably expect their pension schemes to consider how investments will impact the social and environmental conditions prevailing in future at the point when they retire. The principles have been adopted by Aon MasterTrust, the Environment Agency Pension Fund, Smart Pension Master Trust, South Yorkshire Pensions Authority, Surrey Pension Fund and Wiltshire Pension Fund, among others. Investment consultant and fiduciary managers adopting the principles include Aon, Cardano, Redington, Schroders Solutions and XPS Investment. Supporters promoting the principles include GSG, the World Benchmarking Alliance and others. The have also been endorsed by the Global Impact Investing Network which oversees the global Operating Principles for Impact Management (OPIM).[347]

In May, the US Department of Justice and Federal Trade Commission filed a statement of interest supporting a complaint made in November 2024 by the Texas Attorney General which alleges that BlackRock, Vanguard and State Street conspired to suppress the US coal market, by using their holdings in US coal companies to pressure those companies to adopt environmental, social and governance targets. The complaint highlights the managers' membership of organizations like Climate Action 100+ and the Net Zero Asset Managers Initiative, which both called for achieving net-zero investment portfolios. US Assistant Attorney General Abigail A. Slater said President Trump 'has declared a national energy emergency, and we need competition in coal production now more than ever to help fuel American energy dominance'. The three asset managers claim that they were acting lawfully.[348]

In June, Schroders published its first *Group Nature Report* based on the government-recommended Taskforce on Nature-related Disclosures (TNFD). While such reports are now mandatory for many types of companies, they are voluntary for asset managers and asset owners, such as pension providers, and help them identify potential nature-related risks and opportunities. Schroders says the report underscores the firm's commitment to actively navigating nature risks and meeting clients' investment expectations in this space. The report follows the launch of Schroders' proprietary tool, NatCapEx, earlier in the year,

[345] https://funds-europe.com/scope-3-emissions-overestimated-by-2480-ai-study-finds/
[346] The first set of principles were drawn up in 2020.
[347] https://impact-investor.com/revised-impact-investing-principles-for-uk-pension-schemes-launched/
[348] https://www.ai-cio.com/news/doj-ftc-side-against-largest-asset-managers-in-esg-related-coal-suit

which supports nature-focused, TNFD-aligned analysis across 9,000 public companies, building on Schroders' SustainEx model. Schroders global head of sustainable investment Andy Howard said: 'As a active asset manager, we are leading by example proactively disclosing our nature-related risks and opportunities, as well as developing our new proprietary tool, NatCapEx, to help fill the nature data gap. With the world's natural environments under growing pressure, measuring and managing the nature-exposed risks of our investments is becoming increasingly important. We also hope this voluntary disclosure in line with TNFD will help galvanise broader progress in corporate and investment disclosures. We will continue to engage with companies to encourage them to publish their own nature-related disclosures and shed light on this increasingly important risk and opportunity'.[349]

In June, Phenix Capital published its 2025 Net Zero report which found that there had been no growth in the percentage of funds aligned with net-zero targets since the previous year (33% of the total). Reasons for this included wavering support for net zero by some of the world's largest asset managers and the challenges created by president Trump's decision to take the US out of the Paris climate change agreement for the second time. From an investor perspective, a lack of high-quality data and uncertainty regarding future government policies around the world were regarded as significant global challenges. Continuing controversy over some aspects of net zero targets, including concerns over their effectiveness, possible economic and social side effects and differing views on how best to achieve them created further uncertainties. Defining whether net zero goals should relate to carbon emissions or all greenhouse gas emissions added another layer of complexity to fund managers' decision making. Geographically, Europe accounted for the largest share of impact funds with net-zero targets (40.6%), followed by global funds (30.8%) and North America (27.3%). Just 11.2% of the net-zero aligned impact funds focused on Asia, including China and India. Some of the funds targeted more than one region. In terms of UN sustainable development goals, net-zero aligned funds focused principally on affordable and clean energy (SDG7), followed by climate action (SDG13), responsible consumption and production (SDG12) and industry, innovation and infrastructure (SDG9).

The report also highlighted the leading role being played in net-zero investing by pensions schemes, whose fiduciary duty increasingly includes the need to take account of climate risk on the investments – and lives – of their beneficiaries. Pension funds are the largest category of investors in net-zero aligned impact funds (282), followed by foundations (223) and development finance institutions (192). In the UK, schemes with over £1bn in assets under management are required to consider their exposure to climate risk to comply the Taskforce on Climate-related Financial Disclosures' standards. One of these, the London Pensions Fund Authority committed to investing around £250m in environmental solutions assets to support its net zero ambitions, while Wiltshire Pension Fund has a net-zero goal

[349] https://corporate-adviser.com/schroders-publishes-first-tfnd-report/

for its investment portfolio by 2050 and has published its first climate and nature report describing how it plans to do it.[350]

In June, the Principles for Responsible Investment's Advance initiative announced that it was developing a strategy to help investors engage with policymakers on human rights issues. The initiative's 118 signatory investors uphold the UN's Guiding Principles on Business and Human Rights and engage with their portfolio companies to promote responsible business conduct. Members include Cardano, Phoenix Group and BNP Paribas which have developed case studies of human rights stewardship.[351]

In June, the World Resources Institute (WRI) has published a study demonstrating that funding for climate adaptation and resilience was among the most impactful development investments available, with every $1 invested in climate adaptation and resilience generating a yield of more than $10 in benefits over a 10-year period. The study analyzed 320 adaptation and resilience investments totaling $133bn across 12 countries, between 2014 and 2024, and found that this translated to potential returns of over $1.4trn, with average returns of 27%. Examples included infrastructure built to better manage extreme weather events, irrigation systems that support diverse cropping patterns, evacuation centers that can double as community hubs, and nature-based solutions, such as watershed, wetland and coastal protections, which also provided recreational benefits. The investments were funded by multilateral development banks and international climate finance institutions [352]

In June, Sierra Club Foundation announced that it terminated BlackRock's asset management contract for its $167m fund for failing to address the 'financial implications of the climate crisis' in its investments by promoting 'a dangerous all-of-the-above energy strategy' that accelerates climate change and harms clients' financial investments.[353]

In June, EDHEC Business School's Climate Institute announced the creation of Scientific Climate Ratings (SCR), the first European rating agency dedicated to quantifying the financial materiality of climate-related risks. The ratings combine climate science, geospatial data, and financial valuation models. Covering around 6,000 infrastructure assets, SCR provides forward-looking ratings designed to inform investment, regulatory, and policy decisions. SCR offers two distinct but complementary outputs (see Figure 8):

- Climate Exposure Rating (CER), assessing the degree of exposure to future climate risk under a 'continuity' scenario – a projection based on current global policies and emissions trends. CER uses a transparent A–G rating scale.[354]

[350] https://impact-investor.com/net-zero-drive-among-impact-funds-loses-steam-report/
[351] https://www.ipe.com/news/pri-to-step-up-on-human-rights-lobbying/10130999.article
[352] https://impact-investor.com/wri-study-reveals-ten-fold-impact-of-climate-adaptation-and-resilience-investments
[353] P&I Daily, 26 June 2025.
[354] The Climate Exposure Rating (CER):

- Climate Risk Rating (CRR), estimating the financial impact of climate risks in Net Asset Value terms, through both 2035 and 2050, using multiple scenario pathways weighted by probability. These are also rated on an A–G scale.[355]

The methodology adjusts for asset or company-specific adaptation measures using insights from the Climate Institute's ClimaTech database. The database includes standardized decarbonization and resilience strategies along with their documented impacts on emissions and physical damage.[356]

- Measures future climate exposure under a 'continuity' policy scenario, through 2035 and 2050. CER ratings are presented on a scale from A (low exposure) to G (high exposure), allowing for clear peer comparison.
- Computes Scope 1, 2 and 3 emissions to measure transition risk exposure accurately.
- Uses precise geolocation and asset boundaries to evaluate physical risk exposure.
- Accounts for adaptation efforts and their effectiveness, leveraging the comprehensive ClimaTech database.
- Translates the final exposure into a score and a rating designed for peer comparison.

Source: https://scientificratings.com/wp-content/uploads/2025/11/scr_ipe_supplement_nov2025.pdf (p.5)

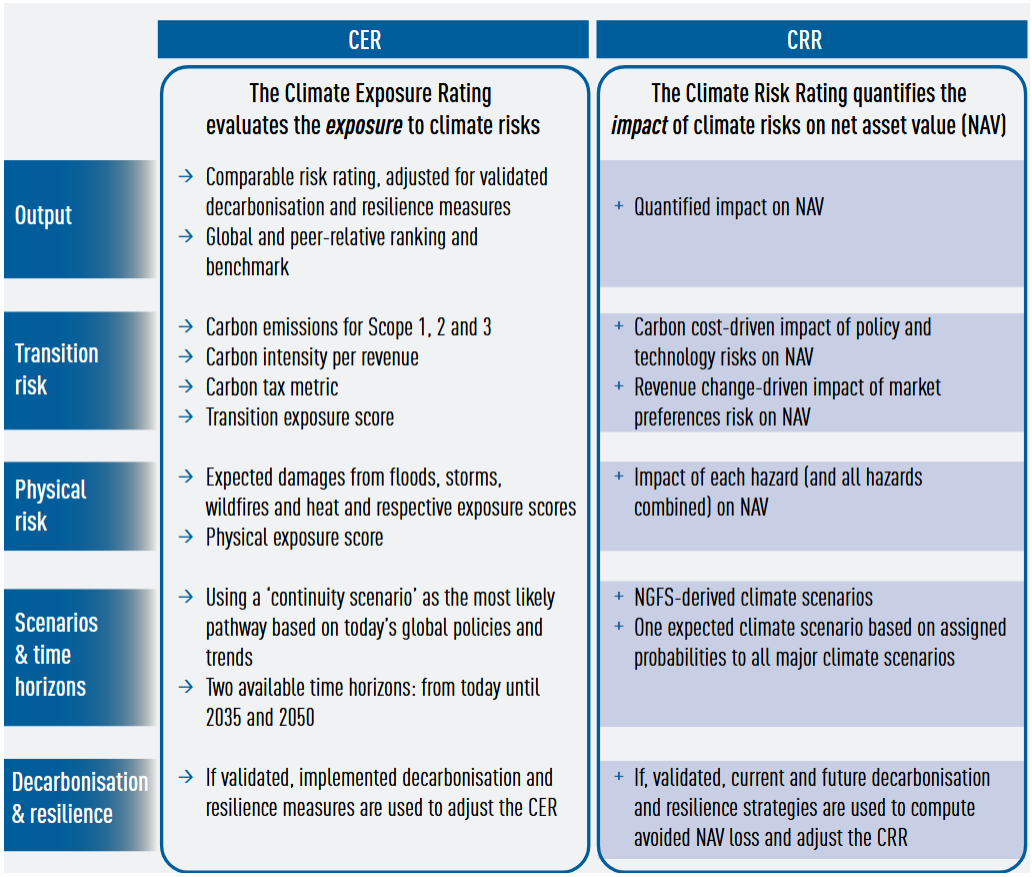
[355] The Climate Risk Rating (CRR):

- Quantifies dollar impact expressed as net asset value (NAV), by weighting a range of probabilities assigned to climate scenarios, including both physical and transition pathways, through 2035 and 2050 (rated from A to G).
- Calculates expected impact due to transition risk by analysing carbon costs and revenue growth.
- Computes expected impact due to physical risk through detailed geolocation and asset boundaries.
- Expressed as NAV impact, reflecting effects on cash flow and overall valuation.
- Accounts for adaptation efforts and their effectiveness by utilising the ClimaTech database.
- Translating the final exposure score into the CRR for peer comparison.

Source: https://scientificratings.com/wp-content/uploads/2025/11/scr_ipe_supplement_nov2025.pdf (p.5)

[356] EDHEC Climate Institute, 26 June 2025.

Figure 8: Quantifying the financial impact of climate risk with CER and CRR



Source: Scientific Climate Ratings; https://scientificratings.com/wp-content/uploads/2025/11/scr_ipe_supplement_nov2025.pdf (Figure 3, p.6)

In July, the European Securities and Markets Authority issued four principles that should underpin sustainability-related claims by market participants:

- Accurate: Provide a balanced and factual reflection of the entity or product's positive and negative sustainability characteristics.
- Accessible: Ensure claims are presented in a way that is understandable, but not overly simplified, and easily found by investors.
- Substantiated: Base claims on robust evidence and credible methodologies, with full disclosure of underlying assumptions or limitations.
- Up to Date: Keep claims current and promptly disclose any material changes or revisions to the sustainability profile.[357]

In July, the European Commission published a revised set of rules for disclosure under the Taxonomy Regulation. There will be a 90% reduction in the number of data points financial institutions have to report against, implying that investors do not have to evaluate certain

[357] ESMA Releases Practical Guidance on Sustainability Claims and ESG Credentials

assets and activities which do not contribute significantly to the overall portfolio. They will also be allowed to delay detailed disclosures for two years.[358]

In July, the UK government announced that it would not introduce a green taxonomy to deliver the green transition, but would instead focus on policies that industry indicated would have a greater impact by making the UK a global hub for green and transition finance activity.[359]

In July, the Association of British Insurers released the first annual update of progress made by the UK insurance and long-term savings industry's Investment Delivery Forum.[360] In 2024, the ID Forum pledged to invest £100 billion into assets which contribute to economic growth and the net zero transition over the following decade. The update revealed that in 2024, £10.9bn had been invested against annuity business directly into UK focused productive assets, including:

- £3.8 billion invested in real estate, helping to build affordable and social housing and student accommodation.
- £2.7 billion invested in utilities including energy and water supply.
- £1 billion invested in transport, supporting buses and ports.
- The remaining £3.4 billion was invested across a variety of sectors including manufacturing, construction, and human health and social work.

In July, the European Insurance and Occupational Pensions Authority (EIOPA) released a public statement on how (re)insurers in Europe were integrating climate change-related risks in their Own Risk and Solvency Assessment (ORSA). EIOPA's monitoring exercise followed its Opinion on the supervision of climate change risk scenarios in ORSA.[361] The results of the monitoring exercise show that insurers have made important progress in integrating climate change-related risks into their risk management frameworks. Most (re)insurers surveyed now include climate change risk assessments in their ORSAs, covering both physical and transition risks. They are also making greater use of scenario analysis to assess the potential financial impacts of these risks. In a growing number of cases, climate change assessments are linked to defined management actions and are being taken into account in strategic decision-making. The exercise has also highlighted important challenges, including significant variations in approaches across jurisdictions, limited availability of high-quality, reliable and granular data, and the difficulty of extending the time horizon of analyses beyond what is typical for ORSA.[362]

[358] https://www.ipe.com/news/eus-sustainability-simplification-drive-continues-with-taxonomy-esrs-updates/10131573.article
[359] https://www.ipe.com/news/uk-government-decides-against-green-taxonomy/10131631.article
[360] https://www.abi.org.uk/news/news-articles/2025/7/10.9-billion-invested-in-uk-productive-assets/
[361] https://www.eiopa.europa.eu/eiopa-issues-opinion-supervision-use-climate-change-risk-scenarios-orsa-2021-04-19_en
[362] https://www.eiopa.europa.eu/eiopa-monitoring-exercise-marks-progress-integration-climate-change-considerations-insurers-risk-2025-07-23_en

In July, the Autonomy Institute published a study which predicted that climate-induced price increases ('climateflation') for everyday food items could increase food prices by a third by 2050 and push 1 million people into poverty. The study suggested that heatwaves and droughts could affect domestic food production and disrupt international supply chains which would result in higher shop prices. The UK imports almost half the food it consumes. Will Stronge, chief executive of the institute, said: 'Climateflation is no longer a distant risk; it's a present reality. We need to build real economic resilience – and that means rethinking what public service provision can and should provide in the face of climate disruption: from delivery of basic essentials to publicly funded diners and a national buffer stock'.[363]

In July, the US Department of Energy published an official report entitled *A Critical Review of Impacts of Greenhouse Gas Emissions on the US Climate*.[364] The report acknowledged a warming trend since the onset of the industrial era and accepted that human activity might have contributed to greenhouse gas pollution, but argued that, given the scale of natural variations, such attribution remains difficult to confirm. The report concluded that the only rational response is adaptation.

The key points from the report are:

- Global warming causes only negligible impact on the economy. The report found that carbon dioxide–induced global warming has a far smaller economic impact than generally assumed. This was acknowledged by the Intergovernmental Panel on Climate Change (IPCC) its Fifth Assessment Report (AR5, Chapter 10, p. 662): 'For most economic sectors, the impact of climate change will be small relative to the impacts of other drivers.... Changes in population, age, income, technology, relative prices... and many other aspects of socioeconomic development will have an impact on the supply and demand of economic goods and services that is large relative to the impact of climate change'. The report argues that aggressive mitigation strategies, are more harmful than beneficial, as their costs far outweigh their impact on global climate. In particular, it argues that the destruction of the industrial base in order to fund the 'energy transition', as in Europe, is practically and economically counterproductive.

- Negligible effects of US CO_2 emissions. While the US is a major emitter of greenhouse gases, it accounts for only about 14% of anthropogenic CO_2 emissions. The report argues that even a drastic domestic reduction would have only a marginal effect on global atmospheric concentrations. Reaching net-zero emissions in the US, for instance, would barely affect global temperatures, especially as major emitters like China and India continue to increase their output. The report found

[363] https://www.theguardian.com/business/2025/jul/28/climateflation-could-push-up-uk-food-prices-by-more-than-a-third-by-2050-report-says
[364] https://www.energy.gov/sites/default/files/2025-07/DOE_Critical_Review_of_Impacts_of_GHG_Emissions_on_the_US_Climate_July_2025.pdf

that the direct impact of US emission cuts on the global climate was 'undetectable', with any measurable effects emerging only after long delays, thereby casting serious doubt on the sense of ambitious unilateral measures. Europe has a 6% share of global emissions.

- There is no trend of weather events becoming more extreme. The report found that historical US data show no statistically significant increase in the frequency or intensity of extreme weather events—hurricanes, tornadoes, floods, or droughts.

- Beneficial effects of CO_2. The report notes that higher CO_2 concentrations stimulate plant growth, drive global 'greening' and enhance agricultural productivity. It also notes that atmospheric CO_2 enrichment boosts photosynthesis, with satellite studies such as NASA's showing expanded vegetation cover, particularly in semi-arid regions including the Sahel, India, and parts of Asia. Global plant and crop vegetation has increased by roughly 15-20% since the start of the industrial era, largely due to CO_2 fertilization. This greening has slightly reduced ocean alkalinity, with mixed impacts on coral reefs – notably, the recent recovery of the Great Barrier Reef.

- Limitations of climate models. The report argues that global climate models appear to overestimate future warming due to extreme emission scenarios and exaggerated predictions of climate sensitivity. Estimates vary widely (from 1.8 °C to 5.7 °C for a doubling of CO_2). Models also tend to produce projections that are too 'hot' compared to recent observations. The report criticized the excessive use of the high-emissions 'RCP8.5' global warming scenario, which it argues lead to misleading projections, particularly regarding a rise in sea levels and its regional impact, and, in turn, to a literature that is 'imbalanced in an apocalyptic direction'.

- Scientific uncertainties. The report argues that attributing climate change and extreme weather to human CO_2 emissions remains overflowing with uncertainty, due to: natural climate variability, limitations in available data and gaps in climate modelling. To illustrate, lower stratospheric temperatures have shown no significant trend since 2000, contrary to model predictions of CO_2-driven cooling. This suggests that natural factors, such as solar flares or volcanic events, may be more influential in certain climate patterns.

In August, the UK's Smart Pension agreed to invest £330 million in renewable energy, via funds managed by Octopus Energy Generation, the renewables investment arm of Octopus Energy. The aim is to support the UK's low-carbon transition, while generating long-term returns for members. One example is a ground source heat pump network bringing renewable heating and hot water to 114 new homes at Parc Eirin in South Wales.[365]

[365] https://funds-europe.com/smart-pension-invests-330mn-in-uk-clean-energy

In August, research from Isio indicated that just 39% of asset managers had adopted formal ESG objectives or focus areas, compared with 49% in the previous year. This was due to increased regulatory scrutiny, evolving labelling regimes, and a desire to avoid greenwashing claims. This contrasted to the headline data suggesting that 97% of asset managers had an established ESG policy and dedicated sustainability teams. Despite this, more firms were removing measures to check if goals were actually being achieved. Cadi Thomas, head of sustainable investment at Isio, said: 'There is still significant work to do at fund level. Disclosures remain inconsistent, particularly in private markets, and while climate reporting has improved, social and nature-related data continue to lag. Fewer funds are adopting formal ESG objectives, potentially driven by increasing labelling scrutiny'.[366]

In August, the UK's NEST pension scheme invested $750m in sustainably managed timberland in the Americas via BTG Pactual Timberland Investment Group with the aim of achieving strong risk-adjusted returns.[367]

In August, the UK Financial Conduct Authority reported the results of a climate reporting review of UK asset managers, life insurers and FCA-regulated pension providers.[368] It found that its 2021 climate disclosure rules had increased firms' consideration of climate risks and supported their integration into firms' decision-making. Firms were more transparent with their clients and consumers but encountered some challenges with the availability of data and consistent, well-developed methodologies. Firms also considered some information too complex for retail investors to engage with and thought the regime could be less granular and more proportionate. They saw opportunities to simplify reporting, particularly given their broader sustainability disclosure obligations. In light of these findings, the FCA said it would consider how to streamline and enhance its sustainability reporting framework. It wanted to: simplify disclosure requirements and ease unnecessary burdens on firms; maintain good outcomes for clients and consumers and improve the decision-usefulness of reporting, building on the work of SDR to improve trust and reduce greenwashing; and promote international alignment and help maintain the UK's position as a global leader in sustainable finance.

In September, the Lloyd's of London insurance market scrapped its net zero policies in response to President Donald Trump's attack on pro-green financing. Insurers operating at Lloyd's will no longer be required to stop insuring the most polluting fossil fuel projects by 2030 and become entirely net zero by 2050. Instead, insurers will only be expected to operate in line with the laws of countries in which they operate.[369]

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[366] https://www.investmentweek.co.uk/news/4517302/asset-managers-massively-pulling-concrete-esg-objectives-reporting-significant

[367] https://realassets.ipe.com/news/uks-nest-commits-750m-to-americas-timberland-via-btg-pactual-tig/10132006.article

[368] https://www.fca.org.uk/publications/multi-firm-reviews/climate-reporting-asset-managers-life-insurers-fca-regulated-pension-providers

[369] https://www.telegraph.co.uk/business/2025/09/04/lloyds-of-london-reverses-net-zero-ban

In September, real assets sustainability benchmark provider GRESB and the Institutional Investors Group on Climate Change released a new methodology for assessing how infrastructure assets align with the Net Zero Investment Framework (NZIF) 2.0. The framework provides 'a common language for sustainability' that enables consistent comparisons across assets. Eleven global investors and managers, including Aberdeen, Arcus Infrastructure Partners, CVC DIF, IFM Investors, JP Morgan, Macquarie, Morrison Global, Patrizia and PGGM, took part in the working group. A pilot study showed that 16% of respondents reported their assets already achieve net zero, 62% have committed to alignment but have not yet reached their targets, while 20% have yet to commit. Half of participants have set science-based targets. All respondents disclosed Scope 1 and 2 emissions, but under 50% disclosed all Scope 3 emissions. In addition, 84% had governance structures with responsibility for decarbonisation plans, and 42% reported a measurable decline in emissions.[370]

In September, the European Court of Justice ruled in favour of the European Commission in two legal challenges over its definition of 'green' under the EU Taxonomy Regulation. Austria filed a legal challenge requesting that the delegated act that added nuclear and gas into the Taxonomy Regulation in 2022 at the request of Germany and France be annulled. In the second case, ClientEarth filed a case against the Commission for 'unlawfully labelling the burning of forest biomass to produce energy, and the manufacture of bio-based plastics and chemicals used to make plastics as "sustainable" in the EU taxonomy'. The ECJ court ruled that the Commission 'was entitled to take the view that nuclear energy generation has near to zero greenhouse gas emissions and that there are currently no technologically and economically feasible low-carbon alternatives at a sufficient scale. …The General Court endorses the view that economic activities in the nuclear energy and fossil gas sectors can, under certain conditions, contribute substantially to climate change mitigation and climate change adaptation'.[371]

In September, Scotland's National Investment Bank announced that had put impact investing at the heart of its £2bn strategy, targeting the climate emergency, place-based inequality and demographic pressures, mainly driven by Scotland's ageing population. The three missions of the SNIB are: to address the climate crisis through growing a fair and sustainable economy; to transform communities, making them places where everyone thrives; and to scale up innovation and technology for a more competitive and productive economy. It has so far invested in 39 SMEs and five funds: Social and Sustainable Housing (SASH), Gresham House Forestry Fund, Thriving Investments MMR Fund, Par Equity, and Iona Wind Partnership. For every £1m it has invested by the SNIB, its investees have received on average a further £1.9m from other sources.[372]

[370] https://realassets.ipe.com/news/gresb-and-iigcc-join-forces-on-net-zero-alignment-for-infrastructure-assets/10132500.article
[371] https://www.ipe.com/news/court-sides-with-european-commission-over-definition-of-green-business/10132560.article
[372] https://impact-investor.com/impact-investing-central-to-scotlands-development-bank-strategy

In September, a Morningstar proxy-season analysis revealed a 40% decline in ESG resolutions in 2025, with only 30 significant proposals garnering at least 30% shareholder support. This contrasts with the previous five years when US-listed companies faced more than 100 resolutions annually. Morningstar found that major asset managers remained hesitant to back ESG initiatives, with Vanguard Group abstaining from supporting any ESG proposals. The six largest US asset managers showed only modest engagement, with average support for significant ESG resolutions at 18% – up from 17% in 2024, but below the 46% peak observed in 2021.[373]

In September, the European Environment Agency reported that the average annual economic losses in the EU associated with intense heat, floods and other extreme weather was €44.5bn between 2020 and 2023, two and a half times as high as between 2010 and 2019. It said that 75% of companies producing goods and services in the Eurozone are 'highly dependent' on at least one natural ecosystem, adding that 75% of bank loans are given to companies that rely on natural resources for their business and almost 15% of industrial assets are on floodplains. Europe is the fastest-warming continent and this is leading to increasingly volatile weather patterns together with an increase in forest fires and floods.[374]

In September, ING, FTSE Russell and Robeco published a report entitled *Rethinking Sovereign Debt to Finance the Climate Transition: Introducing a novel investment solution*.[375] The report pointed out that climate change mitigation and adaptation require substantial financial resources. Hence, governments might increasingly turn to financial markets to raise funding through sovereign bond issuances. This provided an opportunity for sovereign debt investors to finance the low-carbon transition and encourage governments to implement robust climate policies. ING, FTSE Russell and Robeco have developed an investment solution – involving an investable index intended to drive capital toward climate leaders – that offers institutional investors the following benefits: alignment with climate goals, such as climate change mitigation and adaptation; performance potential, since the index favors countries that are better managing climate-related challenges, potentially leading to improved economic performance and credit ratings; risk management investing in countries with strong climate performance, thereby helping mitigate transition risks; and sovereign engagement opportunities.

In October, a federal judge in Fort Worth, Texas, issued a series of restrictions and requirements on fiduciaries of two American Airlines 401(k) plans to remove 'ESG influence' on investment management. He said plan fiduciaries violated ERISA's duty-of-loyalty provision, which says fiduciaries must put participants' interests ahead of corporate interests, by allowing nonpecuniary factors, such as ESG and sustainability, to influence investment management.[376]

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[373] pionline@e.crainalerts.com; 24 September 2025

[374] https://www.ft.com/content/b119fd7e-0507-4b13-b839-80da8314ad7f

[375] https://www.lseg.com/en/ftse-russell/research/rethinking-sovereign-debt-to-finance-the-climate-transition

[376] pionline@e.crainalerts.com, 2 October 2025

In October, PFZW, the Netherland's second-largest pension fund (with assets of €248bn) announced that BlackRock had lost its contract to manage its $17bn passive equities fund. This followed from PFZW's revised investment regime that emphasizes sustainability in equal measure with return and risk. There was also a pivot towards active management.[377] In December, PME, another Dutch pension fund, withdraw its €5bn global ESG equity portfolio from BlackRock and transferred it to UBS Asset Management and MN.[378]

In October, the Trump administration announced that it would open 13 million acres of federal lands for coal mining and provide $625m to recommission or modernize coal-fired power plants. This will help to meet rising US electricity demand from data centers, artificial intelligence and electric cars. At the same time, the government has reduced the growth of renewable energy by freezing permits for offshore wind projects, ending clean energy tax credits and cancelling wind and solar projects on federal lands. Interior Secretary Doug Burgum said that President Trump now had another initiative: 'mine, baby, mine'. Environmental groups denounced the actions. The Environmental Defense Fund said: 'Subsidizing coal means propping up dirty, uncompetitive plants from last century – and saddling families with their high costs and pollution. We need modern, affordable clean energy solutions to power a modern economy, but the Trump administration wants to drag us back to a 1950s electric grid'.[379]

In October, the Global Tipping Points study reported that global warming was approaching critical thresholds sooner than expected, with coral reefs suffering what researchers describe as an almost irreversible decline, marking the first major climate tipping point. The study also warned that the Amazon rainforest could collapse if temperatures exceed 1.5°C and that key ocean currents are also at risk. With global temperatures already 1.3-1.4°C above preindustrial levels and the years 2023 and 2024 being the hottest on record, the 160 researchers involved in the study recommended stronger emissions cuts. The report was prepared for COP30 in Belém, Brazil between 10 - 21 November 2025. The world is currently on track for 3.1°C degrees of warming by the end of the century, based on national policies.[380]

In October, a proposal from the UN's International Maritime Organisation to impose a net-zero levy on ships of up to £360 per ton of CO_2 emitted over a certain level was delayed for a year after President Trump labelled the proposal a 'green scam'. He threatened to impose sanctions on countries that signed the agreement which would raise consumer prices by at least 10%.[381]

In October, the UK Emissions Trading Scheme reported that 15% of the UK's reduction in greenhouse gas emissions since 2004 was explained by the closure of 116 energy-intensive

[377] pionline@e.crainalerts.com, 2 October 2025
[378] https://www.ipe.com/news/pme-replaces-blackrock-in-5bn-esg-equities-portfolio/10134286.article
[379] https://abcnews.go.com/US/wireStory/trump-administration-opens-land-coal-mining-offers-625m-126048784
[380] https://www.yahoo.com/news/articles/climate-tipping-points-being-crossed-182734510.html
[381] https://www.telegraph.co.uk/politics/2025/10/17/starmerglobal-net-zero-tax-tatters-us-revolt

factories such as steelworks at the cost of 30,000 jobs. Overall emissions fell by 65% since 2014 due in part to a fall in power generation from domestic industries.[382]

In October, the European Investment Bank Group announced €10bn in annual financing from 2025 to 2027 for EIB Global, its international partnerships and development arm, to fund high-impact projects in more than 130 non-EU countries dealing with poverty, energy shortages, pollution, drought and extreme weather events.[383]

In October, a study by Bloomberg reported that the financial markets were pricing physical climate risk (those relating to, e.g., tropical cyclones, heat stress and flooding) into firms' cost of capital, with firms with higher exposure to physical risks facing an approximate 22 basis point premium per 10 point increase in physical risk in their weighted average cost of capital (WACC) (with a 95% confidence interval of 12-31 bps). The pricing effect was found to be clearest within the materials and utilities sectors, which saw an average increase of approximately 56bps and 45bps WACC per 10 point increase in physical risk, respectively.[384]

In October, the *Financial Times* reported that, having declined as a result of the growth of renewable energy, orders for gas turbines has been increasing since 2021, driven by the demand for electricity from the data centres that are powering the artificial intelligence revolution. AI-related computing capacity requires reliable 24-hour power. In 2024, the US Department of Energy forecast that data centres would consume 6.7 to 12% of US electricity by 2028, compared with 4.4% in 2023. The International Energy Agency predicted in April 2025 that data centres' electricity use globally would double by 2030 to 945 terawatt hours, more than Japan's current power consumption. Climate activists argue that this will breach the Paris climate agreement.[385]

In October, the UK's £31.2bn Pension Protection Fund published its first sustainability report, covering its UK Stewardship Code submission to the Pensions Regulator, its climate change report that aligns with the Task Force for Climate-related Financial Disclosures (TCFD) recommendations, and reporting about sustainability at the PPF as an organisation. Key achievements during the year included 'significant work to ensure potential external investment managers meet our expected standards and worked with several to develop their stewardship processes'. In private markets, the PPF was pushing for greater transparency, better data quality and more credible transition plans.[386]

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[382] https://www.telegraph.co.uk/business/2025/10/20/15pc-drop-carbon-emissions-caused-industrial-decline
[383] https://impact-investor.com/eib-expands-investments-outside-eu-to-up-to-e10bn-a-year
[384] https://www.ipe.com/news/physical-climate-risks-are-being-priced-into-cost-of-capital-finds-analysis/10133266.article
[385] https://www.ft.com/content/dfd87d3d-a386-4706-a4ba-9f9274760111
[386] https://www.ipe.com/news/uks-ppf-publishes-first-sustainability-report/10133298.article

The Climate Financial Risk Forum (CFRF) 2025 Symposium was held in London in October.[387] The UK's long-term growth prospects depended on maintaining its leadership in transition finance despite politics and global competition for green capital, according to a panel session entitled 'Investment Opportunities and the Future of Sustainable Finance' which included representatives from the UK Sustainable Investment and Finance Association, the Green Finance Institute, and the UK Transition Finance Council. Panel members suggested that UK must show leadership and give business and industry the confidence to continue on the course to net-zero, describing the challenge as one of unlocking economic opportunities rather than just managing climate risk. It also discussed how the UK government's Transition Finance Playbook aims to bridge the gap between financial planning, technology pathways and project delivery, ensuring that local projects have credible finance plans from the outset. However, despite frameworks, the flow of capital into transition projects remained below expectations. Policy inconsistency and a shortage of investable deals were the main bottlenecks, and investors need planning and grid-connection barriers cleared to accelerate deployment. The panel concluded that the UK's status as a global centre for sustainable finance should be measured not only by domestic investment, but also by how effectively it channels capital abroad: 'We have immense financial expertise within a few miles of the City. The real opportunity is to deploy that globally'.[388]

The CFRF also published a number of studies to help financial markets integrate climate adaptation and scenario analysis into their decision-making. One piece of research involves nine case studies from companies like Aviva, Aberdeen Investments and Legal & General which examines different approaches to quantifying the financial impacts of climate scenarios. This will help investors benchmark themselves against peers, develop new use cases and methods, and support risk-based internal discussions. The CFRF also released an interactive tool – the Online Climate Scenario Narrative Tool – that generates a summary of investors' climate-related risks and opportunities, based on their business activities and products; it utilizes data from scenarios developed by the Central Banks' and Supervisors' Network for Greening the Financial System. In addition, the CFRF published recommendations on how to provide training and awareness in the financial markets about the physical risks posed by climate change.[389]

The UN Food and Agriculture Organization's *Global Forest Resources Assessment 2025* found that the rate of deforestation is slowing down. Between 2016 and 2025, the world lost 10.9 million hectares of forest annually, down from 13.6 million between 2000 and 2015, and 17.6 million between 1990 and 2000.[390]

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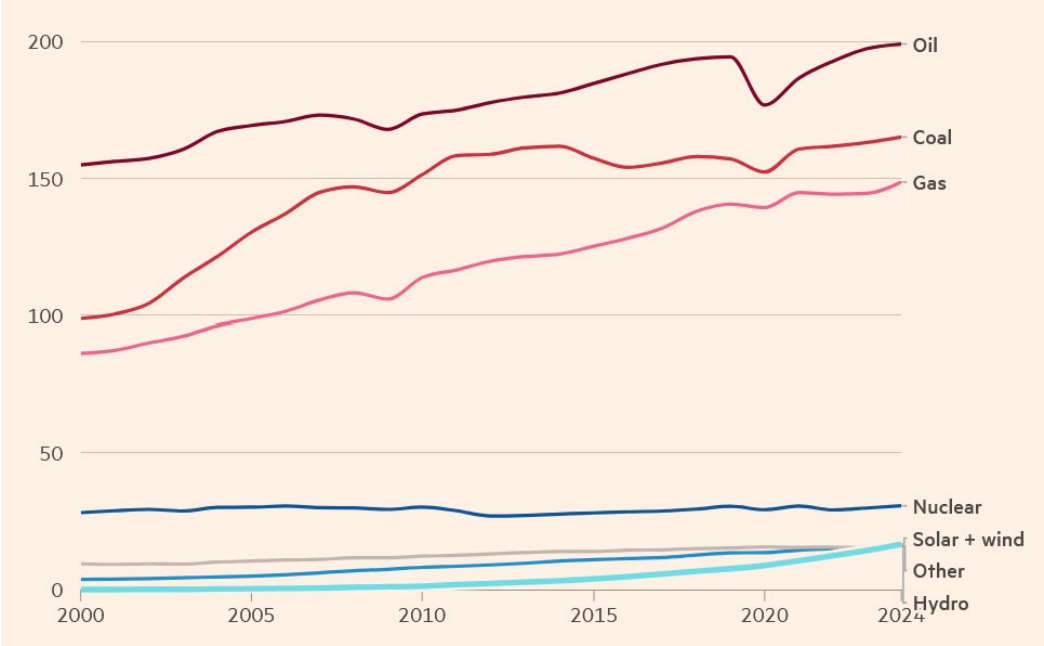
[387] The Climate Financial Risk Forum was set up by the UK Financial Conduct Authority and the UK Prudential Regulation Authority in 2019.
[388] https://funds-europe.com/transition-finance-seen-as-key-to-the-uks-green-growth/
[389] https://www.ipe.com/news/uk-investors-regulators-address-climate-risks-in-new-reports/10133385.article
[390] https://openknowledge.fao.org/handle/20.500.14283/cd6709en

In October, the EDHEC Climate Institute reported that up to 54% of global infrastructure value is at risk from climate-induced weather events without adaptation. US$10bn in assets face devaluation risk due to non-alignment with sustainability criteria, and another US$245bn is exposed to regulatory uncertainty. Yet fewer than one-third of major infrastructure companies disclose credible transition or resilience strategies.

The Energy Institute's 2025 Statistical Review of World Energy reported that electricity generation from oil, gas and coal continued to rise, implying that renewables were still only helping to meet the increase in energy demand, rather than reducing fossil fuels – see Figure 9.

Figure 9: Global energy supply, by fuel type (exajoules)



Source: EI Statistical Review of World Energy, 2025; https://www.energyinst.org/statistical-review; https://assets.kpmg.com/content/dam/kpmg/sk/pdf/2025/Statistical-Review-of-World-Energy-2025.pdf; https://www.ft.com/content/c4068478-c091-4e87-a3cd-5bfc71281ec8

In October, Net Purpose acquired the Sustainable Development Investments Asset Owner Platform (SDI AOP), forming one of the largest independent providers of sustainable development data. The merged organisation aims to create an advanced data infrastructure to help accelerate investing in climate and other UN Sustainable Development Goals and will serve clients with more than $40trn in assets. Net Purpose will integrate SDI AOP's methodology, data processing and customer services into its platform, and will launch SDG classifications under the unified framework, thereby 'aligning around common standards

to achieve measurable impact', as investor demand shifts from box-ticking compliance to real-world outcomes.[391]

In October, a report entitled *Roasting the Planet: Big meat and dairy's big emissions* was released by Foodrise, Friends of the Earth US, Greenpeace Nordic, and the Institute for Agriculture and Trade Policy.[392] The report found that 45 large meat and dairy companies – including JBS, Marfrig, Tyson, Minerva, and Cargill – generated more than a billion tonnes (CO_2-equivalent) of greenhouse gas emissions in 2023 – more than the emissions of Saudi Arabia. Over half of emissions from the sector came from methane – generated from enteric fermentation and manure – more than that produced by all European countries. The report called for policies that set binding targets for agricultural GHG emissions cuts, reduced animal farming and the promotion of a shift to healthy, sustainable and plant-rich diets. The big meat and dairy companies responded by saying they were taking various steps to bring down emissions or tackle deforestation.[393]

In October, the United Nations Environment Programme (UNEP) *Adaptation Gap Report 2025* estimated that the cost of adaptation finance needed in developing countries was $310bn per year in 2035, when based on modelled costs, and $365bn per year, when based on extrapolated needs expressed in Nationally Determined Contributions (NDCs) and National Adaptation Plans (NAPs). However, international public adaptation finance flows to developing countries were $28bn in 2022 and $26bn in 2023, implying that adaptation financing needs in developing countries are 12-14 times as much as current flows. The report added: 'If current finance trends continue, the Glasgow Climate Pact goal of doubling international public adaptation finance from 2019 levels by 2025 will not be achieved, while the New Collective Quantified Goal for climate finance is not ambitious enough to close the finance gap. The private sector could do more – with potential to provide around $50bn per year if backed by targeted policy action and blended finance solutions. While far from enough, there is visible progress on closing the planning and implementation gap. Most countries have at least one national adaptation policy, strategy or plan in place; countries are getting better at mainstreaming adaptation into wider national development planning; and countries reported on over 1,600 implemented adaptation actions, mostly on biodiversity, agriculture, water and infrastructure. Climate fund support for new adaptation projects rose in 2024, although emerging financial constraints make the future unclear. Both public and private finance must step up to increase adaptation, taking care not to increase the proportion of debt instruments used by vulnerable nations'.[394]

In November, Morningstar reported that global assets in open-end funds and electronic traded funds (ETFs) with a climate-linked mandate were valued at $644bn in June 2025, an increase of 8.5% from December 2024. Europe was responsible for 86% of these assets. Climate transition funds which back companies preparing for a low-carbon economy

[391] https://www.ipe.com/news/net-purpose-buys-asset-owner-sdg-platform-combining-40trn-in-sustainable-assets/10133396.article
[392] https://foodrise.org.uk/RoastingThePlanet/
[393] https://impact-investor.com/ngos-call-for-cop30-action-on-rising-meat-and-dairy-emissions
[394] https://www.unep.org/resources/adaptation-gap-report-2025

reached $318bn, while green bond funds and clean energy and technology funds were valued at $44bn billion each.[395]

In November, an MSCI study found that extreme heat and rainfall were the biggest physical climate risks faced by global pension funds' listed equity portfolios. It estimated that listed companies risk losing $1trn in aggregate revenues per annum as a result of business disruption caused by climate-related events. MSCI analysed 500,000 physical assets owned by 11,000 companies across the globe, and found that 55% of these companies 'face significant and active physical hazards today', such as heat stress, water scarcity, and flood risk. Around 25% of companies' assets are concentrated in high-hazard zones, such as the US Gulf Coast, coastal China and India. MSCI examined the listed equity portfolios of 18 large pension funds with combined assets of more than $4trn, including the Pension Protection Fund, PensionDanmark, Pensionskasse des Bundes PUBLICA, Universities Superannuation Scheme, Norges Bank Investment Management and Stichting Pensioenfonds ABP. It said that: 'Some portfolios carry as little as 14% exposure, while others shoulder up to 61%'.[396]

In November, XPS's fifth annual *Investment Fund ESG Rating Review* reported that investment firms' progress on ESG and climate strategies had declined, with the proportion rated 'green' falling to 64%, down from 72% in 2024 and 85% in 2023.[397]

In November, the UK government set up the Office for the Impact Economy (OIE) to support social impact investing, following a recommendation by the Social Impact Investment Advisory Group (SIIAG), whose membership included the Impact Investing Institute. The OIE's aim is to unlock £100bn of untapped capital for impact investing in areas such as affordable housing, community energy, education and healthcare. A report from social investor Better Society Capital (BSC), also a SIIAG member, estimated that the UK's social impact investment was £11.2bn in 2024. There were around a 100 funds, intermediaries and social banks engaged in social impact investing, including both real assets and investments into social purpose organisations. BSC identifies four types of investment: social and affordable housing (54% of the market), social lending to charities and social enterprises (39%), impact venture (7%), and social outcomes contracts (1%). The report envisaged wider use of public, private and philanthropic capital, using mechanisms, such as match funding, blended finance, guarantees and social outcomes partnerships. In July, also following a SIIAG recommendation, the government launched a £500m Better Futures Fund to pay for social outcomes that improve conditions and create opportunities for vulnerable children and young people over the next decade. Pension funds, such as the South Yorkshire Pension Authority, were becoming increasingly involved in place-based investing and other social impact allocations. Charitable

[395] https://funds-europe.com/__trashed-16/
[396] https://www.ipe.com/news/msci-extreme-heat-and-rainfall-biggest-climate-risks-for-pension-funds/10133618.article
[397] Insurance Asset Management, 25 November 2025

foundations and endowments were also increasingly prioritising impact to create social value as well as financial returns.[398]

In December, the Network for Greening the Financial System reported that its Phase V long-term scenarios for assessing physical climate risks were based on an academic paper by Kotz et al. (2024) – from the Potsdam Institute for Climate Impact Research – that contained an error and has since been retracted from the journal *Nature*.[399] The paper had used a 'damage function' to estimate the economic impact of climate change which indicated that global economic output could fall by as much as 62% by 2100 under the high emissions scenario. However, the authors subsequently found an error in the GDP data for Uzbekistan between 1995 and 1999 which resulted in a substantial overestimation of the potential economic damage. When the 'damage function' was re-estimated, the potential fall in economic output was lower at 23% by 2100. A number of banks, including Lloyds, NatWest and HSBC, confirmed that they used the NGFS research to identify the sectors most exposed to the net zero transition and to set their lending policies (although they would not say precisely how).[400]

In December, President Donald Trump signed an executive order targeting proxy advisory firms ISS and Glass Lewis, claiming they use 'enormous influence' to advance politically-motivated agendas related to ESG. The order directs the SEC, FTC and DOL to review existing rules and potentially develop new ones to increase oversight of the proxy adviser industry. JPMorgan Chase CEO Jamie Dimon had previously criticized these firms, labeling them a 'cancer' and accusing them of promoting ESG interests rather than focusing on financial matters.[401]

In December, a report from the Climate Policy Initiative found that pension funds were more effective in implementing their climate targets and strategies than other financial institutions, such as banks and asset managers. Measures included fossil fuel exclusion targets, policy advocacy and climate risk management. The study covered 594 pension funds with a combined $22.5trn under management or ownership (AUM/O), representing 78% of global pension assets. However, the report said that 'targets must now improve in quality', since only a third of the pension funds had a climate investment target, while only 40% had fossil fuel exclusion or phase-out targets.[402]

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[398] https://www.gov.uk/government/groups/office-for-the-impact-economy; https://impact-investor.com/uks-new-impact-office-potentially-catalytic-for-social-investment; https://impact-investor.com/uk-social-impact-investment-market-reaches-11-2bn-up-10-on-2023

[399] Maximilian Kotz, Anders Levermann and Leonie Wenz (2024) 'The Economic Commitment of Climate Change', *Nature*, 628: 551–557. This paper is known as KLW24.

[400] https://www.ngfs.net/en/press-release/statement-regarding-physical-risk-estimates-phase-v-ngfs-long-term-scenarios; https://www.telegraph.co.uk/business/2025/12/14/banks-under-fire-for-using-flawed-net-zero-study. For an analysis of the background to the KLW24 paper, see Andrew Stuttaford (2025) Climate Modeling with Uzbek Characteristics, *National Review*, 19 December.

[401] pionline@e.crainalerts.com, 15 December 2025

[402] https://www.ipe.com/pension-funds-take-climate-targets-more-seriously-than-other-financial-institutions/10134308.article

COP30 – November 2025

In November 2025, COP30 took take place in in Belém, Brazil.[403] The key goals were: reinforcing multilateralism and cooperation, connecting climate change to individuals and the economy – via nationally determined contributions (NDCs), each country's 5-year national plan to address climate change – and accelerating implementation.[404]

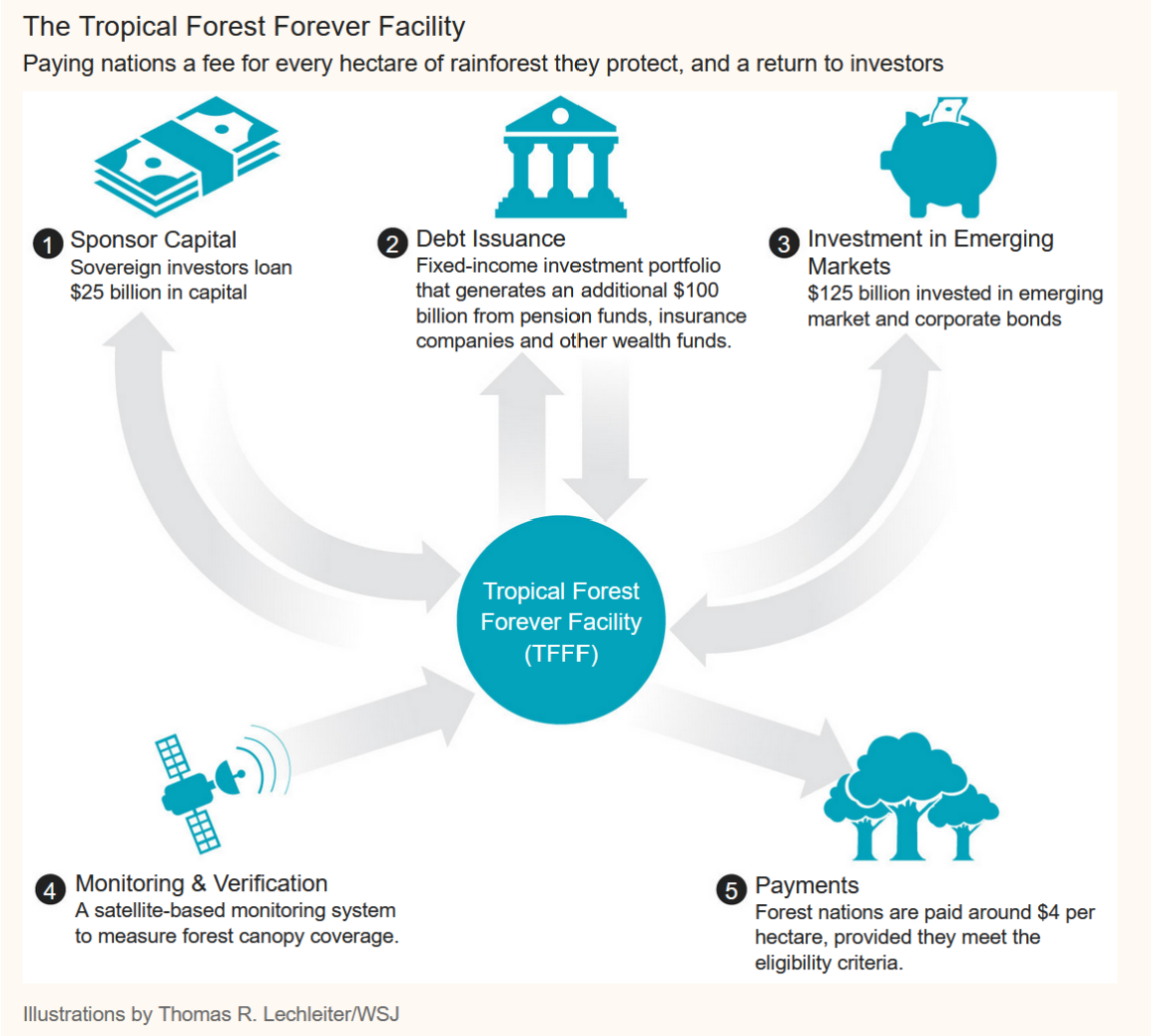
The BBC described the outcome of the event as follows: 'In three decades of these meetings aimed at forging global consensus on how to prevent and deal with global warming, this will go down as among the most divisive. Many countries were livid when COP30 in Belém, Brazil ended … with no mention of the fossil fuels that have heated up the atmosphere. Other nations - particularly those with most to gain from their continued production - felt vindicated. The summit was a reality check on just how much global consensus has broken down over what to do about climate change'.[405] There was no official US delegation and China avoided taking any strong positions during the discussions.

The Brazilian presidency of COP30 released a final package termed the 'global mutirão' ('collective efforts'). It was an attempt to draw together controversial issues, such as finance, trade policies and meeting the Paris Agreement's 1.5C temperature goal. A 'mechanism' to help ensure a 'just transition' globally and a set of measures to track climate-adaptation efforts were also agreed. The need for adaptation was prevalent throughout the conference. A new deal was agreed to triple climate finance provided to developing countries by 2035.[406]

A key focus of the conference was 'catalytic capital', a form of leveraged finance where a small sum of capital is used to attract a much larger sum. This often involves multilateral development banks and private banks. The Brazilian finance ministry and the UN-backed Green Climate Fund launched a $400 million fund aimed at bringing in $1 billion in capital. The Rockefeller Foundation launched a $5.4 million investment to help support regenerative agriculture. The Gordon and Betty Moore Foundation launched Catalytic Capital for the Agricultural Transition to support sustainable soy and cattle farming without adding to habitat loss in Brazil; it had $50 million in initial funding and aims for total funding of $200 million. The Tropical Forest Forever Facility, with an initial $25bn in sovereign loans, aims to mix sovereign wealth and private capital in order to pay rainforest nations for forest protection and provide a return to investors – see Figure 10.

[403] https://www.un.org/en/climatechange/cop30
[404] https://commonslibrary.parliament.uk/research-briefings/cbp-10357
[405] https://www.bbc.co.uk/news/articles/cp84m16mdm1o
[406] https://www.carbonbrief.org/cop30-key-outcomes-agreed-at-the-un-climate-talks-in-belem/

Figure 10: The Tropical Forest Forever Facility



Tariye Gbadegesin, CEO of the Climate Investment Funds, a multilateral lender launched in 2008, said focusing leveraged finance on adaptation is key for developing nations. CIF has so far invested $12.5bn in adaptation and resilience. The final deal at COP30 said that adaptation finance would be tripled to $120bn a year by 2035.[407]

2026 developments in sustainability

On 1 January, the EU Carbon Border Adjustment Mechanism (CBAM) came into effect. It imposes a carbon tariff on carbon-intensive imports (like iron and steel, aluminium, cement, hydrogen, electricity and fertilisers) to the EU which is designed to prevent 'carbon leakage' by ensuring imported goods face a comparable carbon cost to domestic EU

[407] https://www.fnlondon.com/articles/state-aid-for-sustainability-is-dwindling-climate-leaders-are-turning-to-private-markets-06844eae?

products, thereby creating a level playing field and encouraging cleaner production globally. EU companies importing more than 50 tonnes of CBAM goods into the EU will have to apply for the status of authorized CBAM declarants. Importers are required to buy CBAM certificates (from the national authorities in their country of establishment) that reflect embedded emissions, with prices set by the EU Emissions Trading System (ETS). The price of the certificates will be calculated based on auction price of ETS allowances expressed in €/tonne of CO_2 emitted, as a quarterly average in 2026 and as a weekly average from 2027 onwards. Importers will declare the emissions embedded in their imports and surrender the corresponding number of certificates each year.[408] Diana Casey, executive director of the Mineral Products Association in the UK, which includes cement producers, said: 'The challenge for us is that the rest of the world is not keeping up in terms of decarbonization. That's making production of products like cement much cheaper outside Europe as a consequence. Imports to the UK of cement had tripled from about 10% of the market a decade ago to about a third currently. We need the CBAM to level that carbon cost playing field. We really do view it as quite fundamental to securing the future of cement production here in the UK'.[409]

In January, Agnes Mazurek, from Apex Group, argued that tokenization is changing how sustainable projects are funded, verified, and owned. Tokenisation is allowing small and medium-sized enterprises, previously locked out of green borrowing by high entry barriers, to raise funds directly from investors through digital units of ownership. For example, a wind farm in Scotland can now attract hundreds of investors, each holding a verifiable stake in its output. Similarly, tokenization overcomes the credibility issues associated with double-counting, vague claims, and inconsistent data, by ensuring that each transaction leaves a permanent, traceable record, making every credit unique and verifiable. Payments linked to environmental results can now be automated and executed only when verified outcomes are achieved. In Brazil, a reforestation project released funds automatically when satellite data confirmed tree survival rates above target. This kind of automation cuts administrative cost and gets capital to the projects that need it most.[410]

In January, scientists at the University of California San Diego's Scripps Institution of Oceanography found that previous estimates of ocean damage from climate change – the 'blue' social cost of carbon – did not account for potential ocean impacts such as losses to fisheries, damage to coral reefs and coastal infrastructure, and related risks to human health linked to warming and changing ocean chemistry. When these impacts are included, the cost of carbon dioxide could rise by $46.2 per ton to $97.2 per ton overall, doubling previous estimates. According to the Global Carbon Budget, global CO_2 emissions were 41.6 billion tons in 2024, suggesting around $2 trillion in ocean-related damages between 2024 and 2015. Scripps argues that the social cost of carbon is a more accurate method of

[408] https://taxation-customs.ec.europa.eu/carbon-border-adjustment-mechanism_en
[409] https://www.theguardian.com/environment/2026/jan/01/eus-new-green-tariff-rules-on-high-carbon-goods-come-into-force
[410] https://funds-europe.com/tokenisation-is-rewriting-the-rules-of-sustainable-finance/

accounting for the harm from climate change than other methods, such as those used as the basis of carbon credits or carbon offsets by airlines.[411]

In January, the EDHEC Climate Institute's ClimaTech research project issued a report noting that 'data centres are uniquely vulnerable to climate change – in the form of direct impacts such as extreme heat, flooding, power outages, wildfires etc – as they can withstand close to no variation in conditions to function effectively. Their connectivity needs, huge energy [and water] consumption and high heat output also add a very specific transition risk to their profile – it is particularly challenging for them to shift to any kind of sustainable business model'. ClimaTech was looking at 'opportunities for data centre assets to reduce their climate transition impacts. Several of the most material decarbonisation and physical-risk strategies also reduce the need for water by cutting overall cooling demand. These include switching to natural and evaporative cooling, optimising operational practices (such as safely raising operating temperatures and improving layouts), and locating new centres in cooler climates. These measures lower energy use and emissions from cooling but also reduce reliance on resource-intensive mechanical systems. This enables them to mitigate transition risk, improve resilience to extreme heat, and ease pressure on local water supplies. The latter also supports wildfire response capacity in stressed regions'. The report warned that there are stranding risks when assets cannot comply with legislation to become greener.[412]

In February, climate risk analyst Unwritten's *2025 Benchmarking Private Market Investor Climate Disclosures* report revealed that 67% of investment managers – across private equity, private debt and real assets – included climate risk assessment in pre-investment due diligence, but only 13% applied the same discipline throughout the full investment lifecycle, from acquisition to exit. The report calls the shortfall a structural 'implementation gap', with many managers still treating climate risk as a box-ticking exercise at entry rather than something that actively shapes the portfolio. Scenario analysis was the main tool for assessing climate risk. While Scope 1 (direct emissions from owned operations), Scope 2 (emissions from purchased energy) and Scope 3 (indirect emissions across value chain) emissions disclosure was virtually universal in private markets, nature and biodiversity reporting remained underdeveloped. Although 36% of managers reference biodiversity risk assessment, only 14% disclose fund-wide results, with most relying on high-level qualitative commentary.[413]

In February, the £60bn UK pension scheme NEST announced that it had set up a Member Assembly to guide its sustainability decisions and to 'feed into NEST's ongoing decision making for how it invests and acts as an active and responsible asset owner'.[414]

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[411] https://abcnews.go.com/US/damage-ocean-doubles-economic-cost-climate-change-new/story?id=129202855
[412] https://climateinstitute.edhec.edu/news/protection-adaptation-evaluation?
[413] https://funds-europe.com/private-market-climate-disclosures-rise-execution-lags/
[414] https://www.ipe.com/news/nest-launches-member-assembly-to-steer-sustainability-decisions/10135098.article

Three key sustainability issues: biodiversity, natural capital and the circular economy

We now turn to three key sustainability issues attracting the attention of pension schemes: biodiversity, natural capital and the circular economy.

Biodiversity

Mark Thompson (2023),[415] a pension scheme trustee, argues that pension funds should consider biodiversity on their investment strategy:

> *Biodiversity is the variety of animals, plants, fungi and micro-organisms that make up the natural world. These species and organisms work together in ecosystems to maintain balance and support life. The planet's biodiversity is being seriously depleted, threating the viability of human existence. Since 1970, the Earth's wildlife populations have fallen by almost 70% – a result of deforestation, excessive human consumption and industrial scale pollution.*[416] *Mother Nature's cupboard cannot be raided forever without serious consequences. ...It is estimated that around half of the world's GDP is dependent on nature.*
>
> *Against this background, there are four possible risks supporting why trustees should incorporate biodiversity considerations into their investment processes:*
>
> - *Companies that rely on threatened ecosystems will suffer from increased financial risk, with negative effects on their share prices and credit ratings.*
> - *Like climate change, there is transition risk, as governments legislate to mitigate the systemic risk of biodiversity loss.*
> - *Companies that exploit unpriced biodiversity externalities run the risk of reputational risk as media and public opinion turns against them with the resultant impacts on shareholder value.*
> - *Finally, schemes are unlikely to reach their climate net-zero objective without significant improvements in biodiversity loss. This is because marine and terrestrial ecosystems are the sole sinks of anthropogenic carbon emissions.*
>
> *In December 2022, almost 200 countries signed up to the UN Biodiversity accord.*[417] *The accord commits to halting and reversing biodiversity loss by 2030. Implementation will be key to the accord's success and that will need increased legislation around the globe.*

[415] Mark Thompson (2023) Biodiversity: What trustees need to know, *portfolio institutional*, 17 January; https://www.portfolio-institutional.co.uk/opinion/biodiversity-what-trustees-need-to-know/

[416] If the global average temperature rises above 1.5°C, this could constitute a threat to 20-30% of all remaining species.

[417] The COP15 Kunming-Montreal Global Biodiversity Framework discussed above.

However, in doing this, unlike climate change (which is essentially a case of controlling carbon emissions), biodiversity has many facets, and they are location-specific. This makes constructing a framework to manage biodiversity risks, and develop disclosure requirements, more complicated. This is the challenge the Taskforce on Nature-related Financial Disclosures (TNFD) has taken up. It is sensibly adopting the framework pioneered by the TCFD to build on.

Assets managed by funds focused on biodiversity increased from $525m to $1.3bn between 2020 and 2022. However, the Convention on Biological Diversity estimates that to reverse biodiversity losses would require global investment in conservation of $536bn annually by 2050, while current expenditure is only $133bn per year.[418] In January 2024, 320 organizations across more than 46 countries and representing US$14trn in assets under management committed to making nature-related disclosures based on TNFD recommendations. These included PwC, EY Global, Candriam, Cardano, Robeco, Van Lanschot Kempen, the UK Local Government Pension Scheme pools Brunel Pensions Partnership and London CIV, UK asset managers such as Fidelity International and Schroders, and the London Stock Exchange Group.[419]

The UN's COP 16 Biodiversity Conference took place in Cali, Colombia in October-November 2024. A key aim was to assess progress on the Kunming-Montreal Global Biodiversity Framework agreed at COP15. However, only 44 of 196 countries submitted their National Biodiversity Strategies and Action Plans at COP16. Another aim was to check progress on the Global Biodiversity Framework Fund (GBFF) which was set up at COP15.[420] The GBFF aims to help countries achieve the Kunming-Montreal Global Biodiversity Framework goals and targets with a strategic focus on strengthening national-level biodiversity management, planning, policy, governance, and finance approaches. At COP16, a total of $396mn was pledged to the GBFF by Austria, Canada, Denmark, France, Germany, Japan, Luxembourg, New Zealand, Norway, Province of Québec, Spain, the UK and others. Yet another aim was to persuade developed nations to commit at least $20bn annually by 2025 and and at least $30 billion a year by 2030 to support conservation efforts in the Global South.[421]

Some fund managers are integrating biodiversity into their listed equity strategies. For example, AXA IM's 'biodiversity strategy aims to achieve long-term investment returns by investing in innovative companies that can deliver a positive and measurable outcomes'. It applies both the Kunming-Montreal Global Biodiversity Framework and the Global Impact Investing Network (GIIN)'s framework. It is focusing on three solutions that will

[418] CAMRADATA (2023) Biodiversity; https://s42854.pcdn.co/wp-content/uploads/2023/12/Biodiversity-whitepaper.pdf
[419] https://www.pensionpolicyinternational.com/uk-pension-funds-to-begin-tnfd-reporting/
[420] https://www.thegef.org/what-we-do/topics/global-biodiversity-framework-fund
[421] https://en.wikipedia.org/wiki/2024_United_Nations_Biodiversity_Conference; https://www.nature.org/en-us/what-we-do/our-priorities/protect-water-and-land/land-and-water-stories/biodiversity-global-conference/

contribute to stopping biodiversity loss by 2030 and have a net positive impact on biodiversity by 2050:

- Sustainable food and agriculture - reducing the use of water, fertilisers, pesticides, and pollution while increasing food production helped by shifting consumption to meat and dairy alternatives.
- Responsible production and consumption – increasing resource efficiency and reducing pollution through recycling, sustainable materials, and recirculation.
- Resilient infrastructure – modernising ageing water networks to reduce water consumption and pollution, and using the latest science and technology to build next generation sustainable infrastructure designed with biodiversity in mind.[422]

Natural capital

Natural capital is a new asset class in which land is used to generate an investment return. There are three sub-categories: food production (the traditional use of land), afforestation (for carbon sequestration), and timber (as an alternative to steel and concrete in real estate construction). But with total productive land in scarce supply, there is an increasing competition over these uses.

The outcome in any particular country will depend on the price of carbon generated by the country's emission trading scheme. If demand from companies for carbon offsets increases the price of carbon credits, this makes carbon farming more attractive.

For example, in New Zealand, which is one of the world's highest per-capita carbon emitters (because of its red meat industry), carbon credits are above US$50 per tonne. This has resulted in prime farmland being sold to forestry investors for NZ$20,000 per hectare, up from NZ$4,000 per hectare, reflecting the higher net present value of the cash flows that can now be generated from it. This, in turn, has led to criticism from the red meat industry (Beef + Lamb New Zealand) which is forecasting significant economic damage to the sector and its rural communities.

The University of Melbourne's *Land Gap Report*, published in November 2022, has the following warning: 'Governments' over-reliance on carbon removal could push ecosystems, land rights and food security to the brink – with new land area equivalent to 50% of the world's croplands currently being required to meet [climate pledge] targets. Climate pledges should focus on protecting and restoring existing ecosystems with carbon benefits'.

Asset manager Gresham House has produced a Forest Charter, outlining six core pillars for investment managers, which include biodiversity and integration with the community.[423]

[422] https://core.axa-im.com/responsible-investing/insights/why-and-how-integrating-biodiversity-listed-equity-strategies
[423] https://greshamhouse.com/forest-charter/

It argues that a long-term sustainable supply of timber is 'enabling the world to transition to a lower carbon, sustainable model, through the continued replacement of concrete and steel as building materials'.[424]

According to Florence Chong (2023): 'Global asset managers now see as a central tenet of their management practices an ability to deliver benefits to surrounding communities in the first instance, then to the wider community. An ongoing emphasis on sustainability, preservation, biodiversity and rehabilitation of degraded land is seen as paramount. They point out that, in the first instance, they are accountable to their investors as to how both carbon credits are generated and the timber products produced. Increasingly, too, they are under no illusion that land is finite, and that their ongoing viability as businesses depends on co-existing with other forms of land use, especially farmland'.[425] Further, investors in natural capital assets will have to take into account both climate mitigation and climate adaptation and understand the physical risks to their portfolios.

In February 2024, it was reported that most of the 50 largest natural capital investors are from North America. The largest is Canada's Public Sector Pension Investment Board (PSP Investments) with €8.4bn in assets. This is followed by the US TIAA (General Account) with €5bn and Canada's BCI with €3.5bn. US public pension plans have been investors in timberland and farmland for a considerable time. The largest investor outside the US is the Dutch ABP pension fund with €2.9bn in assets.[426] In total, the 50 largest institutional natural capital investors owned €70.6bn at the end of 2014, equal to over 1% of their total assets.[427]

An example of the social benefits of protecting natural capital is the US reforestation program which began in the 1920s. Since then, 15m hectares have be reforested in the eastern US. This has created a 'warming hole' over the areas covered where temperatures have flatlined or even fallen, despite a warming trend elsewhere in the US.[428]

In January 2025, the First Sentier MUFG Sustainable Investment Institute commissioned a report from Pensions for Purpose which found that 65% of asset owners in the UK were incorporating nature and biodiversity into their sustainability strategies, while a further 20% planned to do so. The report emphasized the need for the financial sector to tackle biodiversity risks, with asset owners increasingly aware of the dangers of biodiversity loss. Pensions for Purpose research manager, Bruna Bauer, said that it was financial materiality, rather than regulatory pressure, that had emerged as the primary reason for asset owners to act: 'Biodiversity loss poses tangible risks to investments, including supply chain vulnerabilities and ecosystem fragility, prompting schemes to proactively protect their

[424] https://greshamhouse.com/news-media/global-timber-outlook/
[425] Florence Chong (2023) Natural capital: food, timber or carbon?, *IPE Real Assets*, January/ February; https://realassets.ipe.com/forestry-agri/natural-capital-food-timber-or-carbon/10064740.article
[426] https://realassets.ipe.com/special-reports/top-50-natural-capital-investors/10071197.article
[427] https://realassets.ipe.com/special-reports/holistic-natural-capital-strategies-take-shape-in-investors-minds/10128328.article
[428] https://www.theguardian.com/environment/2024/feb/17/us-east-trees-warming-hole-study-climate-crisis

portfolios. Asset owner respondents have realized ignoring nature-related risks is not just a sustainability issue but has financial consequences too, leading to the integration of nature into sustainable strategies before more regulation mandates it'.[429]

The risks of ignoring nature-related risks could lead to 'planetary insolvency' according to a report by the UK Institute and Faculty of Actuaries entitled *Planetary Solvency – Finding our Balance with Nature*.[430] The report defines 'planetary solvency' as 'managing human activity to minimise the risk of societal disruption from the loss of critical support services from nature'. The report concludes that there is an increasing risk of 'planetary insolvency', i.e., 'an increasing risk of severe societal and economic disruption caused by a breakdown in critical ecosystem services. This could include the provision of food and water and regulation of the climate. Therefore, catastrophic or extreme impacts are plausible unless decisive action is taken to mitigate climate and nature risks'.

The report has five recommendations to mitigate the risk of 'planetary insolvency':

1. Implement planetary solvency assessments to provide clear global systemic risk information for realistic and effective global risk management
2. Set planetary solvency limits that respect planetary boundaries, including revisiting climate goals and developing metrics to monitor planetary health
3. Enhance governance structures to formalize planetary solvency and provide transparent, easy-to-digest assessments for relevant bodies and the public
4. Build policymaker capacity on systemic risk management, enhancing understanding of the risks and interdependencies, and embedding risk outputs within current risk management processes
5. Take action to mitigate risk through incentives and policy design, as well as exploring options to limit global warming

The report introduces illustrative outputs for planetary solvency risk assessments in the type of format that might be provided to a risk committee. This includes an assessment of risk appetite alongside a risk dashboard. It sets out the current risk position and trajectory across the different dimensions of: climate, nature, society and the economy.

In March 2025, natural capital investment manager New Forests launched a fund to help Japanese paper-products manufacturer Oji Holdings meet its 2030 environmental goals. Oji Holdings will invest US$300m to establish Future Forests Innovations Fund which will invest in forestry plantations in Southeast Asia, North America, Latin America and Africa. It is targeting an additional 1.5m tCO_2e p.a. of net sequestration by 2030 from the forestry

[429] https://www.pensionpolicyinternational.com/uk-financial-materiality-forcing-nature-and-biodiversity-into-sustainability-strategies/

[430] https://actuaries.org.uk/document-library/thought-leadership/thought-leadership-campaigns/climate-papers/planetary-solvency-finding-our-balance-with-nature/

assets it acquires. It already owns 635,000 hectares of plantations globally and will invest in an additional 70,000 hectares, including greenfield and brownfield assets.[431]

In March 2025, the British Standards Institution (BSI) released a government-backed green finance standard – as part of the Nature Investment Standards Programme – to encourage investment in nature restoration and prevent greenwashing. The standard will promote investment in projects such as wetland restoration, water quality improvement, flood resilience, and habitat creation. The BSI is also launching a consultation on the first version of a Natural Carbon Standard which will gather market views on high-integrity principles for projects selling nature-based carbon credits in UK markets. These credits will consist of habitats which store carbon, such as woodlands or peatlands.[432]

In March 2025, a report entitled *Balancing Act: Aligning Climate And Nature* was released by Savvy Investor and Nuveen.[433] The report investigated the intersection between net-zero investing and nature conservation and highlighted the unintended risks of focusing solely on emissions reduction. It considered how climate-driven investment strategies can inadvertently harm biodiversity and outlined a framework for integrating nature considerations into investment decision-making for investors seeking to balance decarbonization with ecosystem preservation. The report suggested that to bring nature-positive investing into financial decision-making most effectively, investors should consider a whole-portfolio approach that encompasses both systemic- and event-based risks. This implies looking at how nature-related impacts occur across different asset classes and identifying opportunities to support ecosystem restoration and resource efficiency. The report proposes some key investment strategies:

- Prioritizing high-impact themes: Focus on sectors and activities with the greatest environmental footprint, such as land use change, resource consumption, and pollution generation. Identifying material risks within corporate value chains can help direct capital toward the most impactful areas.
- Using science-based assessment frameworks: Metrics such as the Science Based Targets Network (SBTN) provide structured methods for evaluating corporate sustainability commitments. Investors can use these frameworks to measure progress toward nature-positive outcomes.
- Exploring fixed-income solutions: A specific example is a $225m Amazon reforestation bond issued by the World Bank, which ties financial returns to measurable carbon removal outcomes. This type of innovative financial instrument can channel capital toward conservation efforts while generating returns.

[431] https://realassets.ipe.com/news/new-forests-launches-300m-fund-to-help-japanese-corporate-meet-2030-goals/10129587.article
[432] https://www.bsigroup.com/en-GB/products-and-services/standards-services/the-nature-investment-standards-programme/; https://www.ipe.com/news/uk-launches-nature-finance-standards-to-prevent-greenwashing/10129677.article
[433] https://www.savvyinvestor.net/sites/default/files/node/paper/file/savvyreport_nuveen_mar2025_final.pdf

Further, the report said it was of critical importance to address nature risks across different asset classes, such as equities, corporate debt, and structured financial products. Given that nature risks are embedded across multiple industries, creating and using a holistic strategy that incorporates biodiversity and natural capital considerations is necessary for investors who wish to manage long-term financial risks.

In April 2025, the IFRS Foundation and the Taskforce on Nature-related Financial Disclosures (TNFD) agreed to create better guidelines for improving nature-related financial disclosures, building on the TNFD recommendations in the ongoing work of the International Sustainability Standards Board (ISSB). The ISSB said: 'Our collaboration with the TNFD is a clear signal to the market that we are committed to reducing fragmentation in sustainability disclosure while meeting the need for relevant and high-quality information for capital markets'. The TNFD said: 'Nature is essential to our economies and our future. Our collaboration with the ISSB is a major step toward making nature visible in businesses reporting and how capital is allocated. Climate-related standards have already moved markets, and we are pleased to continue to support ISSB efforts that bring the rest of nature into global reporting practice. Stronger standards mean stronger businesses, and a healthier, more resilient planet for all of us'.[434]

In September 2025, the World Economic Forum published *Finance Solutions for Nature: Pathways to Returns and Outcomes* which offers institutional investors, banks, asset managers and development institutions ten finance solutions for investments in nature:[435]

- Sustainability-linked bonds (SLBs): Commercial bonds tying coupon rates to nature-related targets for corporates or governments. To scale up, SLBs need stronger triggers, clearer metrics and closer alignment between issuers and investors.[436]
- Thematic (or use-of-proceeds) bonds: Bonds with proceeds earmarked for nature projects. Scaling-up requires clearer guidance and aggregation to improve outcomes for issuers and investors.
- Sustainability-linked loans (SLLs): Flexible debt, linking interest rates to nature-related targets. SLLs need simpler verification, standardized metrics and stronger triggers to drive nature-positive lending.
- Thematic (or use-of-proceeds) loans: Loans for specific nature-related projects. Greater clarity on taxonomies and aggregation is needed to enhance capital flows.
- Impact funds: Funds investing in nature-positive outcomes, often accepting higher risk or longer pathways to returns. Scaling-up requires a stronger pipeline of investable projects and better governance.

[434] https://www.ipe.com/news/ifrs-joins-forces-with-tnfd-to-improve-nature-related-financial-disclosures/10129953.article

[435] https://reports.weforum.org/docs/WEF_Finance_Solutions_for_Nature_2025.pdf

[436] The first issuer of a SLB was Chile in 2021 which tied coupons to emissions reduction and renewable electricity targets. The second issuer was Uruguay in 2022 which linked its coupons to deforestation limits and commitments to increase forest cover; https://impact-investor.com/slbs-find-their-place-within-em-sovereign-debt-says-ninety-one/

- Natural asset companies (NACs): Publicly and privately listed companies that convert the full economic value of nature into financial flows via equity models. NACs hold significant potential but need more transactions for price discovery and replicable investment blueprints.
- Environmental credits: Tradeable certificates for verified environmental benefits, used in compliance or voluntary markets. Scaling-up needs integrity principles, unified standards and stronger local community engagement.
- Debt-for-nature swaps (DNS): Mechanisms to restructure sovereign debt in exchange for conservation or restoration commitments, with investable components including bonds and loans. DNS need better governance and standardization, plus an expanded pipeline of eligible debt to deliver conservation funding.
- Payments for ecosystem services (PES): Contracts rewarding conservation for specific ecosystem services, driven by the public sector. Private sector schemes require longer contracts, aggregation and supply chain integration to scale up.
- Internal nature pricing (INP): Unexplored, voluntary shadow pricing or fee-based tools to incentivize nature-positive performance in companies or across investment portfolios, similar to internal carbon pricing (ICP).

In November 2025, Van Lanschot Kempen Investment Management released a report entitled *Building nature-positive portfolios* which argued that 'For investors seeking to create positive impact, private markets are uniquely positioned to deliver nature-positive outcomes. Private equity, private debt, infrastructure, farmland and forestry (real assets) enable capital to be invested in transformative business models and projects that combine financial returns with nature restoration'.[437]

In January 2026, Funds Europe and Gresham House released a report *Perspectives on Nature* which identified significant sources of sustainable and uncorrelated risk-adjusted returns from investing in natural capital and assets such as sustainable agriculture, forests and timberland, and land assets acquired on the basis of legislation encouraging a market in biodiversity net gain (BNG).[438] Olly Hughes, managing director Forestry at Gresham House, pointed to factors such as the structural shift towards a circular bioeconomy driving demand for timber versus carbon-intensive materials, such as steel, concrete and plastic. The forestry market is also shifting away from traditional owners such as HNWIs and family offices towards institutions, including pension funds, insurers and endowments.[439]

[437] See also: https://www.vanlanschotkempen.com/-/media/vlk/vlk-im-documents/news-and-knowledge/whitepapers/vlk-natural-capital-farmland-document.pdf
[438] The specific regulatory requirement in England, effective from February 2024, that requires that developers leave biodiversity in a measurably better state than before development took place.
[439] https://funds-europe.com/valuing-natural-capital/; https://funds-europe.com/gresham-house-natural-capital-report/

Circular economy

A key feature of a sustainable future is the Circular Economy. This has been defined, by Amundi Asset Management, as an economy which 'allows [the production of] sustainable consumer goods, while protecting nature – by giving it time to regenerate – and ensuring the wellbeing of individuals. There is an urgent need to promote a society in which natural resources are protected, in which nature has the time to regenerate, where consumption is reasoned, where the life of goods is extended to the maximum and where waste is treated to be recycled in new products… We therefore need to move from a linear economic model to a circular economic model that will limit the damage to the environment, giving it time to regenerate by promoting the extension of the life span of produced goods – notably through eco-design, reparability, durability, and the second-hand market. It must also include better treatment of waste allowing raw materials to be reused to create new goods... thus closing the loop'.[440]

One example of this is enhancing building efficiency through 'smart windows' that generate power, cool rooms and heat water. A smart window incorporates a thin layer of a semi-transparent photovoltaic (STPV) material between two panes of glass. The STPV layer absorbs most of the visible light passing through the window, provides some shading, and generates electricity to help power the building's cooling system.[441]

Speaking at the Fiduciary Investors Symposium at Oxford University in November 2024, Gabriel Micheli, senior investment manager at Pictet Asset Management, pointed out that the planet had lost around three quarters of its species over the past 50 years and that biodiversity regeneration and restoration were essential for the planet's resilience. He said that regenerative agriculture is more resilient, reduces tilling and uses less pesticides and more nature-based solutions to ensure yields. Although circularity accounts for just 7% of the global economy, he predicted that the circular economy and recycling offer investors a huge opportunity.[442] Speaking at the same Symposium, Ingrid Kukuljan, head of impact and sustainable investment at Federated Hermes Limited, also agreed that 'you can make money by investing in solutions. [But] if you don't start investing now there won't be any returns in ten years because the degradation will be so high. Take it seriously from a fiduciary duty point of view'. She also reminded delegates of the potential risks from not

[440] The wheels of a Circular Economy go round and round, Amundi Asset Management, 26 January 2022; https://research-center.amundi.com/article/wheels-circular-economy-go-round-and-round

[441] Abdelsamie, M. M., Ali, K., and Hassan Ali, M. I. (2025) Enhancing building efficiency: Multifunctional glazing windows with integrated semitransparent PV and selective liquid-filters, *Appl. Energy*, 377, 124723. See also: https://kuexplorer.ku.ac.ae/2025/09/09/smart-windows-help-power-heat-and-cool-buildings

[442] https://www.top1000funds.com/2024/12/biodiversity-regeneration-set-to-become-big-investment-theme-in-future

stemming biodiversity losses: ‘plants alone are responsible for around 40% of the medicine in the western world’.[443]

Investment and sustainability

Here we discuss how investors are responding to the climate change challenge.

Integrating biodiversity into finance

Emmanuelle Sée, Head Equity Management, Swiss Life Asset Managers France, discusses the importance of integrating biodiversity into finance:

> *By integrating biodiversity into decision-making and investment practices, financial institutions can help protect the planet’s natural resources while generating sustainable returns for investors and society. The economy’s dependence on nature makes biodiversity loss a significant risk for companies, especially as regulations tighten.*
>
> ***Nature-related risk: a critical challenge for businesses.*** *Financial institutions must anticipate and incorporate both climate-related and nature-related risks into their business activities and investment portfolios. The degradation of biodiversity and ecosystems presents substantial threats to financial stability, including physical, transition, and systemic risks. Recent estimates suggest that annual cost of losing ecosystem services range from USD 4 trillion to USD 20 trillion (OECD).*
>
> ***Physical risks*** *result from the degradation of nature, which impacts economic activities – ranging from acute crises like natural disasters to chronic issues such as ecosystem decline. Sectors dependent on specific ecosystems are particularly vulnerable. For instance, the decline of pollinators can reduce agricultural yields, while large-scale pollution events, such as oil spills, can disrupt business operations.*
>
> ***Transition risks*** *include reputational and regulatory challenges as governments enforce stricter environmental regulations or as consumers become more environmentally conscious. Companies that fail to adapt to these demands risk being left behind as sustainable alternatives gain traction.*
>
> ***Systemic risks*** *refer to the broader implications of biodiversity loss on the global economy’s resilience. Ongoing ecosystem degradation can undermine natural infrastructures, such as coastal wetlands that protect against storms, posing risks to both communities and businesses.*

[443] https://www.top1000funds.com/2024/12/why-investing-in-biodiversity-champions-pays

Addressing these risks is not just about compliance; it is essential for safeguarding the long-term viability of economic activity and ensuring the resilience of financial systems.

A nature-positive approach. *Companies and investors are increasingly adopting a 'nature-positive' approach, complementing their carbon neutrality efforts. This shift is influenced by international agreements like the Paris Accord, alongside rising governmental regulations aimed at enhancing environmental sustainability. The approach recognises biodiversity's essential role in ecosystem health and strengthening the resilience of global economies amid climate challenges.*

This broader focus extends beyond climate to include biological diversity, encapsulated by the equation: Nature = Climate + Biodiversity. Nature is shaped not only by climate but also by the diversity and interactions among species. Integrating biodiversity into corporate strategies is key to meeting stakeholders' growing expectations regarding sustainability and environmental responsibility.

By pursuing a 'nature-positive' approach, businesses can minimize their environmental impact and actively contribute to preserving and restoring vital ecosystems. This involves strategies that protect biodiversity, restore degraded ecosystems, and align business models with the needs of the planet and its inhabitants.[444]

The financial sector's pathway to sustainable investing

In April 2025, the Institut Louis Bachelier (ILB) released a report entitled *Financial sector's path to global climate goals*.[445] The report argues that 'While numerous methodologies exist to assess the alignment of individual institutions or portfolios, a consolidated, sector-wide perspective is still largely missing'. Although the report recognises the importance of 'emission alignment' metrics, it calls for two additional metrics, 'transition alignment' metrics and 'financing alignment' metrics. It argues that 'Assessing consolidated climate alignment can reveal whether financial flows are being redirected at the scale and pace required to meet global climate targets'. This allows three complementary questions to be asked: 'Who provides financing, what does it finance, and what outcomes does it achieve in terms of alignment with climate goals?'. Answering these questions will make it easier to mobilize capital globally, since 'new annual flows can be aligned [to the transition to net zero] – while the accumulated stock of capital may not be, because of past misalignment of financial flows'. The report also suggested that 'To provide actionable insights, a robust assessment methodology should link individual

[444] Emmanuelle Sée (2024) The new nature of business: integrating biodiversity into finance, Swiss Life Asset Managers, November; https://hub.ipe.com/asset-manager/swiss-life-asset-managers/the-new-nature-of-business-integrating-biodiversity-into-finance/10076605.supplierarticle

[445] https://www.institutlouisbachelier.org/wp-content/uploads/2025/05/financial-sector-s-path-to-global-climate-goals-april-2025-1.pdf

institution performance with macro-level objectives. This requires reconciling diverse data inputs, ensuring transparency, and avoiding distortions. Accounting for the unique impact of different financial activities ensures that progress in one area does not overshadow gaps in others. By addressing these dimensions, consolidated alignment assessments can clarify whether financial institutions (FIs) are collectively contributing to global climate objectives'. The report then went into more detail about the three metrics:

> ***FI Transition alignment approaches*** *focus on evaluating whether individual financial institutions within a defined group are aligned with climate objectives. This approach answers the question: 'To which extent the chosen group is constituted of aligned financial institutions?'. These approaches are the simplest and most widely applied. They often assess institutions based on their commitments, governance, decarbonization levers such as engagement and adoption of frameworks such as science-based targets. However, variations in the definitions and quality of the methodologies used across different frameworks can make comparisons difficult. Steps to implement this approach include defining the criteria to define whether a specific institution is aligned or not, evaluating individual institutions against these criteria, and aggregating the results into a consolidated metric at group-level. Aggregation can be based on the number of aligned institutions, financial metrics, or emissions data, each with specific strengths and limitations. While these approaches provide a high-level overview, they have limitations. They do not establish direct links to emissions reductions or ensure alignment with global carbon budgets at the macro level. Additional research is needed to integrate data on financial flows and stocks and emissions to make this approach more robust and comprehensive.*
>
> ***Financing alignment approaches*** *focus on tracking the reallocation of capital towards climate-aligned investments away from 'climate-incompatible' investments. These approaches aim to assess whether financial flows (and stocks) are being redirected at the necessary scale and pace to meet global climate goals. These approaches can be applied to both instruments with known use of proceeds, such as green bonds, and those with unknown use of proceeds, such as corporate loans. Historically, they have been used in the context of macro analysis, unrelated to specific FIs, as well as at FI-level focussing on fossil fuels specifically. Increasingly, there are discussions of using this approach at FI-level for target-setting and monitoring across all types of assets in relation to the transition (solutions, credibly transitioning, incompatible). Bridging the gap between individual FIs and macro analysis to produce a consolidated alignment metric would involve defining what constitutes climate-aligned and incompatible financial flows and stocks, identifying current and projected flows, setting alignment benchmarks describing the pace and scale at which financial flows and stocks should be reallocated, and aggregating results. Key challenges include distinguishing between stock metrics (accumulated financial flows) and flow metrics (new financing activities), as well as addressing the lack of standardization in the classification of financial instruments and counterparties as net-zero aligned.*

The absence of robust tools to assess general-use financial instruments, to project future flows and stocks, and to derive benchmarks further complicates the analysis. Advancing this approach will require enhanced data availability, improved methodologies for mapping financial flows and stocks to counterparties, and refined tools to assess alignment.

***FI Emissions alignment approaches** use the GHG [greenhouse gas] emissions data associated with financial institutions' activities as an input to the analysis. These approaches seek to address the ultimate objective of climate-related finance: achieving measurable reductions in greenhouse gas emissions. These approaches have historically been used by FIs to assess the alignment of their portfolios, using projected emissions. The same logic could be applied at the consolidated level, for a group of FIs. It would involve retrieving and harmonizing emissions data, addressing inconsistencies in reporting, mitigating double-counting risks, projecting future emissions and assessing alignment against decarbonization benchmarks. Yet, forward-looking emissions alignment metrics trying to project future emissions (and thus future emission reductions/avoidance) bring with them their own challenges: uncertainty of the projections, need to build a sound 'Business as Usual' reference scenario, attributability of the reduction/avoidance. [The report argues] that, in the context of consolidated alignment assessments, emissions' alignment approaches are best used as an ex-post assessment, to monitor whether FIs changing financing practices have had the desired impact on real world decarbonization. The main challenge includes the risk of 'paper decarbonization', where emissions reductions are only achieved through metric optimization (perimeter/methodological changes, adjustment of the portfolio exposure through divestment of some GHG-intensive companies to the profit of light-intensive GHG companies, without any actual effect on real-economy GHG emissions). Further research is needed to standardize methodologies, integrate emissions data with financial metrics, develop reliable tools to monitor emissions' reduction and aggregate the results relating to different asset classes and financial services. These efforts should focus on ensuring that these approaches capture the real-world impact of financial institutions' activities on emissions reduction.*

The drivers of investment funds' allocation to sustainable investments

Annamaria de Crescenzio and Etienne Lepers (2024) consider the key drivers of investment funds' allocation to sustainable investments, particularly in emerging markets (EMs).[446] Using a unique micro-level dataset on a detailed portfolio-level sample of the 37,000 largest investment funds globally and a unique classification of 'green' companies

[446] Annamaria de Crescenzio and Etienne Lepers (2024) What Drives Capital to Green Companies in Emerging Markets: Evidence from Investment Funds;
https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4822081;
https://cepr.org/voxeu/columns/drivers-investment-funds-allocation-green-companies

based on revenues in carbon solutions (renewable energy, green transport, and infrastructure), the authors find that:

- A key role is played by benchmarks. Inclusion in major indices, such as the MSCI EM equity index, was the single most important factor influencing global investment fund choices. For example, major EMs like China and Brazil, with substantial representation in these global benchmarks, were able to attract significant shares of green investments, 'reflecting the appeal of their green companies'.
- Developing robust green sectors can position countries as prime destinations for capital. Countries with high renewable energy generation and strong green exports were able to attract more capital. Conversely, structural barriers, such as concentrated ownership of listed companies, deter investment by limiting the availability of tradable shares. So maintaining openness and a favourable investment climate remains critical.
- There was no robust statistical evidence for a role of climate policies in influencing green investment shares in country portfolio allocations.

Building sustainable investment strategies

How can investors build sustainable investment strategies? Bouchet and Shahyar (2024) offer a framework for achieving this which begins with certain building blocks (themes, levers and data) and ends with four categories of sustainable investment strategies (sustainable, transition, solutions, and ethical).[447]

The themes range from local 'ESG' to global 'SDG'. There are three key types of lever: exclusion, allocation and engagement. Exclusion removes certain stocks from the portfolio; it is used as a response to non-sustainable activities, as a last resort when engagement fails, and to align with trustees' ethical considerations or resource constraints. Allocation applies a weighting scheme to the selected stocks, with the objective of either (1) maximizing sustainable metrics like ESG scores, carbon intensity, or average sustainable revenues or (2) ensuring a minimum allocation to certain market segments, e.g., companies offering climate solutions. Engagement builds relationships with companies and stakeholders. It begins with 'field building', the establishment of direct relationships with companies and with the fellow investors and regulators who can also influence a company's behaviour. This, in turn, leads to specific actions, such as 'Say on Climate' resolutions (e.g., ESG votes at AGMs) and collective investor initiatives like Climate Action 100+. The aim is to change corporate behaviour, particularly in transitioning non-sustainable activities to sustainable ones. Since this involves significant time and resources, investors are recommended to focus on specific themes and companies. The effectiveness of engagement is increased if exclusion by a group of investors remains a genuine possibility.

[447] Vincent Bouchet and Shahyar Safaee (2024) Institutional equity portfolios: how can asset owners build coherent sustainable strategies?, *EDHEC Research Insights*, Summer 2024, 7-11.

Data can be distinguished between primary and secondary. Primary data for sustainable investing reveals a company's state and activities. This is increasingly standardized, with metrics aligned with reporting requirements which emphasize climate mitigation. There is also more public data available, such as Urgewald's global coal exit list and the Finance Exclusion Tracker Initiative's aggregated exclusion list. Further, technological developments in web scraping and text analysis allow the generation of alternative ESG data. This has led to more reliable ESG primary data, making it easier to set exclusion and sustainable investment criteria. Secondary data are derived from primary data and are used to create ESG ratings. However, there are currently significant differences between ESG rating providers at both company and fund levels, mainly due to differences in the measurement of ESG attributes, rather than differences in scope or weight. There are also secondary metrics, chiefly related to climate change mitigation, but again there are big differences in measurement methodologies; nevertheless they can provide a useful basis for discussions with companies.

The themes, levers and data can be used to construct the four types of sustainable investment strategies. A sustainable investment satisfies one or more of the three ESG criteria of avoiding harm to environmental or social goals, contributing positively to these goals, and adhering to good governance standards. 'Harm' as a result of both activities (what a company produces) and behaviour (how the company produces) have to be defined, and an investor could assess them in terms of, say, the EU's 'do no significant harm' (DNSH) criteria or the UN's SDG framework, using primary data on, e.g., revenue distribution, consumption and production. A company can be considered to make a 'positive contribution' if its core activities meet one or more SDGs at a minimum threshold and the company also manages negative impacts from all activities and behaviour, consistent with 'do no harm'. Some organizations have set criteria for defining such investments, e.g., the Sustainable Development Investment (SDI) Asset Owner Platform.[448] Again, primary data on revenues and production tend to be preferred for screening positive companies, since they focus directly on company activities; by contrast, secondary metrics such as ESG scores, tend to focus more on behaviour and often net off positive and negative contributions.

Investment strategies can range from 'alignment', where holdings align with values but no specific change is expected, to 'impact', where explicit improvements in activities or behaviour are targeted. Targets should ideally be derived from science-based or global standards, such as the Paris Agreement or the Net-Zero Asset Owner Alliance's Target-Setting Protocol.

Bouchet and Shahyar argue that the above analysis leads naturally to four categories of investment strategies with the following aims and principal levers (see Figure 11):

[448] https://www.sdi-aop.org/about/. SDIs are defined as those solutions that contribute to the UN Sustainable Goals.

- *Sustainable*. Aim: to align the portfolio's constituents with one or more sustainable development goals, focusing on companies that 'do no harm' to environmental and social issues. Principal lever: exclusion, based on primary data.
- *Transition*. Aim: to transform companies with negative impacts into sustainable ones, using engagement on specific themes. Principal levers: exclusion thresholds and science-based transition plans, using both primary and secondary data.
- *Solutions*. Aim: to align a significant portion of the portfolio with specific theme solutions addressing environmental or social issues. Principal levers: dialogue with companies to reinforce and develop these solutions, and exclusion to ensure alignment with do-no-harm criteria.
- *Ethical*. Unlike the three preceding strategies, this category allows subjective preferences, such as religious or personal values, to influence investment criteria and targets.[449]

[449] There are other approaches to building sustainable portfolios. For example, Lazanas et al (2025) select a portfolio that minimizes the return variance, subject to a standard no-leverage constraint and an emission budget constraint that requires the weighted average carbon intensity (WACI) of companies included in the optimal portfolio not to exceed the net-zero compliant emissions budget (or target). The companies included from each sector of the economy will be selected from the peer group of companies in that sector. The optimal portfolio weight for a particular company is the standard minimum variance weight plus a term involving the product of the normalized target intensity change for the company's peer group (the excess of the net-zero compliant emissions of the peer group over the risk-weighted intensity average of the peer group, divided by the risk-weighted standard deviation of the intensity of companies in the peer group) and the emission intensity weighted z-score for the particular company (the excess of the emission intensity of each company included in the portfolio over the risk-weighted intensity average of the company's peer group, divided by the risk-weighted standard deviation of the intensity of companies in the peer group). If this product is positive, the optimal portfolio weight for a particular company will be higher than the standard minimum variance weight. See Equation (9) of Antonios Lazanas, Zarvan Khambatta, Yingjin Gan, Lingjuan Ma, and Niall Smith (2025) Building 'Net-Zero-Aligned' Portfolios, CFA Institute, 8 January; https://rpc.cfainstitute.org/research/reports/2025/building-net-zero-aligned-portfolios

Figure 11: Classification of sustainable investment strategies

		Portfolio initial allocation			Portfolio management		
Strategy	**Themes**	**Targeted companies**	**Negative screening**	**Weighting scheme**	**Shareholder engagement**	**Field building**	**'Output' metrics**
Sustainable	All	Companies whose behaviour and activities 'do no harm' to any SDGs	Covering all SDGs, based on revenues, physical metrics, controversies	Optimising risk and return under sustainability constraints: ● Negative screening		Publication of exclusion list	Alignment with 'do no harm' criteria, dynamic review of controversies
Transition	Specific	Companies whose behaviour and activities 'do harm' to certain SDGs, but where change is possible	Companies not prioritised for engagement + Companies where engagement has failed	Optimising risk and return under sustainability constraints: ● Negative screening ● Min/max share of 'targeted transition companies' (sustainability segment)	Systematically engaging on issues relating to the specific theme chosen	Publication of targets, engagement outputs and exclusion list	Engagement results
Solutions	Specific	Companies whose activities contribute positively to specific SDGs	Covering all SDGs, based on revenues, physical metrics, controversies	Optimising risk and return under sustainability constraints: ● Negative screening ● Min/max share of 'positive contribution companies' (sustainability segment)	Focusing on engagement related to activities (strategy, investments)		Share of 'positive contribution' investment
Ethical	All	Companies whose behaviour and activities are in line with ethical choices	Based on subjective preferences	Optimising risk and return under sustainability constraints: ● Negative screening			Respect of exclusion criteria

Source: Vincent Bouchet and Shahyar Safaee (2024) Institutional equity portfolios: how can asset owners build coherent sustainable strategies?, *EDHEC Research Insights*, Summer 2024, p11.

Nick Stansbury, Carl Fredrik Pollack, and Emma Henningsson (2024) take a contrarian view: 'We believe the negative framing of the climate question and the slow transition progress of many companies have created a significant opportunity for investors'. They argue that 'the greatest climate impact – and potentially also some of the greatest returns – can be sought by investing in those companies with high emissions or whose products have the greatest impact on other companies' emissions. Central to this approach is pro-active and profound company engagement; we believe in encouraging the companies to pull the levers necessary to target improved aggregate climate outcomes. The goal is to allocate more capital to drive the business opportunities the transition creates, while simultaneously driving down emissions over time'.[450]

Another warning comes from a study by Samuel M. Hartzmark and Kelly Shue published in December 2023 called 'Counterproductive Impact Investing: The Impact Elasticity of Brown and Green Firms'.[451] The authors argue that the dominant sustainable investing strategy in recent years involves directing capital towards green firms and away from brown firms, with the goal of facilitating a green economic transition by influencing the firms' costs of capital. However, this may be counterproductive, as it makes brown firms more brown without making green firms more green. The authors introduce a new measure called impact elasticity, which quantifies how a firm's emissions intensity responds to a change in its cost of capital. They examine the impact elasticities along with other financial

[450] Nick Stansbury, Carl Fredrik Pollack, and Emma Henningsson (2024) Climate change:Inaction is not an option: Seeking to deliver an active approach to engagement and investing, LGIM and AP7; https://www.lgim.com/landg-assets/lgim/_document-library/climate-change-inaction-is-not-an-option-whitepaper-final.pdf

[451] https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4359282

and emissions data of US public companies from 2002 to 2020. Firms are then sorted into quintiles based on their emissions intensity, with the lowest representing brown firms and the highest representing green firms. With this data, the authors examine: the level and variability of firm emissions, the impact elasticities of brown and green firms, and the incentive effects of the dominant sustainable investing strategy.

The key finding from the study are:

- The average brown firm releases 261 times more emissions per unit of revenue than the average green firm. Additionally, the annual variability of emissions intensity for a brown firm is equal to the average level of emissions from 35 green firms combined.
- The impact elasticity of green firms is close to zero, whereas the impact elasticity of brown firms is large and negative. This means that brown firms substantially increase their emissions following an increase in their cost of capital, while green firms' emissions remain largely unchanged.
- Brown firms have different impact elasticities than green firms because they have the choice to invest in green projects, such as new pollution abatement technology, or brown projects, such as expanding existing high-emitting production. Green firms do not have such choice, as their projects all have relatively low emissions.
- Since green projects have higher up-front costs and relatively more backloaded cash flows than brown projects, an increase in a brown firm's cost of capital will make brown projects more attractive. Therefore, following an increase in their cost of capital, brown firms deprioritize the green transition and emissions reductions, contrary to the goals of sustainable investing.
- Changes in environmental impact are often measured in the wrong units. Many green funds and ESG ratings mistakenly reward firms for a large percentage reduction of emissions rather than a large reduction in the level of emissions. For example, a green firm reducing its emissions by 100% is much less economically meaningful than a brown firm reducing its emissions by only 1% since the initial level of the brown firm's emissions intensity is substantially higher than the green firm's.
- Rather than avoiding brown industries, as many do not have suitable alternatives, sustainable investors should instead direct capital towards these brown industries and reward the relatively green or transitioning brown companies within these industries.

In short, the study finds that brown firms have a large and negative impact elasticity: they respond to increases in their cost of capital by increasing their emissions. In contrast, green firms have an impact elasticity of around zero: their emissions do not meaningfully change following a change in cost of capital.

A number of studies from asset managers and academics seek to address some issues about net-zero investing.

Valeria Dinershteyn and Guido Baltussen (2024), for example, argue that investors can achieve alignment with their net-zero commitment without significant active risk and without compromising their return objectives. They accept that many net-zero strategies have high levels of tracking error, but they explain this in terms of sub-optimal portfolio construction. Many climate-focused indexes are substantially underweight in sectors such as energy and utilities, but if sector volatility is high (e.g., due to sensitivity to economic events), the tracking error may also be elevated. They analyzed the impact of a carbon intensity reduction on a portfolio's active risk in the MSCI World Index universe. They calculated carbon intensity by dividing a company's carbon emissions by enterprise value including cash. Their research shows that investors can achieve significant reductions in carbon intensity with very little active risk. Specifically, just 0.5% of active risk in a portfolio is required to achieve an 80% reduction in carbon intensity. They point out that this scale of reduction is well ahead of the existing pathway for global carbon emission targets. Forward-looking measures of carbon risk, such as the MSCI Low Carbon Transition Score or the ISS Carbon Risk Rating, have a more material impact on active risk. For example, 1.0% of active risk allows for a 17% improvement in the MSCI Low Carbon Transition Score and a 27% improvement in the ISS Carbon Risk Rating.

Dinershteyn and Baltussen also counter a second misconception, namely that investors cannot gain meaningful exposure to factors such as value in a net zero portfolio. They found that it is possible to maintain the vast majority of targeted factor content while achieving carbon intensity reduction levels above 70%. Integration of forward looking measures have a bigger impact on factor content. They applied their representative set of climate change criteria to the MSCI World Index to see how it would impact a multi-factor approach while allowing for up to 2% of active risk. They found that it is possible to retain over 85% of factor content while meeting significant sustainability goals.[452]

Mathias Talmant (2024) also argues that it is possible to reconcile alpha with sustainability in impact investing. He says that 'Impact investing sits at the intersection of the Venn diagram. It is the only investment philosophy where the interests of all stakeholders (People, Planet, Prosperity) are aligned, in harmony and without compromise. The concept of Triple Bottom Line (or Triple P) challenges the perennial dilemma of impact versus return and implies that impact investing is not a zero-sum game. In other words, caring about sustainability does not mean ignoring fundamentals, but it does indeed limit the size of the investment universe as only the heart of the Venn diagram exhibits purity'. Using total returns by SFDR (Sustainable Finance Disclosure Regulation) classification as compiled by J.P. Morgan with Morningstar data in March 2024 and using Article 9 funds as a proxy for impact, Article 9 funds outperformed both Article 6 and Article 8 funds over a 5-year horizon, although they underperformed over shorter horizons. However, a high demand for impact funds leads to a price premium which can reduce returns, although

[452] Valeria Dinershteyn and Guido Baltussen (2024) Addressing misconceptions with net-zero investing, Northern Trust Asset Management, November; https://hub.ipe.com/asset-manager/northern-trust-asset-management/addressing-misconceptions-with-net-zero-investing/10076602.supplierarticle

Talmant concludes that this 'overlooks the nuanced landscape of sustainable investing, where untapped opportunities abound'. [453]

Ha Do, Théo Le Guenedal, Meghna Bhaugeerutty, Kevin Alinejad, Skender Boughanmi, Aaron Mcdougall, Frédéric Lepetit, and Takaya Sekine (2025) examine the construction of share portfolios with climate-relevant metrics or signals, such as carbon footprint, carbon intensity and scope emissions.[454] The aim is to assess the impact of introducing carbon or climate constraints and objectives in the portfolio construction process. The first step is to collect information that reflects the environmental impacts of a company's economic activity at the level of its financial securities. Each security issuer's activity implies carbon greenhouse gas emissions. By dividing these emissions by revenues or other production metrics, the carbon intensity of the company can be readily deduced. Further, an increasing number of companies report forward-looking carbon reduction targets and describe climate ambition plans in sustainability reports and regulatory reporting requirements, allowing the tracking of carbon emissions and disclosure over time. The second step is to develop more advanced and homogeneous harmonized risk metrics, e.g., measuring all scopes of carbon emissions; measuring the change in credit risk due to the introduction of a carbon tax; decarbonization in 2030 according to the setting of the target or the continuation of the current emission trend; or what a transition scenario (such as the Net Zero 2050 or Delayed 2°C) mean on a company's business. The last step is to integrate this set of signals in the optimal portfolio, along risk and expected return. The authors show that portfolios with fewer Carbon Intensity Reduction ('spot decarbonization') constraints but higher Carbon Trend and Carbon Ambition constraints can be built and could have historically achieved similar performance. A key application of the approach is the construction of climate-aligned benchmarks, such as Paris-Aligned Benchmarks (PAB), which require dynamic portfolio adjustments to comply with stringent decarbonization pathways. These would help investors align their portfolios with transition objectives.

Andreas Brogger, Joren Koeter, and Mathijs van Dijk (2025) examine concentration risk in sustainable portfolios using a global sample of stocks from 47 countries between 1985-2023.[455] They find that it takes around 750 stocks for portfolio volatility to converge to market volatility, in contrast with the 30-40 global stocks are sufficient to fully diversify idiosyncratic risk in standard portfolios. The second aspect of concentration risk they examine relates to FOMO (fear of missing out, leading to subsequent regret), the probability of missing out on the small fraction of top-performing stocks that drive the

[453] Mathias Talmant (2024) Reconciling Alpha with Sustainability in Impact Investing, Degroof Petercam Asset Management (DPAM), November; https://hub.ipe.com/asset-manager/degroof-petercam-asset-management/reconciling-alpha-with-sustainability-in-impact-investing/10076598.supplierarticle

[454] Ha Do, Théo Le Guenedal, Meghna Bhaugeerutty, Kevin Alinejad, Skender Boughanmi, Aaron Mcdougall, Frédéric Lepetit, and Takaya Sekine (2025) Constructing Investment Portfolios with Climate-Relevant Metrics: a multifaceted problem, Aundi Investment Institute, April.

[455] Andreas Brogger, Joren Koeter, and Mathijs van Dijk (2025) FOMO in equity markets? Concentration risk in (sustainable) investing, Rotterdam School of Management, Erasmus University, June.

global equity premium. They find that that just 2.1% of stocks accounted for the entire global equity premium over the sample period (mainly the Magnificent 7[456]). The consequence of this return skewness across stocks is that (very) concentrated portfolios are not only characterized by higher volatility, but also potentially by lower returns. It is possible to reduce volatility in small concentrated portfolios of 30-40 stocks by either careful stock selection based on correlations and volatilities or by imposing maximum weights for individual stocks and maintaining industry composition, but the resulting portfolios remain well short of complete diversification. It is even harder to alleviate FOMO risk in concentrated portfolios, since it is always possible that different portfolios do better ex post – resulting in FOMO. The authors conclude that investors considering concentrated portfolios should take both dimensions of concentration risk (incomplete diversification and FOMO on the next Magnificent 7) seriously as inputs to their decision-making.

Climate betas

In 2023, international asset manager, Robeco, introduced 'climate beta', a risk metric which indicates how sensitive individual stocks are to a climate risk factor.[457] Climate beta is based on the correlation of a stock's price with the climate risk factor and reflects the anticipated positive or negative response of the stock price to climate events.

Robeco's climate risk factor is based on a portfolio that takes long positions in a basket of stocks that contribute negatively to one or more climate-related SDGs ('polluting') and short positions in a basket of stocks that contribute positively to climate-related SDGs ('clean'). In other words, the climate risk factor tracks the difference in returns between polluting and clean companies. Specifically, Robeco calculates two long-short Climate Risk Factor Indices on a daily basis: the Robeco Developed Climate Risk LS Factor Index USD Total Return Index and the Robeco Emerging Climate Risk LS Factor Index USD Total Return Index. The returns on these indices represent the return differential between a long basket of stocks with poor climate SDG scores and a short basket of stocks with good climate SDG scores.

Robeco then estimates climate betas using a two-step procedure:

- Step 1: calculate the return on the climate risk factor that captures the return differential between companies with high climate risk exposure and companies with low climate risk exposure.

[456] Apple, Microsoft, Amazon, Alphabet (Google's parent company), Meta (formerly Facebook), Nvidia, and Tesla.
[457] https://www.robeco.com/en-uk/insights/2023/03/indices-insights-summer-summaries-introducing-climate-beta-a-complementary-climate-risk-metric; https://www.robeco.com/files/docm/docu-20241218-climate-beta-a-forward-looking-lens-on-transition-risk-hksg.pdf

- Step 2: perform a weighted least squares (WLS) regression[458] to estimate a stock's return sensitivity to changes in the climate risk factor:

$$R_t = \alpha + \beta_M MKT_t + \beta_{CB} CRF_t + \varepsilon_t$$

where R_t is the return on the stock in month t in excess of the risk-free rate, α is the risk-adjusted outperformance ('alpha'), β_M is the stock's exposure to the market factor, MKT_t is the return on the market factor in excess of the risk-free rate, β_{CB} is the climate beta, CRF_t is the return on the climate risk factor, and ε_t is the residual.

This results in a metric, β_{CB}, that indicates whether a stock outperforms (negative climate beta) or underperforms (positive climate beta) when there is a positive shock to the climate risk factor. When the climate beta of a stock is zero, the price of the stock tends to be unresponsive to changes in the climate risk factor and, hence, insensitive to climate transition risk.

Robeco argues that 'climate beta is able to identify companies vulnerable to the low-carbon transition (climate laggards) and those expected to benefit from it (climate leaders). This is crucial information that generic emissions data does not provide. …More specifically, firms with a high climate beta tend to do well when the climate risk factor has a positive return, while the opposite is typically true for companies with a low climate beta. As a result, we expect stocks with high climate betas to be negatively affected by stricter climate policies, the transition to a low-carbon economy and innovations in green technologies. On the other hand, we expect stocks with low climate betas to benefit from a shift towards net-zero emissions. In general, we contend that climate beta picks up on a different dimension of climate risk compared to carbon emissions or carbon footprint data'. It concludes: 'Climate beta provides a forward-looking climate transition risk metric that provides unique insights above and beyond traditional carbon emissions data. By using climate beta, investors can better protect their investments against high climate transition risk and negative climate-related events'.

Constructing climate-risk hedge portfolios

Alekseev, Giglio, Maingi, Selgrad and Stroebel (2022) have proposed a quantity-based approach to constructing climate risk hedge portfolios.[459] Climate-risk hedging strategies are becoming increasingly important for investors, but there are few financial instruments available that can directly hedge against these risks and historical stock prices may not

[458] Using WLS instead of ordinary least squares leads to regression estimates that assign greater weight on more recent information.

[459] Georgij Alekseev, Stefano Giglio, Quinn Maingi, Julia Selgrad and Johannes Stroebel (2022) A Quantity-Based Approach to Constructing Climate Risk Hedge Portfolios, Working Paper 30703, National Bureau Of Economic Research, December 2022; http://www.nber.org/papers/w30703

contain enough information to estimate climate risk exposures. Accordingly, the authors introduce a new method to hedge climate risks by analyzing the trading patterns of mutual fund managers following a change in their beliefs on climate change. These patterns can be used to determine the most relevant industries to buy and sell to hedge against negative climate news shocks.

The authors identify two primary triggers for a climate belief shift: an extreme heat event in the manager's region or changes in climate-related discussions in the fund's disclosure reports. Since these events are localized and only apply to a small subset of investors, they do not move stock prices. However, the quantity of stocks bought or sold by fund managers following these events contains information on how investor demand for assets in certain industries at the aggregate level shifts in response to heightened perceived climate risks. The authors quantify how fund managers respond to these events by analyzing the quarterly trading data of nearly 2,500 actively managed non-sector mutual funds in the US between 2010 and 2019.

The study finds that:

- Traditional climate hedging strategies based either on historical time-series data or economic reasoning, such as shorting companies vulnerable to stranded asset risks, are generally not correlated with negative climate news events, suggesting that climate risks are complex and difficult to hedge.
- The long-short quantity-based climate hedge portfolios constructed by the authors outperform the traditional approaches to hedging climate risks.
- This 'wisdom of the crowd' approach uncovers new insights about sector exposures to climate risks. The long-short hedge portfolio is long stocks in the automotive, semiconductor, insurance, and energy sectors and short stocks in the commercial and professional services, real estate, and retail sectors.
- Insurance stocks can surprisingly serve as a hedge to negative climate news, potentially due to expected increases in demand for insurance when climate risks are higher and the ability of insurers to reprice premiums annually.
- Similarly, auto stocks can serve as a hedge to negative climate news, potentially due to increase in demand for electric vehicles from households and firms hoping to reduce their carbon footprints.

Dirk Broeders, Daniel Dimitrov and Niek Verhoeven (2025) propose the introduction of climate-linked bonds to provide investors – including insurance companies and pension funds that are exposed to chronic losses resulting from climate change – with a hedge against long-term climate risks. The bonds adjust their payoffs based on climate variables, such as average temperature and greenhouse gas emissions. They would be issued by national governments and supranational organizations. The authors argue that the bonds

would be 'pivotal in advancing towards a net-zero economy', since they would 'signal government commitment to climate action and incentivize stronger policies'. The price differential between climate-linked bonds and nominal bonds would reflect market expectations of climate risks.[460]

Another way to hedge climate risk is through insurance. Wenjun Zhu, Jinggong Zhang, Lysa Porth, and Ken Seng Tan (2025) explain how index insurance can be used to hedge climate and weather risk: 'Index insurance is a special type of financial contract whose payout is based exclusively on some pre-specified indices. For example, weather index insurance determines the claim payments based on future realizations of weather events determined from certain weather indices. The primary distinction between index insurance and traditional indemnity-based insurance lies in their payout mechanisms. In traditional insurance, payouts are directly tied to the actual losses experienced by policyholders. In contrast, index insurance bases its payouts on predefined indices, which should be built upon data that is both transparent and representative. This structure theoretically reduces information asymmetry issues, such as adverse selection and moral hazard, because the payout is not influenced by the specific losses of an individual policyholder but by the performance of the index. This attribute makes index insurance particularly appealing, as it addresses many of the limitations associated with conventional insurance models. …Furthermore, the adoption of advanced technologies, including satellite measurements and digitalization, has significantly reduced the costs associated with index insurance'. While index insurance has shown some growth in sectors like agriculture that are highly susceptible to weather-related risks, growth is still limited due to basis risk, the risk that the underlying indices and actual losses are mismatched. The authors argue that: 'While challenging to completely eliminate, basis risk can be mitigated through careful contract design. …Besides basis risk, ambiguity aversion, farmers' past insurance payout experiences, and insurance literacy, among others, are also influencing factors for index insurance demand'.[461]

The performance of ESG portfolios

Alves, Krüger and van Dijk (2025) analyzed the relationship between ESG ratings and stock returns over the period 2001-2020, across 16,000+ stocks in 48 countries and seven different ESG-rating providers.[462] They found that ESG investing did not systematically affect investment performance during this period. They also found that: incorporating ESG

[460] Dirk Broeders, Daniel Dimitrov and Niek Verhoeven (2025) Climate-Linked Bonds, ECB Working Paper No. 2025/3011;https://ssrn.com/abstract=5091140 or http://dx.doi.org/10.2139/ssrn.5091140

[461] Wenjun Zhu, Jinggong Zhang, Lysa Porth, and Ken Seng Tan (2025) Index-based Insurance Design for Climate and Weather Risk Management: A Review, in Hirbod Assa, Peng Liu and Simon Wang (eds.), *Quantitative Risk Management in Agricultural Business*, Springer Actuarial (chapter 2); https://doi.org/10.1007/978-3-031-80574-5_2

[462] Rómulo Alves, Philipp Krüger, and Mathijs van Dijk (2025) 'Drawing Up the Bill: Are ESG Ratings Related to Stock Returns Around the World?', Working Paper, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4674146

ratings into investment strategies did not systematically come at the expense of financial returns; the prices of stocks with high ESG ratings were not consistently driven up by demand effects; and firms' cost of capital was not affected by ESG ratings. The authors argue that further research is needed to determine whether the lack of a relationship between ESG ratings and stock returns is due to: the poor quality of ESG ratings, the less than pervasive prevalence of ESG preferences among investors, the challenges in distinguishing between short-term demand effects and long-term equilibrium effects, and/or other reasons.

Bruno and Goltz (2024) also find that sustainable investing did not yield higher returns than standard index funds over the period 2012-22.[463]

A number of authors have investigated the performance of ESG portfolios using a common-factor asset pricing model[464] which incorporates an ESG common factor. Pástor et al (2021)[465] add ESG to a single-factor model, while Dobrick et al. (2025)[466] add ESG to a Fama-French-Carhart four-factor model.[467] The ESG factor in Dobrick et al. (op cit.) is defined as UMS (unsustainable minus sustainable), i.e., is long in 'unsustainable (brown)' stocks and short in 'sustainable (green) stocks'. In long-run equilibrium, the expected return on UMS is positive, since the expected return on unsustainable stocks should be larger than those of sustainable stocks. This is because investors are assumed to have a preference for green stocks, green stocks can be used to hedge climate risk, and green stocks have a resilience to ESG-related shocks, such as unexpected changes to climate-change-related regulation. This drives up the long-run equilibrium price of green stocks relative to brown stocks and drives down their long-run relative returns.[468] However, during the transition period to equilibrium, when investor preferences are changing or when climate-related concerns are increasing, early investors in green stocks will capture the higher returns from the increase in their prices. The risk premium (or factor loading) on the ESG factor is therefore expected to be positive in equilibrium, but may be negative during the transition.

Dobrick et al. (op cit.) examined the ESG factor of three ESG-rating providers (ASSET4, LSE Refinitiv and Moody's Vigeo Eiris). Their data set consists of 4500 companies that have ESG ratings from all three providers over a sample period July 2007 - June 2020 for European companies and July 2012 - June 2020 for North American companies. For each provider, they construct ten decile portfolios with ascending scores for the UMS risk factor.

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[463] Giovanni Bruno and Felix Goltz (2024) Sustainability alpha in the real world, *Scientific Beta, EDHEC Research Insights*, Winter.

[464] This model tries to identify the factors that explain the common variation in stock returns over time.

[465] Ľuboš Pástor, Robert F. Stambaugh, and Lucian A. Taylor (2021) Sustainable Investing in Equilibrium. *Journal of Financial Economics,* 142(2): 550–571; https://doi.org/10.1016/j.jfineco.2020.12.011

[466] Juris Dobrick, Christian Klein and Bernhard Zwergel (2025) 'ESG as Risk Factor', *Journal of Asset Management*; https://doi.org/10.1057/s41260-024-00382-z

[467] The four factors are market risk, size, book-to-market value, and momentum.

[468] See and Pástor et al. (op cit.), Dobrick et al. (op cit.) and Bradford Cornell (2021) 'ESG Preferences, Risk and Return', *European Financial Management*, 27:12–19; DOI: 10.1111/eufm.12295

If there are systematic risk components related to ESG, the risk premium is expected to be positive (negative) for the lowest (highest) scores and insignificant in between. This is what they find for each of the ESG-rating providers, suggesting that ESG should be incorporated into common-factor asset pricing models. However, the authors find the average ESG-factor risk premium is not significantly different from zero over the sample period, indicating that the average investor's return from holding green stocks was no different from the average investor's return from holding brown stocks. This is consistent with the findings of both Alves et al. (op cit.) and Bruno and Goltz (op cit.) above.

Greenfield et al. (2026) demonstrate that the integration of ESG factors into investments can improve earnings quality, reduce operational risk and increase enterprise value. Evan Gordon Greenfield, head of ESG in British Columbia Investment Management Corporation's private equity arm said: 'when treated as a financially-material operating discipline, ESG can drive measurable value creation in private equity. …ESG does not create value because it is ethical. It creates value when it is embedded in investment judgements, operating discipline and value-creation strategy'.[469]

Exploiting climate-related share mispricing

Using 52 years of US stock data, Cuculiza et al (2025)[470] found that firms with higher temperature sensitivity had lower future profitability and riskier corporate policies. These firms were also overpriced and earned lower average future returns as market participants were slow to correct the mispricing, suggesting the financial impact of rising temperatures was being underestimated. The sectors most sensitive to global temperature rises from climate change were agriculture and energy directly exposed to physical climate risks.

Local investors that were familiar with firms' regional conditions were more likely to price in temperature-related risks. However, nonlocal institutional investors allocated higher portfolio weights to firms with high temperature sensitivity, and sell-side equity analyst forecasts were less accurate for these firms.

Together, these results suggest that financial markets underreact to information about firm-level temperature sensitivity, and this generates predictable patterns in returns. A trading strategy that exploits this mispricing generated an annualized risk-adjusted return of 4.1% over the 1968–2020 period.

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[469] Evan Greenfield, Ashby Monk, and Dane Rook (2026) ESG Value Creation in Private Equity: From Rhetoric to Returns, 1 January; Available at SSRN: https://ssrn.com/abstract=6000614 or http://dx.doi.org/10.2139/ssrn.6000614; https://www.ipe.com/news/academic-paper-shows-financial-uplift-from-esg-in-private-equity-portfolios/10134503.article

[470] Carina Cuculiza, Alok Kumar, Wei Xin and Chendi Zhang (2025) 'Temperature Sensitivity, Mispricing, and Predictable Returns', *Management Science*; https://doi.org/10.1287/mnsc.2023.00972

The Sustainability Dividend and the value of climate patents

The Sustainability Dividend of a company is measured by it Sustainability ROI, the return on investment of its sustainability efforts.[471] It is a key measure to attract investors in the company.

Sustainability ROI 'reflects the measurable benefits derived from corporate sustainable practices, including economic, environmental, and social gains. …[The] goal is to evaluate the full value (i.e., the overall worth or benefit) generated from these investments. Sustainability ROI differs from traditional ROI, which emphasizes measurable, short-term returns tied to monetary gains, by adopting a longer-term view and factoring in broader environmental, social and governance outcomes'.

Accurately measuring sustainability ROI can be challenging due to its multidimensional nature and intangible benefits: 'For example, a manufacturing company might reduce costs by improving energy efficiency and waste reduction, while a retail business could enhance its brand reputation by prioritizing ethical sourcing and reducing carbon emissions. Both approaches contribute to Sustainability ROI, but the value created may vary. Some factors, like energy costs, can be easily quantified, whereas others, such as positive brand association, might be more challenging to calculate and attribute. …To fully capture sustainability ROI, companies should account for both tangible (easily quantifiable) and intangible (non-physical, with harder-to-quantify monetary value) benefits, including those that may not be immediately obvious (hidden benefits)'. Currently, few companies are reporting their sustainability ROI.

Marie Brière, Murad Nuriyev and Sébastien Pouget (2025)[472] analyze the effect of climate patents on a firm's market valuation. They investigate the relationship between Tobin's Q[473] and the stock of patents across a range of climate technology categories. They find that, in general, investors do not value climate innovations. However, there were two notable exceptions. First, patents related to improving the efficiency of carbon-intensive technologies (i.e., carbon intensive climate innovation) show a positive correlation with a firm's Tobin's Q. Second, a select group of patents in non-carbon-intensive climate technologies, which contribute to both adaptation and mitigation efforts, are also positively valued. Their results show that a one standard deviation increase in the stock of patents

[471] The Sustainability Dividend: A Primer on Sustainability ROI; https://corpgov.law.harvard.edu/2025/01/04/the-sustainability-dividend-a-primer-on-sustainability-roi/

[472] Marie Brière, Murad Nuriyev and Sébastien Pouget (2025) *Market Valuation of Climate Patents: What are the Most Valuable Innovations?*, Amundi Investment Institute, Working Paper 174, April; https://papers.ssrn.com/sol3/papers.cfm?abstract_id=5211154

[473] Tobin's Q = Total market value of firm / Total asset value of firm. A Tobin's Q ratio of 1.0 indicates that the market value of the firm is equal to its asset value. A ratio greater than 1.0 suggests that the market believes the firm is worth more than its asset value, potentially indicating overvaluation or future growth potential. A ratio less than 1.0 suggests under valuation, potentially indicating that the market believes the firm's assets are worth more than its market value, or that the market is not fully aware of the potential of the company's assets; https://www.investopedia.com/terms/q/qratio.asp

relative to R&D expenses is associated with an increase between 0.5% and 1.5 % in Tobin's Q.

Sustainable investing and the growth in artificial intelligence

Generative artificial intelligence will revolutionize knowledge work, potentially enhancing the productivity of those who are able to embrace the technology, while leading to job losses where the technology replaces specific types of jobs.[474]

AI is heavily dependent on data centres – the physical infrastructure behind processes such as transmission, hosting, data processing and manipulation. These data centres use a massive amount of energy (and water), contributing to increasing power demands at a time when grids are already under strain.[475] According to a report in *Nature*, AI-driven applications require 23-30 times the energy of standard digital processes. In Virginia, for example, data centres account for more than 25% of the state's electricity usage; similarly for financial hubs like London and Dublin.[476] Miranda Beacham, head of UK responsible investment at Aegon Asset Management argues that these energy costs pose a significant challenge for responsible investing: 'With responsible investing becoming more nuanced, advisers must assess not just a company's ESG credentials, but also its exposure to rising energy costs. Advisers are urged to look beyond traditional ESG funds and consider funds focused on the energy transition. Renewable energy, grid infrastructure, and nuclear innovation are areas that could see long-term growth as AI's power needs expand. Advisers must also be prepared to explain the evolving regulatory environment and ensure that client investments align with their financial goals and ethical values'. [477] The UK government has introduced the AI Opportunities Action Plan, which aims to balance AI growth with sustainability. The plan includes measures to enhance energy efficiency in data centres and promote the use of renewable energy sources to mitigate the environmental impact of AI expansion.[478]

Implications

The findings in this subsection have implications for life expectancy (including that of pension scheme members), the assets in which pension funds invest, and the risk and return on those assets (including the risk of investing in what become stranded assets). These

[474] One UK-based research organization estimates that under a worst-case scenario, 8 million jobs could be lost in the UK; https://www.ippr.org/media-office/up-to-8-million-uk-jobs-at-risk-from-ai-unless-government-acts-finds-ippr

[475] Data centres account for around 1% of global electricity consumption, and annual electricity consumption from data centres globally is about half of the electricity consumption from household IT appliances, like computers, phones and TVs; https://www.iea.org/commentaries/what-the-data-centre-and-ai-boom-could-mean-for-the-energy-sector

[476] https://www.nature.com/articles/d41586-025-00616-z

[477] https://www.professionaladviser.com/news/4410533/ais-energy-demands-pose-responsible-investing-challenge

[478] https://www.gov.uk/government/publications/ai-opportunities-action-plan/ai-opportunities-action-plan

factors affect both the asset and liability side of pension fund balance sheets and also of insurers buying out pension fund assets and liabilities. There are other global developments that could affect life expectancy – some positively, others negatively.

It is clear from this look into the future that longevity risk is likely to increase going forward – even the direction of the trend change in life expectancy will be more uncertain than it has been in recent decades. In addition, there is likely to be increasing uncertainty about the real level and volatility of the returns on the assets which pension funds and PRT providers need to hold to achieve their objectives. Technological developments and changing retirement patterns will also influence outcomes.

In addition, and despite all these initiatives, a report from the Oxford Sustainable Law Programme by Wetzer et al. (2024) argues that investors are 'flying blind' to the risk of 'increasingly impactful climate litigation and regulatory enforcement actions' that could hit companies with trillions of dollars in damages. The report counted 2,485 climate lawsuits filed globally against large corporate carbon emitters, with Chevron alone liable for up to $8.5trn if the climate lawsuits it faces are successful. The report recommends five ways for investors and regulators to assess climate-related legal risks: market-impact analysis; analysis using the social cost of carbon; attribution of climate change damages; estimating costs of accelerated climate mitigation, and qualitative analysis of legal, financial and scientific variables to predict legal action and its financial impact.[479] Further, according to Will Martindale, former head of policy and research at the UN Principles for Responsible Investment, asset owners, such as pension funds, do not have the budget to meaningfully contribute to asset managers' stewardship efforts, such as policy engagement, in respect of sustainability challenges.[480]

Finally, Figure 12 shows that the majority of sustainable funds are based in Europe.[481] Around 9,000 of the EU's 27,000 funds (which are mainly domiciled in Ireland and Luxembourg) are classified as sustainability-focused.[482]

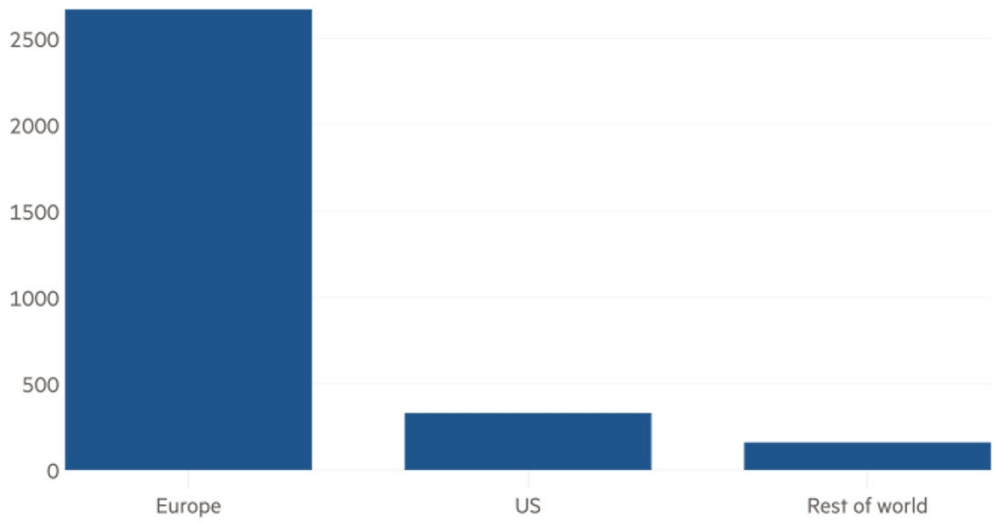
[479]Thom Wetzer , Rupert Stuart-Smith, and Arjuna Dibley (2024) Climate risk assessments must engage with the law: Legal actions determine the allocation and magnitude of climate-related financial risk exposures, *Science*, 383(6679): 152-154; 10.1126/science.adj0598

[480] Will Martindale (2024) *Responsible Investment: An Insider's Account of What's Working, What's Not and Where Next*, London: Palgrave Macmillan.

[481] The Morningstar data comprises funds that claim to focus on sustainability, impact or environmental, social and governance factors.

[482] https://funds-europe.com/sustainability-funds-cross-e6tn-shows-maples-analysis/

Figure 12: Assets under management by sustainable funds, March 2025 ($bn)



Source: Morningstar; https://www.ft.com/content/142eb9ee-7b20-4308-9d13-38613af58ea1