

# #WhyESGMatters | The Handbook | 4th edition



# The handbook – overview

Sourced from our global network of over 280 analysts, this handbook from HSBC Global Research aims to help you broaden your knowledge of key areas of the increasingly broad and fast moving world of ESG.

In this edition, we add sections on key climate issues on the agenda for the year ahead and how “green” hydrogen is set to play a key role in the decarbonisation of transport and is enjoying increasingly robust policy support. These complement a range of other topics including the deforestation crisis, sustaining global food security and the ESG impacts of cyber crime. Choose your topic and expand your knowledge.

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Ask Research – your questions, our answers

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With countries coming together to take action towards achieving the world's collective climate goals, ESG is currently the hottest topic on the world's stage. To stay tuned on all things Climate related by HSBC Global Research follow our monthly ESG brief, join our Live Insights on hot topics such as hydrogen, and watch out for our next ESG Sentiment Survey, which answers the key questions put to decision-makers, across the globe, in roles relating to ESG:



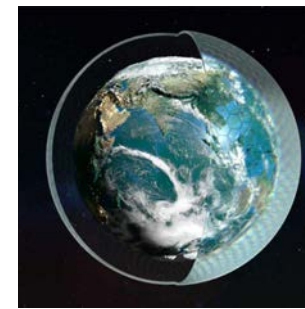
## The ESG Brief

Available to listen and follow on Spotify and Apple channels, search for **HSBC Global Viewpoint**. Click on a badge to access:



## Live Insights: Energy Transition – The case for Hydrogen

Hydrogen has the potential to play a vital role in the transition to a low-carbon economy. But how quickly can ambition be translated into results?



## ESG Sentiment Survey

To find out the results from the 4th edition of the survey, The reach of regulation, view the summary and watch the video.



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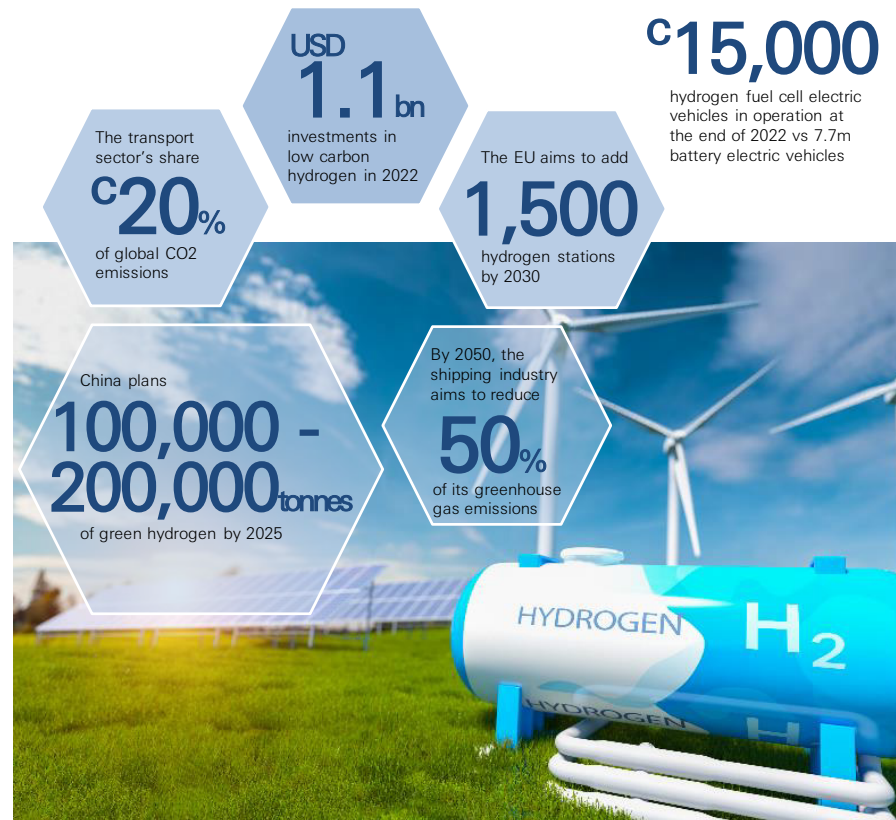
# Hydrogen in transport

Green hydrogen, a pure form of hydrogen produced via renewable energy sources which emits no carbon dioxide when converted into electricity, is set to play a key role in decarbonisation efforts and is enjoying increasingly robust policy support. Although high production costs and lack of refuelling infrastructure for hydrogen vehicles have pushed the auto sector to use battery-powered vehicles, hydrogen remains a compelling decarbonisation option for trucks, excavators, ships, trains and planes.

We discuss green hydrogen's role in decarbonising various segments of the transport industry, look at the booming investment in the space, and assess the policy support needed for its future deployment.

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## Did you know?



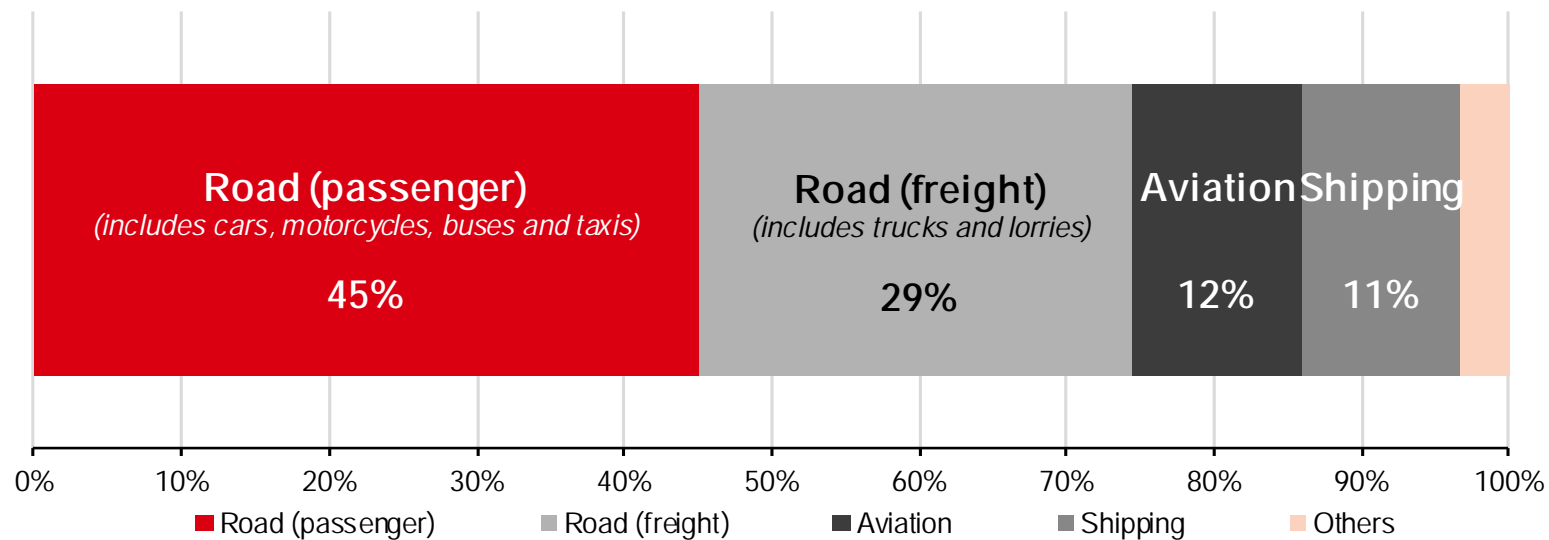
Source: : Hydrogen UK, Bloomberg New Energy Finance (BNEF), International Energy Agency

# 1. Green hydrogen rising

Hydrogen is set to play a more significant role as efforts to combat climate change become more urgent. It's abundant as an element and has great potential as a zero-emission fuel. Many countries have announced strategies for hydrogen along with policy support measures and the first large-scale hydrogen generation projects are underway. Low-carbon hydrogen offers a solution for lowering emissions in the refining and chemicals segments, where most of the hydrogen today is produced and used, and in hard to abate sectors such as steelmaking.

Meanwhile, the transport sector is facing increasing pressure to lower emissions, accounting for c20% of global CO2 emissions, of which c75% is attributable to road transportation. In this report, we look into the current prospects and developments for hydrogen across different transport verticals.

## Global CO2 emissions from transport



Source: : International Energy Agency

Our analysis underlines the mixed prospects for hydrogen across the transport sector as each segment has specific needs on technology, performance, infrastructure and economics that influence investment choices. Though many companies in the transport sector have formed business units for hydrogen and are investing in hydrogen technologies for future deployment, most are pursuing hydrogen as part of a dual fuel strategy, typically alongside battery electric vehicles.

## 2. Hydrogen across transport sectors

A quick way to differentiate across the transport segments is by daily range travelled and by weight. Typically, the larger (and heavier) the vehicle and the further the vehicle travels, the more difficult electrification becomes via batteries. Heavy duty trucks, airplanes and ships, considered the hardest to abate sectors, are thus better suited for hydrogen.

### Aviation

The move to hydrogen is longest dated, with sustainable aviation fuel likely to be the key to decarbonisation in the near future



### Buses

Easier to deploy than trucks, given limited range and back to base refuelling needs



### Rail

Hydrogen can help rail decarbonise in areas where electrification is challenging

## Buses



### Attractive but needing heavy subsidies

Deployment of hydrogen buses is helped by subsidies and zero emission zones. Buses are easier to deploy than trucks, given their more limited range and back-to-base refuelling needs. China and South Korea lead deployments with both having over 3,000 vehicles in operation. Other countries have deployed hydrogen buses in much smaller numbers.

## Rail



### On the path to commercialisation

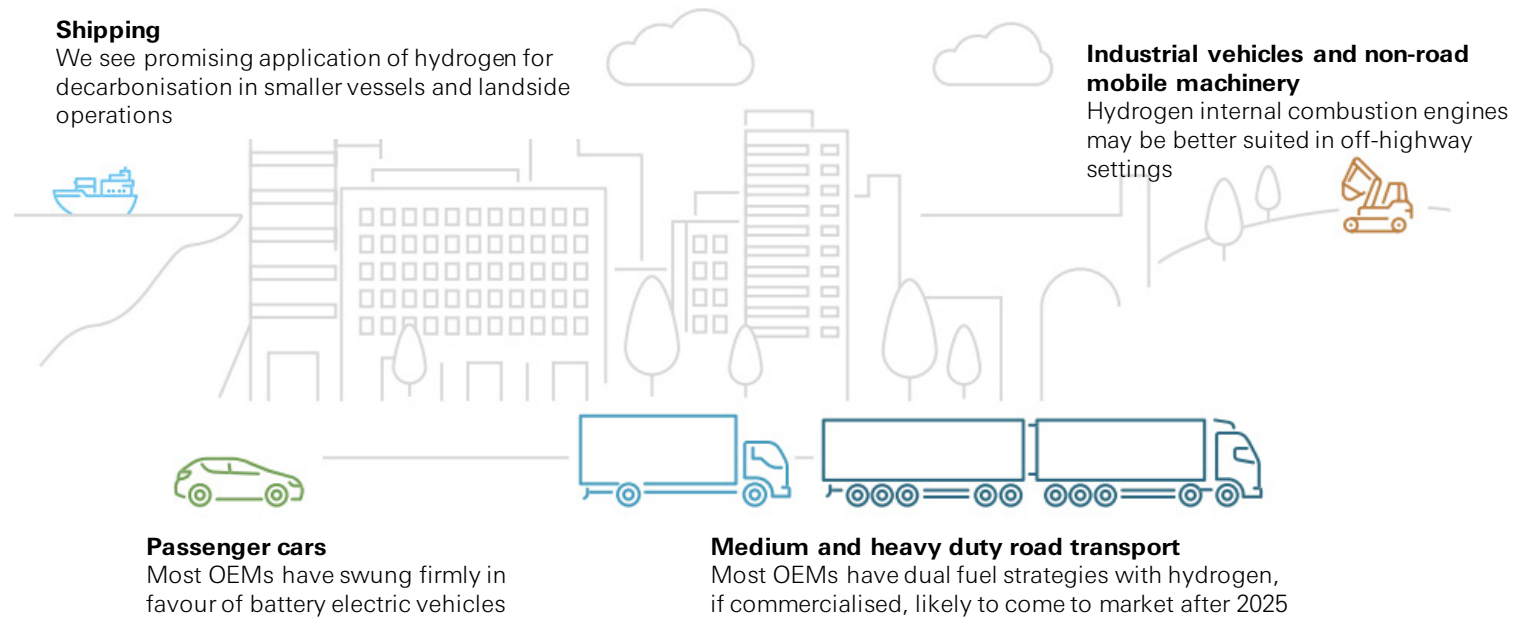
Hydrogen trains are a reality and have been in commercial service in Germany since 2018 and regular service since 2022. France, California and Italy have hydrogen trains on order while other countries have successfully tested hydrogen trains. Hydrogen can help rail decarbonise in areas where electrification is challenging..

## Aviation



### Still a long way to go

The aviation industry is targeting net-zero emissions by 2050 with sustainable aviation fuel (SAF) and fuel efficient aircraft being the key to decarbonisation. The industry is investing in hydrogen powered aircraft but we don't see them entering commercial operations before 2035. Medium to long-haul aircraft which emit a significant share of carbon emissions are not expected to be operational before 2040-2050. Government policies and incentives are key to decarbonising the aviation industry.



### Passenger cars



### The electrification race is being won by batteries

Previous hype cycles for hydrogen focused on the passenger car segment as major car makers released hydrogen powered pilots but most have swung firmly in favour of battery electric vehicles (BEVs). According to a UK government committee report in January 2023, BEVs have gained a “seemingly unassailable” lead over hydrogen. Technically hydrogen appears to be more suited for heavy duty applications, but also finds use cases for light commercial vehicles (LCVs) and sport utility vehicles (SUVs).

## Medium and heavy duty road transport



### Promising but it's early days

Battery electric is currently the dominant technology for decarbonising trucks. But hydrogen offers potential in long haul heavy duty trucks although its viability is a source of debate. Many truck manufacturers have dual fuel strategies with hydrogen, if commercialised, likely to come to market after 2025.

## Shipping



### Multiple pathways to decarbonisation

The shipping industry aims to reduce greenhouse gas emissions by at least 50% and carbon intensity by 70% by 2050. Methanol and ammonia, both hydrogen based, are key fuels to help shippers move beyond liquefied natural gas (LNG) as a longer-term low carbon option. But barriers, such as engine technology readiness, safety, storage and scalable production, are hindering wider use. We see promising application of hydrogen for decarbonisation in smaller vessels and landside operations.

## Industrial vehicles and non-road mobile machinery



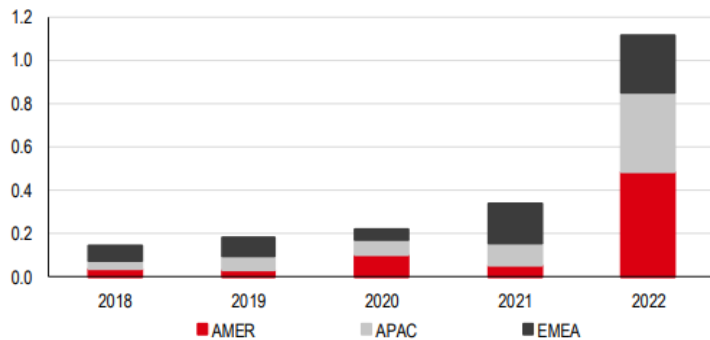
### Development with promise

Hydrogen internal combustion engines may be better suited in off-highway settings with high loads and load changes. Applications include construction machinery and snow grooming. Some mining operators are looking at hydrogen, but interestingly fuel cell rather than combustion. The catch is that the technology is only being adopted as old machines are being retired.

### 3. Hydrogen investment hits record in 2022

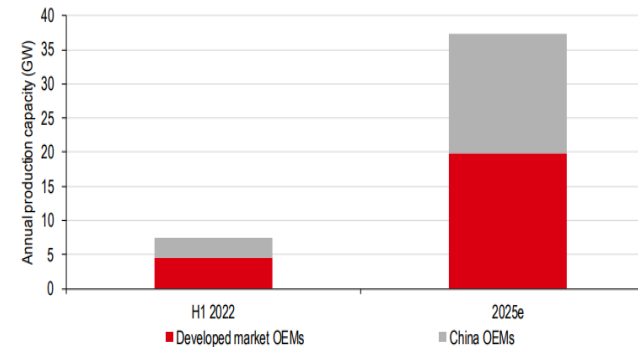
Investments in low carbon hydrogen reached USD1.1bn in 2022, showing strong year-on-year growth (see chart). Investment in electrolyser manufacturing capacity (electrolysers are devices that produce hydrogen through a chemical process that separates hydrogen and oxygen) is also booming and will support growth in low carbon hydrogen generation over the next few years, where a multi-gigawatt pipeline of projects globally has built up.

2022 investment in hydrogen by region (USDbn)



Source: Bloomberg New Energy Finance (BNEF)

Electrolyser production capacity is booming



Source: Company data, HSBC estimates

By region, the acceleration in investments was concentrated in the US and China, as Europe lost its lead from earlier year.

### EU hydrogen policy is playing catch up

A European Hydrogen Bank (EHB) has been set up by the EU Commission as part of the Green Deal Industrial Plan. The aim of the EHB is to support the EU's target of producing 10 million tonnes per annum (mpta) of renewable hydrogen by 2030, as well as an additional 10mpta of imports. The EU estimates that total investment required is EUR335-471bn, including EUR200-300bn required for new renewable energy production, with the vast majority expected to come from private investment.

### Pivot to the US

The US policy environment for green hydrogen has materially improved in recent years given two key pieces of legislation: The Infrastructure Investment and Jobs Act (November 2021), which provides USD9.5bn in grants for green hydrogen projects, and The Inflation Reduction Act (August 2022), which gives production tax credits to green hydrogen producers. We believe tax credits is the real game changer and will likely position the US as the leading destination for green hydrogen investment.

### China is growing grey and green hydrogen

On 23 March 2023, China set comprehensive hydrogen targets for the period 2021-35. The policy framework is positioned towards expanding the use of hydrogen throughout the energy system but is less specific about green hydrogen policy support. In terms of transport, China aims to expand its fleet of hydrogen-fueled vehicles to 50,000 by 2025, up from around 7,500 in 2022, which builds on its dominant position in the space.



### Hydrogen production costs – high today but set to fall rapidly

High gas prices have helped to reduce the cost gap, which still remains high. Scale will help close the gap in many countries by 2030, accelerating uptake of hydrogen in transport segments as well as in industrial segments.

One of the key challenges to the development of a hydrogen economy is the high cost of hydrogen transmission and distribution. This could be as large as 3x the cost of production according to International Energy Agency given the lower energy density by volume (hydrogen is the lightest element) and difficulty in liquefaction (it liquefies at minus 253°C).

There are various methods to store hydrogen for transportation but we think ammonia is the most likely because of its high storage density. This chemical is easier to liquefy (it liquefies at minus 33°C), it contains 1.7x more hydrogen per cubic metre than liquefied hydrogen, and it can be directly used as a fuel – for ships and power plants – without the need for conversion back to hydrogen.



## 4. Conclusion

Whilst battery electric is clearly the technology of choice in the passenger car segment, hydrogen has more realistic commercialisation prospects in the heavier duty segments. However, the lack of specialised hydrogen refuelling infrastructure is a concern and could hinder wider commercialisation of hydrogen vehicles if not rolled out quickly enough. Ultimately, the central role of policy in driving support for scaling up electrolyzers and lowering the cost of green hydrogen production, as well as reducing the unit cost of hydrogen vehicle manufacturing cannot be understated.

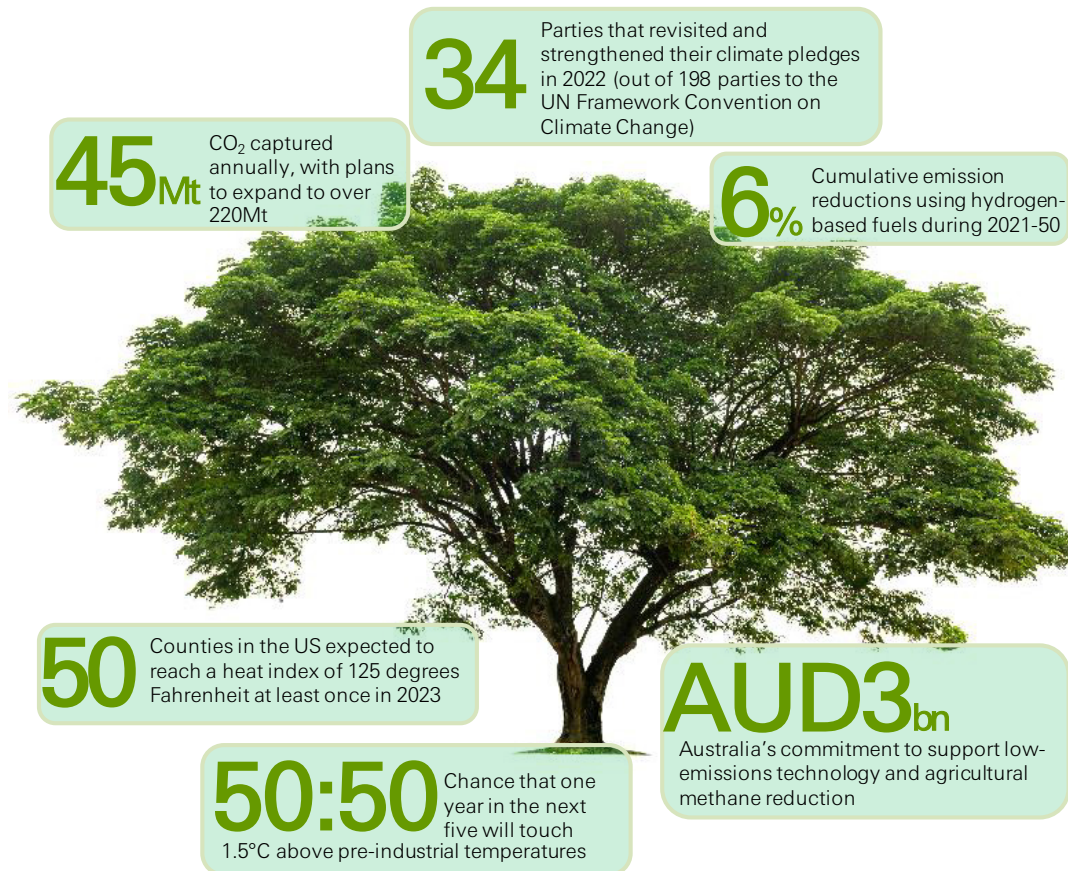
# The climate in 2023

Greater urgency must return to the climate process after a year of distractions in 2022. The first global stocktake, which will take place this year and show just how far we are from implementing the Paris Agreement, will be another wake up call. The flow of climate finance to developing countries will also be in the spotlight while investors will scrutinise corporate net-zero plans more closely as a number of regulators tighten climate disclosures.

We discuss key topics on the climate agenda this year, including what to expect from climate talks at COP28, action to lower methane emissions, and the pressing debates around climate finance. We also highlight emerging technologies which may see renewed investor focus this year and actions that certain countries are planning as part of their energy transition.

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## Did you know?



# 1. What to look out for in 2023

With the climate agenda set to receive a renewed focus in 2023, we highlight key events for investors to note this year, including more discussion on the size of the temperature 'overshoot', greater focus on methane emissions, and the all important issues of climate finance.

## COP28 in the UAE

Following the slow progress from COP27 in Egypt last year, the next major climate talks will take place in the UAE from 30 November to 12 December 2023. These talks are important as they include the **first global stocktake of the Paris Agreement**, to assess progress against the goals of the Agreement, which aims to limit global warming to, preferably, 1.5°C above pre-industrial levels.

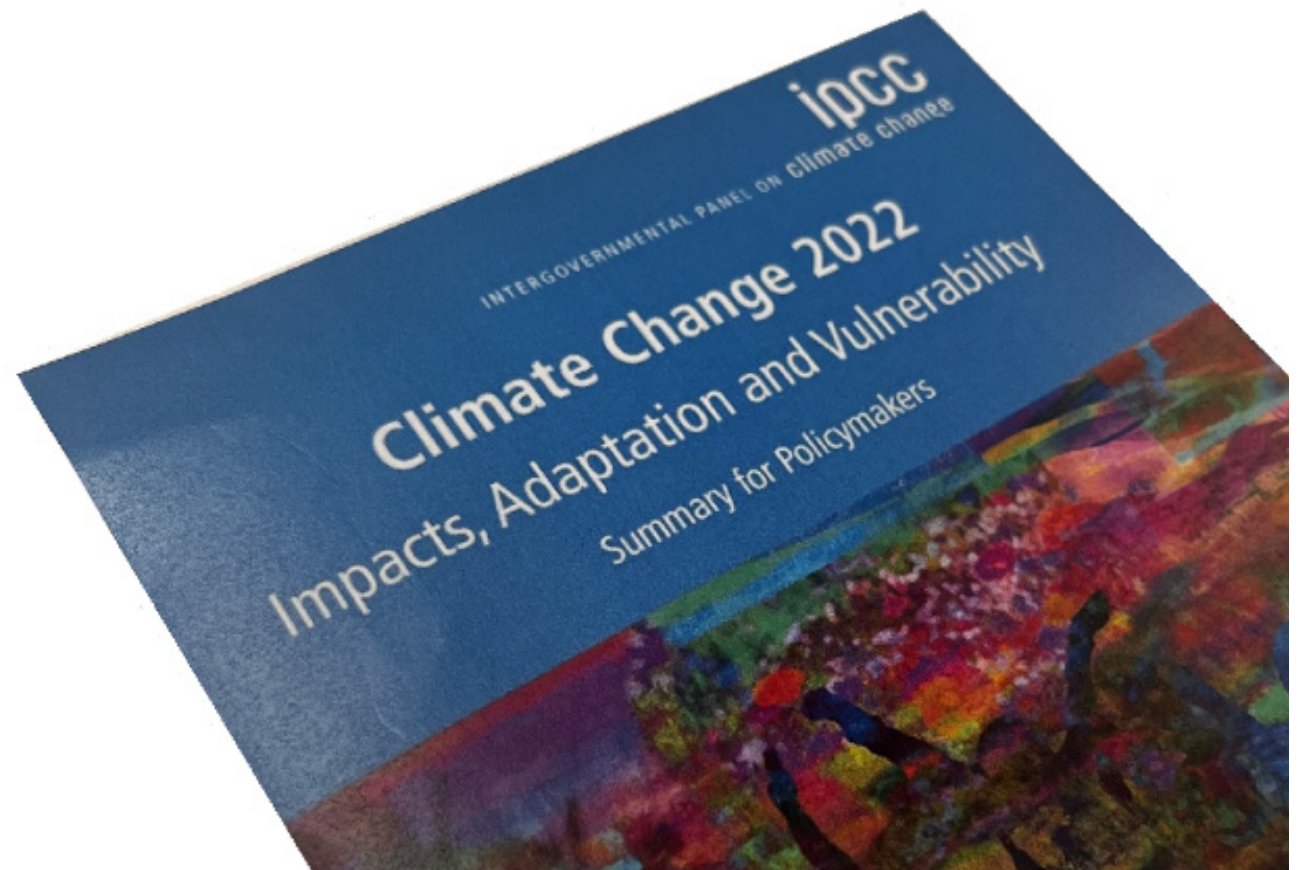
There will also be ongoing workshops throughout the year with regards to key elements, such as the global goal on adaptation (efforts to drive collective action on adaptation), finance goals, and how to operationalise the Loss and Damage Fund (support for developing countries that are particularly vulnerable to the impacts of climate change).



### Science – in the background but always there

**Synthesis report:** the Intergovernmental Panel on Climate Change (IPCC) released a synthesis report in March 2023, which follows its three special reports published last year as part of its sixth assessment cycle. This final report aggregates findings from the series, but also adds to the sense of urgency, given the climate events of 2022.

**Act Now:** A key message of the report is that climate change can only be managed if the world takes deep, rapid and sustained mitigation and adaptation actions now. We notice that the language in this report is stronger and more powerful than the previous ones, reflecting the urgency of climate action. According to its authors: “Our world needs climate action on all fronts: everything, everywhere, all at once”.

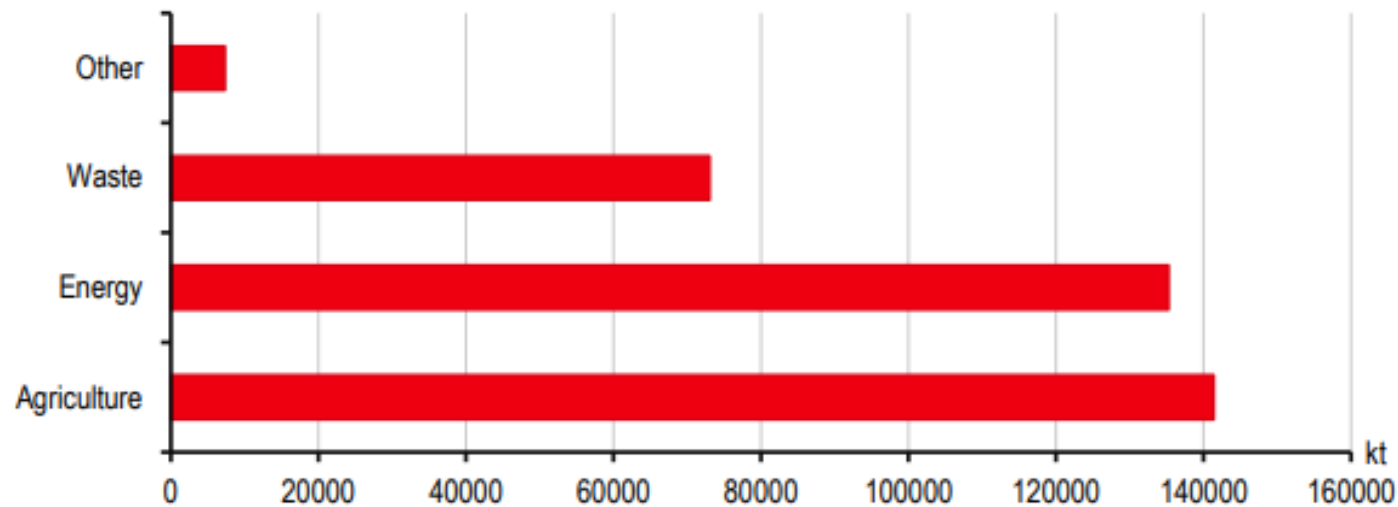


### Methane – record levels

Methane is a powerful but short-lived climate pollutant that accounts for about half of the net rise in global average temperature since the pre-industrial era<sup>1</sup>. According to the World Meteorological Organisation, atmospheric levels of methane reached record highs in 2021 and are expected to rise in 2022 (there is a recording delay). We see two main facets to watch out for in regards to methane in 2023:

- 1. Improvements in methane detection technology** could lead to methane pricing being considered, if not adopted in more jurisdictions, especially as more countries join the Global Methane Pledge (which aims to reduce methane levels to keep the 1.5°C goal within reach).
- 2. Focus on reducing agricultural emissions** (see Figure 1). New Zealand, for example, announced plans in October 2022 to charge farmers on livestock methane emissions while Australia has committed AUD3bn (~USD2.05bn) to support low-emissions technology and agricultural methane reduction. We anticipate more attention on agricultural-related methane emissions.

Figure 1: World methane emissions from all sources



Source: International Energy Agency 2022, HSBC

## Climate finance

As part of the UN climate process, developed countries have continued to miss promised climate finance flows to developing countries, especially the USD100bn promised by 2020. COP27 highlighted that climate finance requirements are now in the trillions rather than billions. In 2023 we think the world will start to focus more on its practical meaning and why these flows aren't happening faster.

There're growing calls for the **private sector** to contribute more towards climate finance and the key market failure is the perceptions of risk that lead to a prohibitively high cost of capital. **Multilateral finance institutions** have a unique role to play in overcoming these market failures but their current activities, particularly around blended finance, have fallen short.

Hence, we think there will be more debate on concessional finance in 2023, especially as the fiscal outlook for many economies – dealing with potential recession and inflation – may not be in a position to take on more long-term debt. We also expect growing calls to reform Bretton Woods Institutions (e.g. IMF and World Bank), enabling them to tackle these market failures more effectively.



### Carbon credits/offsets

As more companies make net-zero pledges, the demand for carbon offsets is set to rise. In 2021 alone, Global Voluntary Carbon market values nearly quadrupled. But, as volumes grow alongside concerns over carbon integrity, we think scrutiny of carbon credits and voluntary carbon markets will also increase from regulators in 2023.

### Trade & carbon border taxes

The EU's Carbon Border Adjustment Mechanism – which ensures that certain goods (such as iron and steel) face the same carbon price whether imported or produced in the EU – will begin operating from October 2023<sup>2</sup>. We believe this will accelerate the adoption of carbon border taxes in other developed countries and the implementation of carbon pricing in developing countries. The United States, for example, has already proposed a border adjustment tax that is expected to start in 2024.



2. EU climate action: provisional agreement reached on Carbon Border Adjustment Mechanism (CBAM) - Consilium (europa.eu), December 2022

## 2. Increasing investment in green technology

Fossil fuels were even more in focus in 2022, given the Russia-Ukraine war and the resulting energy supply issues and price spikes. We anticipate these pressures to remain in 2023, given that it takes time to build out alternative options, such as renewable infrastructure. Specifically, in 2023, we expect:

1. **Oil and gas prices** to remain high as availability continues to be constrained by the curbs on Russian supply (in addition to the long-term issue of less new upstream oil and gas investment)
2. Ongoing tactical pivots towards **alternative energy sources** (mostly coal, some nuclear) to bridge the gaps left by the absence of Russian fossil fuels
3. The heavy presence of the **fossil fuel industry at COP28** may lead to more focus on “low-emission energy” (e.g. natural gas) while reducing chances of commitments to phase down fossil fuels
4. The continuation of the renewed push (and debate) by developing countries (particularly in Africa), allowing them to develop their **fossil fuel assets**

Given these developments, we expect to see increasing investment into a number of **energy efficiency and green technologies** to help lower emissions and bolster energy security in 2023.

Hydrogen generated from renewables can be used to decarbonise a range of industries, including transport (particularly trucks), power generation and chemicals. According to the International Energy Agency, 6% of cumulative emission reductions could be achieved by using hydrogen-based fuels in 2021-50, highlighting its important role in achieving net-zero emissions by 2050.



**'Green' hydrogen**

**Carbon capture and storage (CCS)**



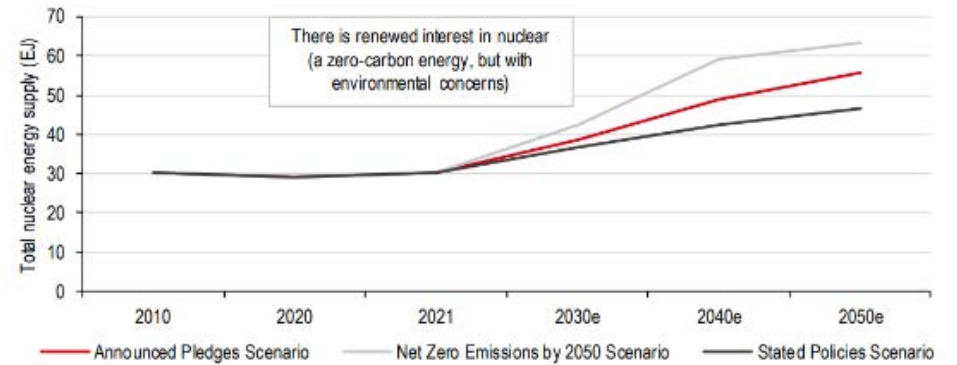
CCS attempts to remove CO2 from industrial processes before it can enter the atmosphere. It currently captures approximately 45Mt of CO2 annually, with plans to expand this to over 220Mt CO2 per year. We expect to see CCS momentum pick up in the coming year, especially after recent EU announcements to certify removals of carbon credits and their inclusion in EU climate targets<sup>3</sup>.

Many countries updated their policies in 2022 to support new nuclear investment given the Russia-Ukraine war (see Figure 2). Japan announced plans to build new nuclear reactors and restart idle plants<sup>4</sup>, France said it would build six large nuclear reactors with an option to build eight more by 2050<sup>5</sup>, and the EU revised its classification of nuclear energy as a green activity which could influence other countries' attitudes towards nuclear power generation.



**Nuclear energy**

**Figure 2: Annual total nuclear energy supply (2010-2021) and IEA projection (2030-2050)**



Source: International Energy Agency World Energy Outlook 2022, HSBC

<sup>3</sup>Reuters, EU takes 'first step' to certify removing CO2 from atmosphere, 30 November 2022

<sup>4</sup>Financial Times, 24 August 2022

<sup>5</sup>The Guardian, 10 February 2022

### 3. The diversity of global action







As government support is crucial in achieving net-zero targets, we outline key climate policies on the agenda for 2023 and how they can assist in their decarbonisation efforts.

#### EU – making proposals a reality

2023 will be crunch time for the EU to finalise negotiations on proposals for the **Fit for 55 package** and, crucially, to ensure such legislation becomes law. This package represents proposals to revise and update EU legislation to reduce net greenhouse gas emissions by at least 55% by 2030.

The **European Green Deal** (policies to reduce EU greenhouse gas emissions) includes other key strategies that will make further strides in 2023 such as biodiversity, air and water quality, and sustainability of plastics and packaging. Other proposals to be particularly aware of include in Figure 3.

Figure 3: Highlights of the European Green Deal

-  Reform of the EU electricity market in early 2023; decoupling effect of gas prices from electricity prices to ensure affordable energy
-  European Hydrogen Bank; Euro 3 billion investment into the hydrogen market
-  Measures to reduce food and textile waste
-  Framework for sustainable food systems including changes to EU's animal welfare law
-  New law to fight global deforestation and forest degradation driven by EU production and consumption to be passed
-  Revision of legislation on the registration, evaluation and authorisation of chemicals to promote sustainable chemicals



Source: European Commission, HSBC

## UK – standard disclosure

The mandatory **Taskforce on Climate-related Financial Disclosures** (TCFD) reporting was introduced in April 2022 as the first step in climate-related disclosures for premium and standard issuers in the UK. The disclosures include four pillars (Governance, Strategy, Risk Management and Metrics and Targets) with 11 questions to assess the integration of climate issues within an organisation.

In September 2023, we expect finalisation of the **Taskforce on Nature-related Financial Disclosures** (TNFD), which was built on the foundation of the TCFD. This extends the framework and requires financial institutions and corporates to understand, report and act on nature-related risks and opportunities. The UK has endorsed the TNFD along with the US, the EU, Canada, Germany, France, Italy and Japan.

## The United States – the impact of reducing inflation

The **Inflation Reduction Act** (IRA), which included the largest investment (cUSD370bn) in the US history to fight climate change, was signed into law in the summer of 2022. Under the IRA, the renewable energy credits were expanded to include wind, solar and other technologies, such as energy storage and hydrogen. We think the IRA will boost investments in renewables, given their improving economics.

## China – on the rebound

China announced that its draft methane plan was pending approval in November 2022, following the commitment to develop a national action plan on **methane** in a US-China joint climate declaration in 2021. We expect it to be released this year and to cover the energy and waste management sectors.

China's Ministry of Ecology and Environment also announced in October 2022 that it would strive to expand its coverage of its **national emissions trading system** (ETS) – a carbon market where emitters can buy and sell emission credits, launched in July 2021 – which we expect to see in 2023.

## India – leadership in 2023

India moved forward in 2022 by updating its energy efficiency policies, renewable deployment, and other climate policies and releasing its national hydrogen plan. The country also took over the G20 presidency in December 2022 and will convene the summit for the first time in 2023 which could be a precursor to India strengthening efforts towards a greener future through newer policy and targets.

## ASEAN – steady progress all round

ASEAN countries are stepping up efforts to invest in the green transition, despite their high reliance on coal and oil. We expect reporting standards to be strengthened in the coming year alongside growth in the number of member nations adopting carbon pricing.



## 4. Conclusion

2022 wasn't a great year for global climate progress, and the political distractions from climate ambition are still in play. 2023 should start to reveal whether energy security concerns will morph back into energy transition plans, with the IPCC Synthesis report in March acting as a reminder of the urgency while more frequent extreme climate events may also drive the message home. Investors should, therefore, be aware of energy efficiency technologies that can help decarbonise industries and support energy security, such as 'green' hydrogen and carbon capture and storage, as they may see greater focus in 2023.



# COP27 – Slivers of progress

After two weeks of intense negotiations at last year’s UN Climate Change Conference (COP27) in Sharm el-Sheikh, Egypt, only slivers of progress were achieved with many continuous issues left for future climate talks. We believe the establishment of a fund for loss and damage came at the expense of raising climate ambition, while the goal to keep global warming within 1.5°C above pre-industrial levels is only “alive on paper”. Other key issues such as adaptation and finance saw progress by virtue of the passage of time, rather than any substantive decision.

We discuss why we believe that only inconsistent progress was made at COP27, the key issues agreed, what they mean for investors, and what lies ahead in the global climate process.

[Watch video](#)

## Did you know?



Source: UNFCCC, US Department of State, WMO, International Partners Group

<sup>1</sup> Called for by the World Meteorological Organisation, 7 November 2022

<sup>2</sup> Provided by the International Partners Group (co-led by the US, EU, Japan, Canada and the UK)

<sup>3</sup> To pre-arrange finance and political guidance for vulnerable groups against climate events

# 1. COP27 – Slivers of progress

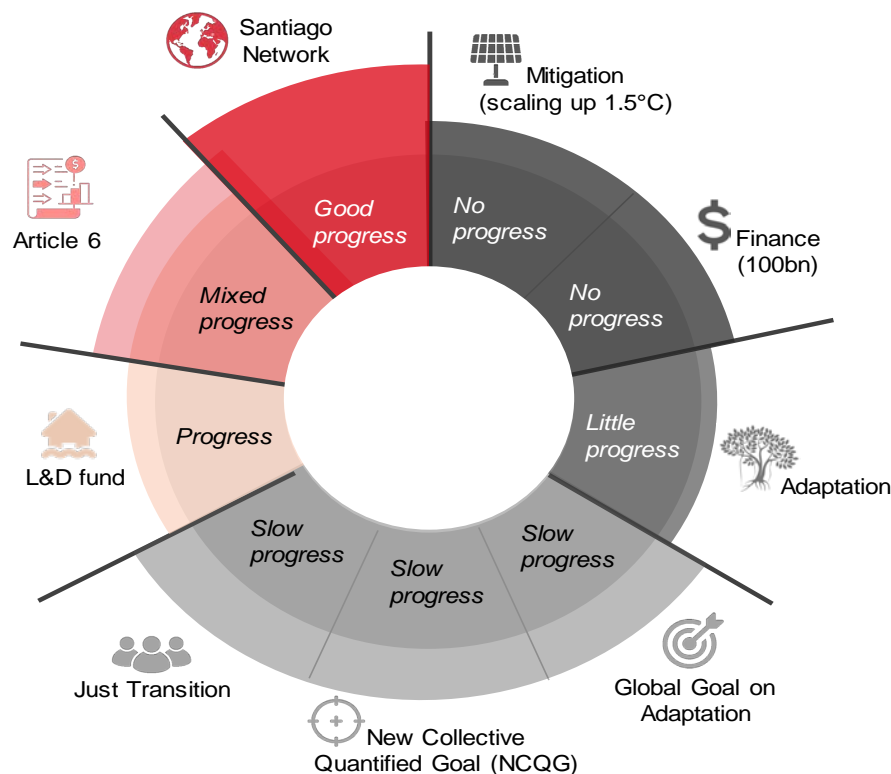
COP27 hosts Egypt were looking for “progress across the board” on all climate issues “in a balanced and equitable manner”. Although there was some progress, we do not think it was balanced across the board, in our opinion it was more inconsistent progress (see Figure 1).

Parties were close to walking away without a deal, but more than 36 hours after the deadline, the key issue of a Loss & Damage fund was agreed. However climate ambition was not raised while many divisions within the global climate process remain.

## Geopolitics also played a role at COP27

Previously China-US cooperation was seen as crucial to unlock negotiations as the US represents developed countries and China was seen to represent developing countries. However, they suspended climate cooperation in the summer of 2022 and only vaguely agreed to re-engage after the G20 Leaders’ Summit in Bali which took place in the second week of COP27.

Figure 1: Our view on the progress made across various issues at COP27



Source: HSBC (based on UNFCCC, COP27 decisions)

## 2. Summary of key outcomes

### Establishing a loss and damage fund

This was the dominant and most contentious issue at COP27 – it held up the start and finish of the talks as Vulnerable Parties fought to get the item on the agenda and refused to leave without a fund. Two main decisions were made:

1. To establish a fund for loss and damage to assist developing countries that are particularly vulnerable to the adverse effects of climate change, and
2. To establish a transitional committee to operationalize the new funding arrangements for responding to loss and damage and the fund

However, no details were agreed on which countries pay into the fund, which countries can access the fund, and under what conditions this access is triggered (e.g. what extreme events qualify). The fund is intended to be operational by COP28 (Nov 2023), which will clearly involve challenging negotiations.

### Mitigation - keeping the 1.5°C target alive

At COP26 (in 2021), Parties were asked to revisit and strengthen their 2030 climate targets before COP27, but only 29 Parties (out of 195 signatories to the Paris Agreement) did so. COP27 issued the same call to Parties “by the end of 2023”; the EU has already signaled its intention to do this.

There was little else at COP27 that raised climate ambition. Wording around coal was the same as previous year (i.e. not strengthened), a potential “phase out/down” of fossil fuels was not included in the decision, and there were more mentions of “low-emission” energy than before (likely referring to gas). The UN will host another climate ambition summit in 2023 (before COP28) to try to increase ambition.

### Adaptation and the global goal on adaptation

Adaptation was high on the agenda at COP27, given the event was on African soil, with discussions covering areas such as reporting, planning and funding. However, there was no progress on the (COP26) target “to at least double” adaptation funding.

Instead, most discussions were focused on the global goal on adaptation (which seeks to guard against the adverse impacts of climate change), covering topics such as water, food & agriculture, health, infrastructure and oceans. Delegates will show their progress towards the goal at COP28, when the two-year work programme on the topic concludes.

### Finance – the USD100bn pledge

Finance was featured heavily (as usual) although overshadowed by the discussions to establish a loss and damage fund. However, disappointment was expressed through “serious concern” that the annual USD100bn funding goal from developed to developing nations was missed yet again.

Some general climate finance numbers were mentioned in the Cover decision (the overview of decisions taken at a COP), which estimate the magnitude of climate funds required (see Figure 2). There were also discussions of climate finance grants (as opposed to loans) to developing countries so as not to saddle them with even more debt.

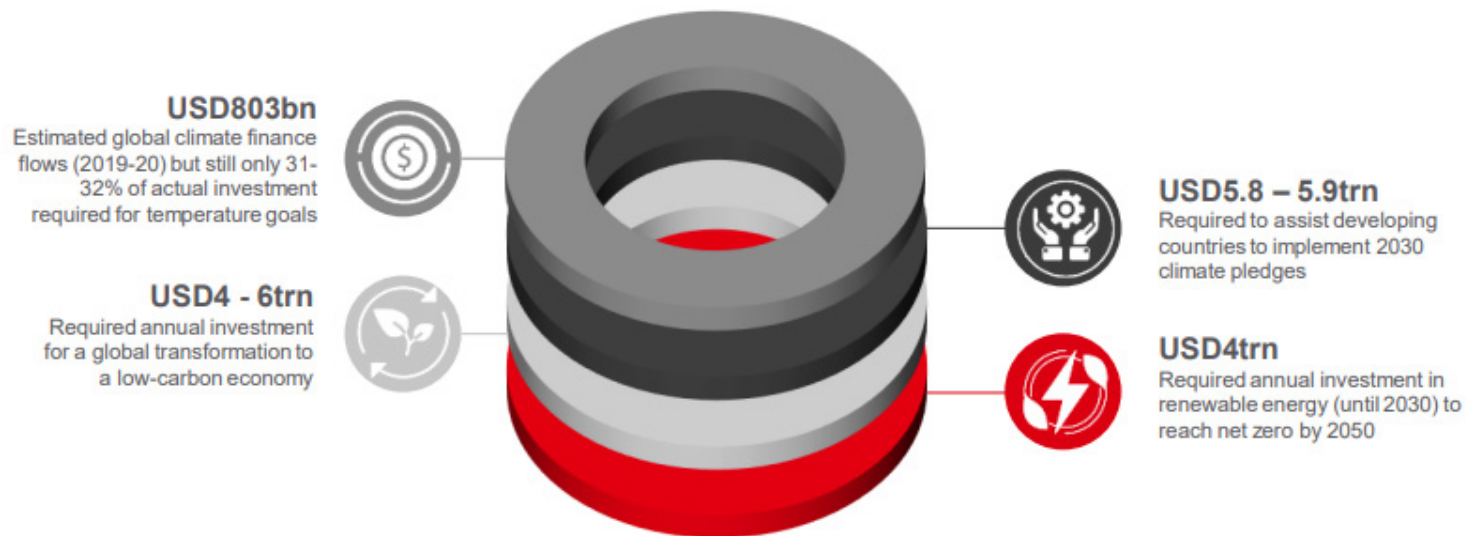
### Other key issues

**The Santiago network:** Good progress was made in terms of operationalising the Santiago network, which provides technical assistance to developing nations to limit loss & damage. COP27 agreed to provide funding to the Network, although from developed countries on a voluntary basis.

**A “just” transition:** Various conference workstreams included the issue of a ‘just’ transition, where interests of diverse groups (such as indigenous communities and the most vulnerable) are included in the move towards a low-carbon or net zero world. A formal work programme on just transition was also established, although no timeframes were mentioned.

**Article 6 of the Paris Agreement** (covers how Parties use mitigation outcomes in other countries towards their own climate targets): The task was to operationalise the component parts – cooperative approaches, the mechanism and non-market approaches. Mixed progress was made with work to continue at future COPs.

Figure 2: General climate finance numbers were mentioned in the Cover decision



Source: : UNFCCC, COP27 decisions  
 Note: Taken from third party reports

### 3. What's next in global climate talks

There are many ongoing issues to be discussed in the global climate process. Whilst some may feel they achieve little, others believe it is the only forum where the whole world comes together to try to do something. We believe COP27 did little to accelerate the speed of transition at a political level, leaving ambition and action for future discussions.

The recent spike in energy prices may have increased the short-term need for fossil fuels, but it has not flattened the importance of achieving long-term energy transition solutions and renewable infrastructure.

The ESG world now shifts its focus to COP15 on biodiversity, in Montreal this December. Biodiversity concerns the variability of all forms of life and their interaction within an ecosystem, and the conference will cover topics such as how to measure biodiversity, invasive alien species and the role of nature based solutions.

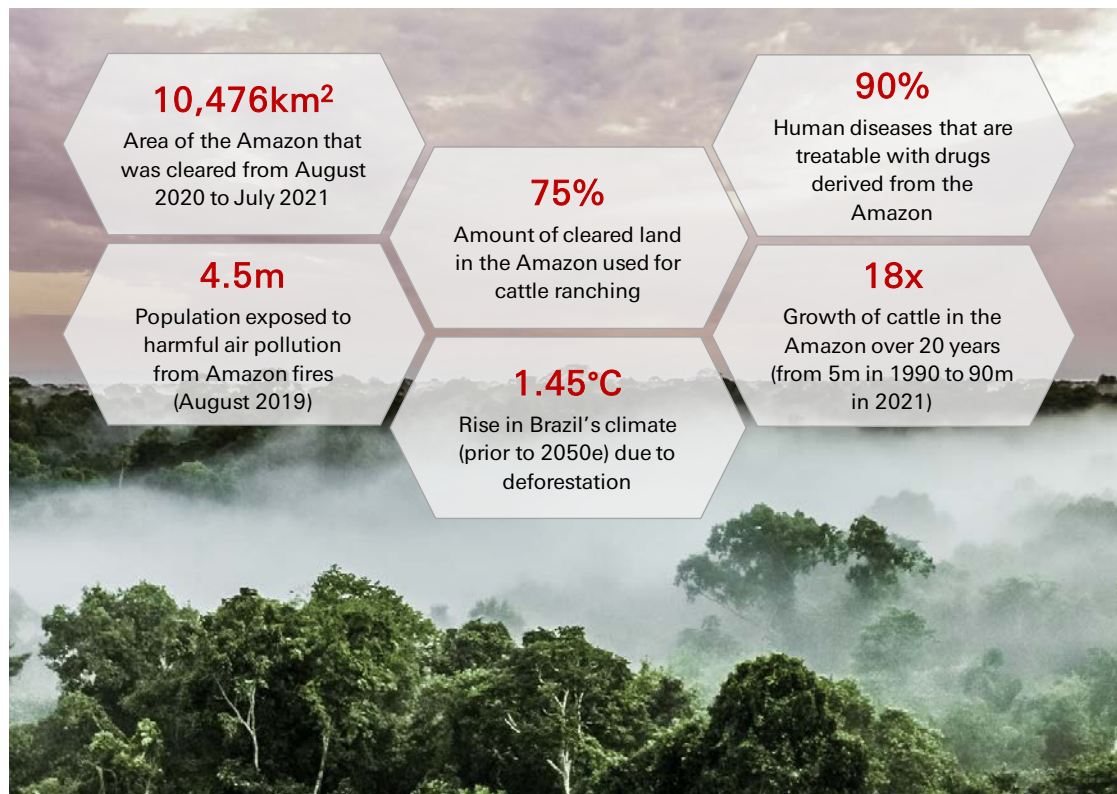
The next UN climate conference, COP28, will take place in the UAE between 30 November and 12 December 2023, where the first global stocktake will take place to assess the progress towards Paris Agreement goals, specifically in terms of mitigation, adaptation and means of implementation.

# The deforestation crisis

The Amazon rainforest spans 6.9 million sq km on the South American continent, with the majority contained in Brazil.<sup>1</sup> Yet it is on the threshold of turning into a savannah, as significant growth in the cattle ranching industry is driving deforestation. Such activities are contributing to one-fifth of global greenhouse gas (GHG) emissions. Tropical forest destruction is becoming a global issue in destroying a key tool to fight climate change – the most valuable carbon sink on Earth.<sup>2</sup>

We explore various public and private initiatives that can help curb deforestation in the Amazon. Potential solutions lie in raising the economic and reputational costs associated with deforestation across stakeholders, both locally and internationally. Global investors, retailers, importers/exporters and civil society can also play crucial roles to help alleviate the growing issue.

## Did you know?



Source: WRI using Hansen et al. (2019), Amnesty International (2019), MapBiomias (2022), Nature (2021), The Guardian (2021), IPAM (2017), Human Rights Watch (2020), Rainforest Trust (2013), EIA (2019), ANA (2020), HSBC

<sup>1</sup> WWF, About the Amazon

<sup>2</sup> An area or ecosystem that absorbs more carbon dioxide (CO<sub>2</sub>) than it releases; National Geographic, Carbon Sources and Sinks

# 1. Deforestation is a global problem

Brazil is home to one-third of the world's remaining rainforests. The Amazon, which spans more than half of the country, houses the greatest concentration of biodiversity on the planet.<sup>3</sup> Towards to east lies the Cerrado region, a very rich tropical savannah and wetland that contains 5% of all biodiversity in the world.<sup>4</sup> Together, the Amazon and Cerrado natural biomes make up over 70% of Brazil's area.<sup>5</sup>

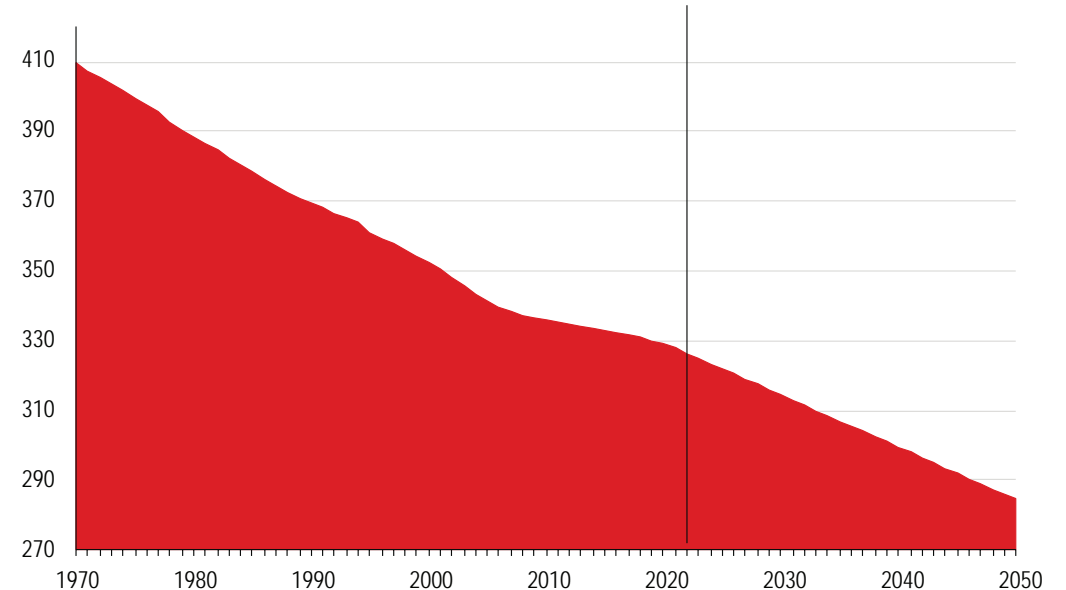
## Severity of the issue

The Amazon suffers from the greatest annual deforestation by area of any place on Earth and is responsible for about 15% of the world's yearly deforestation.<sup>6</sup> Over 20% of the Amazon's original forest cover has been cleared, with cattle ranching occupying over 75% of the deforested areas.<sup>7</sup> This is consistent with the global trend where cattle ranching is responsible for more than one in every eight hectares of forests destroyed.<sup>8,9</sup>

The Cerrado region is also under the threat of commodity-driven deforestation. Over 40% of the region's native vegetation has been altered to make way for soy production and cattle ranching. In 2021, an area equivalent to the size of Puerto Rico was deforested, marking a six-year record high for deforestation.<sup>10</sup>

A study has found that 94% of deforested areas in the Amazon and Cerrado regions may be due to illegal activity, which exposes a worrisome lack of transparency and a serious structural governance and law enforcement problem.<sup>11,12</sup>

Figure 1: The natural forest in the Brazilian Amazon by year



Source: MapBiomass (2022), HSBC estimates for the forest cover post 2021 given current deforestation rates

<sup>3</sup> WWF, Inside the Amazon

<sup>4</sup> WWF, Cerrado

<sup>5</sup> Brandão Jr., A. et al., Estimating the Potential for Conservation and Farming in the Amazon and Cerrado under Four Policy Scenarios, Center for Sustainability and the Global Environment, 10 February 2020

<sup>6</sup> Greenpeace, Slaughtering the Amazon, 9 June 2009

<sup>7</sup> Reuters, Indigenous leaders push new target to protect Amazon from deforestation, 5 September 2021

<sup>8</sup> WWF, Unsustainable cattle ranching

<sup>9</sup> Greenpeace, Amazon cattle footprint, 2010

<sup>10</sup> Mongabay, As its end looms, Cerrado tracker records 6-year deforestation high, 12 January 2022

<sup>11</sup> WWF, New study finds 94% of deforestation and habitat destruction in Brazil's Amazon and Cerrado could be illegal 17 May 2021

<sup>12</sup> WWF, Illegal Deforestation and Conversion in the Amazon and Matopiba: lack of transparency and access to information, March 2021

## Land use for global food security

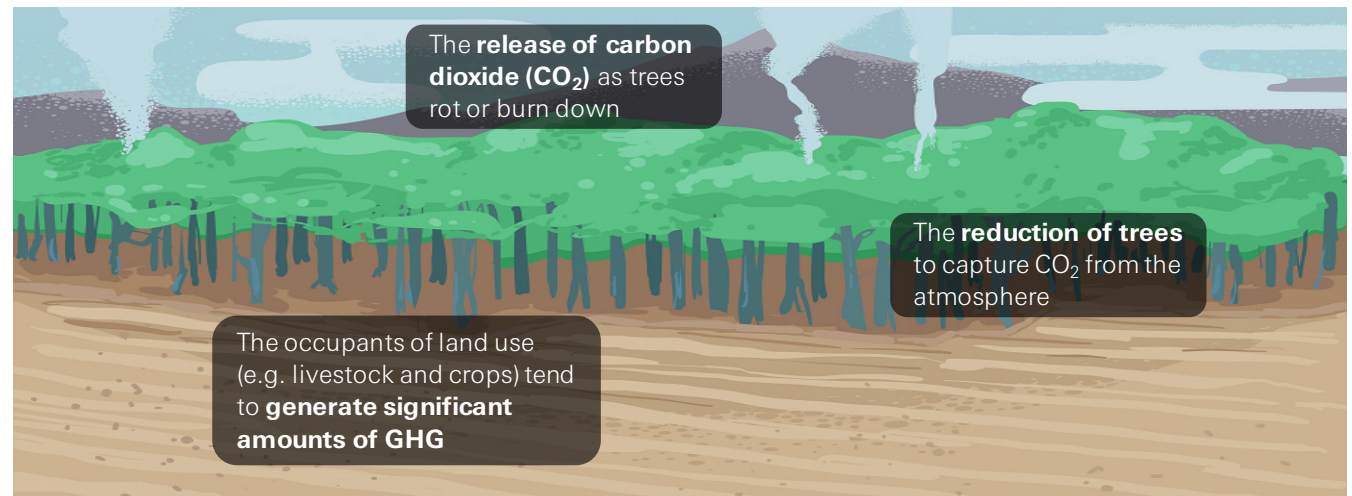
Brazil has become a top three global producer of sugar, soybean, corn, ethanol, wood pulp, cotton, fruit juice, coffee, and protein among other things.<sup>13,14</sup> The cattle herd has also grown to over 210 million heads in recent years and the agricultural sector now accounts for more than one fifth of Brazil's GDP.<sup>15</sup> To facilitate this, ranchers have had to clear large swathes of land to graze cattle. Yet when the grass dries up, most of these pastures are then repurposed to soybean cultivation, and the ranchers move to a different piece of cleared forestland, thereby expanding deeper into the biomes.<sup>16</sup>

## The impact on climate

Deforestation attributes to half of Brazil's GHG emissions, which results in three significant outcomes: the release of carbon dioxide as trees rot or burn down; reduced uptake of carbon dioxide from the atmosphere; and further emissions from livestock raised on the land.

Taken together, these account for a quarter of all global emissions. But the Amazon rainforest is also a critical carbon sink, storing 200 billion tons of carbon – about one tenth of the total carbon stored in land ecosystems – so any major change to its vegetation has an impact on the global climate system. The Cerrado region stores an estimated 13.7 billion tons of carbon.<sup>17,18,19</sup>

Today, over 20% of the Amazon rainforest has been destroyed and scientists argue that 20-25% is the threshold for it to turn into a non-forest ecosystem: a savannah. This tipping point may be close. Despite the growing threat to the Amazon's survival, deforestation rates have been rising and fines for illegal deforestation have been falling.<sup>20,21,22,23,24,25</sup>



<sup>13</sup> Embrapa, Brazil is the world's fourth largest grain producer and top beef exporter, study shows, 01 June 2021

<sup>14</sup> Observatory of Economic Complexity, Brazil

<sup>15</sup> Brazilian Institute of Geography and Statistics; IBGE (2022)

<sup>16</sup> Mongabay, Brazil's key deforestation drivers: Pasture, cropland, land speculation, 19 March 2019

<sup>17</sup> The Guardian, Amazon rainforest now emitting more CO2 than it absorbs, 14 July 2021

<sup>18</sup> Chain Reaction Research, Cerrado deforestation disrupts water systems poses business risks for soy producers, 02 October 2018

<sup>19</sup> Landscape News, The Amazon rainforest is nearing its tipping point – but what does that mean?, 16 September 2021

<sup>20</sup> Nobre, CA. et al., Land-use and climate change risks in the Amazon and the need of a novel sustainable development paradigm, National Academy of Sciences of the US, 16 September 2016

<sup>21</sup> Lovejoy, TE., and Nobre, C., Amazon Tipping Point, Science advances, 21 February 2018

<sup>22</sup> Amigo, I., When will the Amazon hit a tipping point?, Nature, 25 February 2020

<sup>23</sup> WWF, Brazil Gets Tough to Stop Amazon Deforestation, 01 October 2008

<sup>24</sup> Reuters, Indigenous leaders push new target to protect Amazon from deforestation, 05 September 2021

<sup>25</sup> The Guardian, More than half of Amazon will be lost by 2030, report warns, 06 December 2007

## 2. Fixing the problem

Deforestation rates have been worsening in Brazil since 2013, raising serious questions about the effectiveness of current public and private initiatives. We highlight some of the high impact solutions that can be pursued to better curb the problem of deforestation.

### Review of legislation and policies

A study conducted by the Amazônia 2030 research group identified key legislative incentives that paradoxically encourage land grabbing and forest destruction, along with legal recommendations to fix them (such as defining a clear timeframe for occupation of public lands).<sup>26</sup> We believe these recommendations should be helpful in relieving the current loopholes and legal vacuums.

Brazil has also embarked on a path towards decentralising environmental management from the federal to the state level, and more recently to the municipal level. However, this has led to a great dissonance of environmental policies in the country, making it harder for policies to have a real impact. Indeed, proper supervision and management of this issue is indispensable, with more powers needed for federal agencies.

### Land use and regulatory pressures

There are billions of dollars of lost value to the undesignated areas that grabbers are possessing and deforesting. In fact, around 70 million hectares of public land in the Amazon and 3 million in Cerrado have never been officially allocated for specific uses.<sup>27</sup> Designating public lands as protected areas and with supervision could be fundamental to curb deforestation.

The Brazilian government can also, for instance, regulate banks and other financial institutions who have the potential to directly or indirectly participate in the facilitation of criminal activity. For example, banks should have access to each farm's deforestation status and not be permitted to extend credit to ranchers that have engaged in illegal deforestation.

### Full cattle traceability is key

Non-compliant cattle suppliers 'launder' their animals through the supply chain, by raising them on illegally deforested lands, and subsequently moving them to legal farms for sale. To combat this, making the supply chain fully traceable is not only possible, it is also relatively cheap, and does not take much time. Examples of cattle-tracing tools that can be pursued by beef packers include:

- ◆ **Radio frequency identification device (RFID):** an implantable tag used for cattle identification
- ◆ **Visipec:** a tool that connects existing monitoring systems with enhanced visibility for meatpackers in the Amazon<sup>28</sup>
- ◆ **Blockchain-based solutions:** by leveraging on shared data that is stored cryptographically, users would rely on the voluntary supply of information from ranches

<sup>26</sup> Amazônia 2030, Brazilian Land Tenure Law Encourages Land Grabbing and Deforestation in the Amazon, 28 April 2021

<sup>27</sup> Stabile, M. et al., Solving Brazil's land use puzzle: Increasing production and slowing Amazon deforestation, Land Use Policy, 2020

<sup>28</sup> Visipec

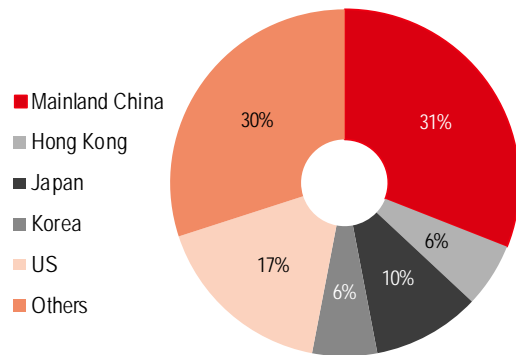
### 3. Driving change

Global importers, retailers, investors and civil society all have a critical role to play as they can push for solutions from governments and across the supply chain.

#### Importers can upgrade in sourcing

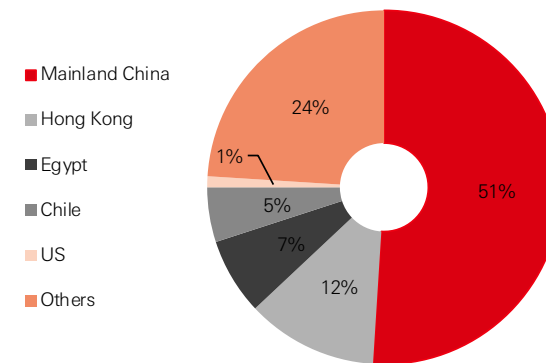
Mainland China, Hong Kong and the US today are some of the world’s biggest importers of beef (Figure 2), and are the beneficiaries to 64% of Brazilian beef exports (Figure 3). Given these volumes, any beef sourcing policy adopted by these countries that would require Brazil beef exporters to ensure full cattle traceability from birth to slaughter – similar to the European Union – would be instrumental.

Figure 2: Mainland China, Hong Kong and the US are some of the largest global beef importers...



Source: United States Department of Agriculture, 2020

Figure 3: ...64% of Brazilian beef exports go to these 3 economies alone



Source: Comexstat, 2020

That said, mainland China already demands very high animal quality and health standards which cannot be met by most meatpackers, and neither by the vast majority of deforesting ranchers in Brazil who happen to be too small to invest in genetics, technology, and pasture management.

#### Retailers demanding deforestation-free products

For grocery retailers around the world, they can play a critical role by ceasing purchases from beef suppliers that cannot confirm zero deforestation throughout the supply chain. This may require upgrading and good maintenance of beef sourcing policies in order to account for indirect cattle suppliers to the meatpackers.

Commercial boycotting is a reality and banks, credit rating agencies, and investors are increasingly giving higher weight to ESG in their investment and lending criteria. Continued deforestation risks may upset the long-term prospects of retailers’ sales and cost structures, as well as their reputation, investor base, and capital markets capabilities.

### Investors can drive change

Investors are putting pressure on Brazilian meatpackers to fix the country's cattle laundering problem if they want to access US capital markets for funding. Indeed, firms are increasingly focused on ensuring that their supply chains are not linked to deforestation as these ESG risks can dramatically affect future sales, limit access to capital, hike the cost of capital, restrain strategic opportunities, and reduce stock value.

There is also pressure on developed market retailers and fast food chains, from their investors and consumers, to adopt a more sustainable and transparent approach for beef sourcing. The majority of sales are often outside Latin America, and linkage back to deforestation in the Amazon could profoundly affect the importers' reputation in other markets.

### Civil society has an important role

Exposing companies that disregard sustainable practices and electing politicians committed to ending deforestation is becoming progressively common, as the risks of climate change have been made increasingly clear. According to a survey, 79% of Brazilians stand against forgiving the fines of those involved in illegal deforestation.<sup>29</sup>



<sup>29</sup> O Globo Política, Código Florestal: segundo pesquisa Datafolha, 79% dos brasileiros são contra perdão de multas a quem desmatou ilegalmente, 11 March 2011

## 4. Conclusion

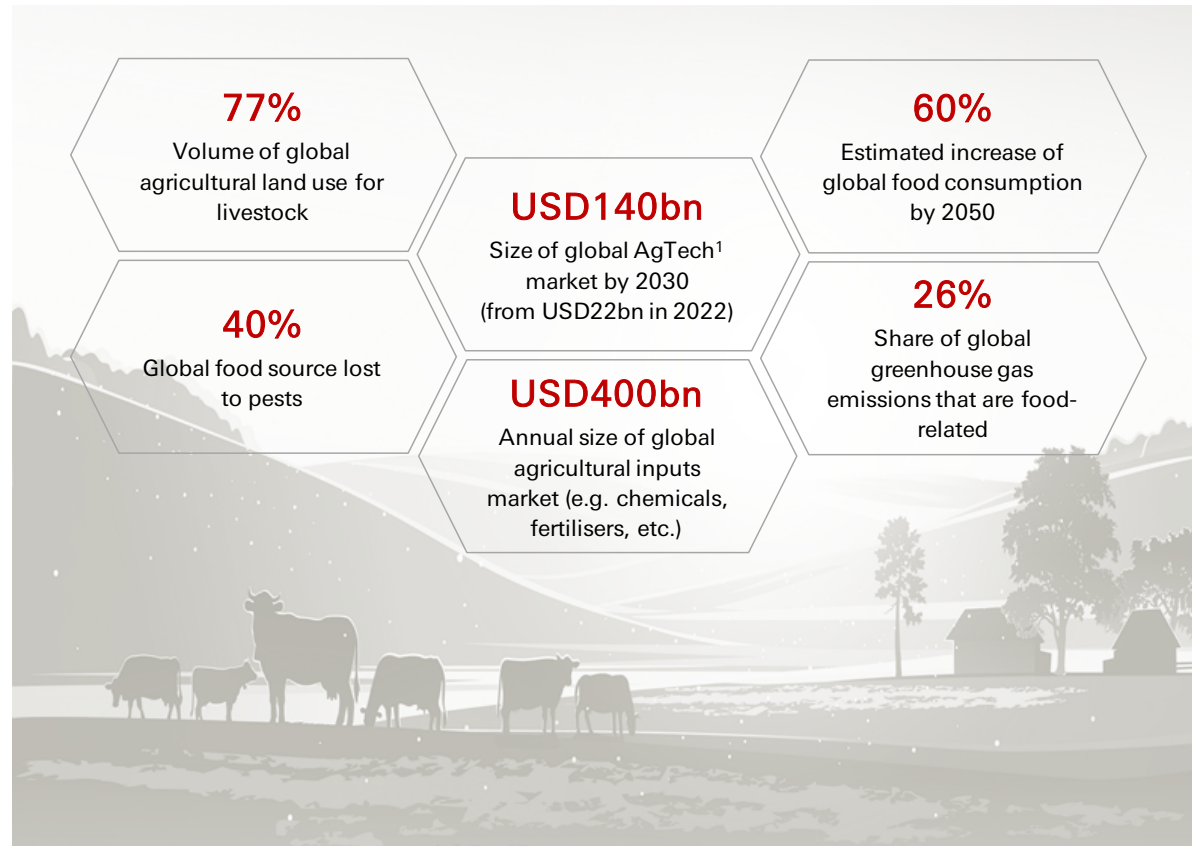
A holistic approach is needed to properly curtail the legal, economic, and cultural incentives to deforesting. However, all the key stakeholders can drive game changing initiatives that can help preserve both the Amazon and Cerrado regions, as well as other areas in the world that are at risk of deforestation. Investors should be aware of the options on the table for solving this crisis, noting that companies, individual and consumer actions may drive change faster than policy shifts. We see the interests of these stakeholders converging as the risks of preserving the status quo are rising and there is effectively no time to lose.

# Sustaining global food security

Food & Agriculture is one of the critical sectors that not only contributes to global warming, but is also adversely impacted by it. According to the United Nations, it is estimated that an additional 60% of food is needed by 2050 to feed the rising global population (versus the year 2000). As the reality of climate change becomes ever clearer and the environmental impact from agriculture continues to build – including emissions, deforestation, biodiversity, fertiliser run-off and more – the pressures of sustaining food security are increasingly top of mind for society, companies and investors.

We discuss the significance of Food & Agriculture’s role in sustaining global food security. We also explore the agricultural technologies required to develop less greenhouse gas-intensive practices and food production methods, including how various smart farming tools can be sustainable in the longer term.

## Did you know?



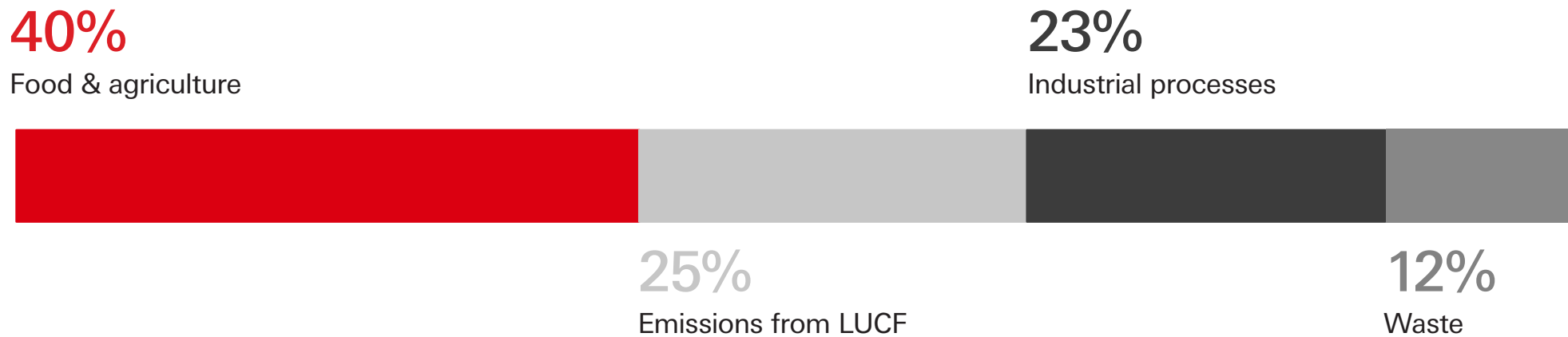
Source: Food & Agriculture Organisation, Finistere Venutres, HSBC

<sup>1</sup> Abbreviated from of agricultural technology, or the application of technology for improvement in agriculture

# 1. Balancing food security and climate change

Global greenhouse gas (GHG) emissions can be largely divided into two categories: 1) energy-related activities e.g. electricity, heat production, transportation, buildings, etc. that form 70% of emissions and 2) non-energy related activities e.g. agriculture, forestry and other land use that fulfill the remaining 30%. Within the non-energy activities, c40% is attributed from the Food & Agriculture sector alone, making it the highest across all major sources – see Figure 1:

Figure 1: Non-energy sources of global GHG emissions with Food & Agriculture accounting for 40%



Source: HSBC, IEA, EDGAR, Global Carbon Project; Note: LUCF is Land Use Change & Forestry, 2012

The sector therefore is a prime example that needs to adapt to the challenges posed by climate change, while also mitigating its own role in global warming. Sustaining global food security is one of the sector’s key priorities, as such new investments are required to develop less GHG intensive agricultural practices and food production methods.

## Varying exposures

Livestock is a major sub-segment, which supports the global food system and employs a large share of the population. Increasing wealth, shifting diets and growing populations have led to increasing protein demand and made the livestock sector one of the fastest growing agriculture sub-sectors.

But, according to the Food & Agriculture Organisation (FAO), livestock has one of the highest impacts on biodiversity losses and it is also responsible for 80% of the global land-use for agriculture-related activities. Meanwhile, ruminant livestock such as cattle, sheep and goats cause the majority of emissions in the sub-sector, with around 44% in the form of methane, and the remainder shared between nitrous oxide (29%) and carbon dioxide (27%).

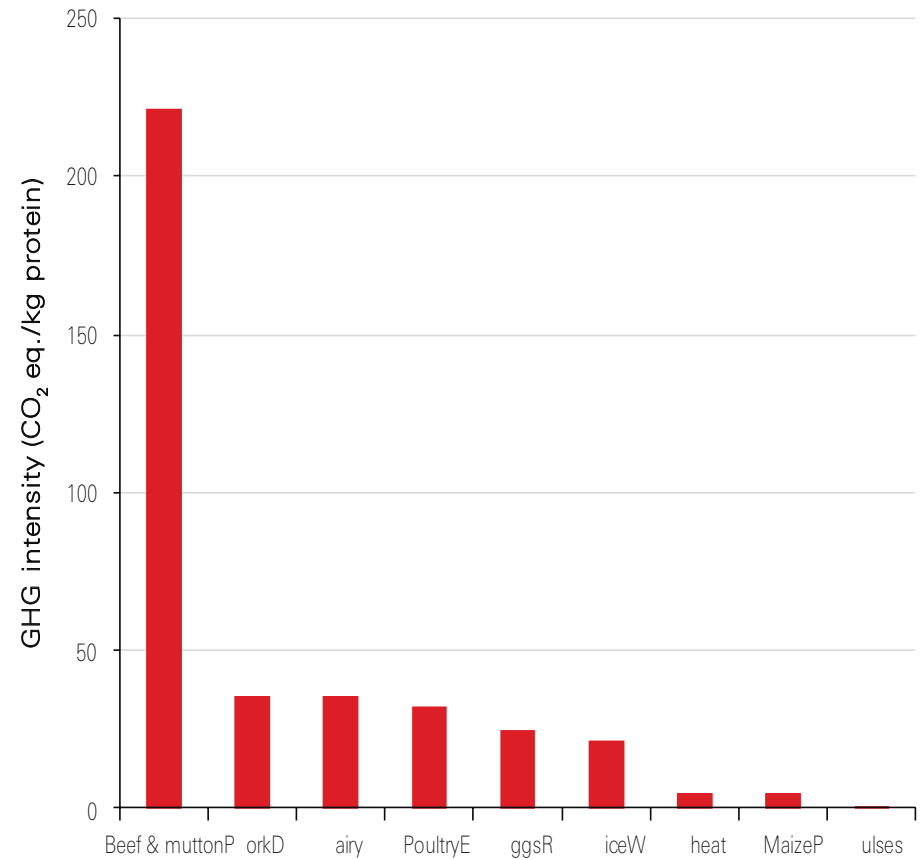
## 2. Rising demand for global resource-intensive food

According to the United Nations, each person will consume 12% more food by 2050 (compared to 2000), which implies that 60% more food would be needed to feed a global population of nearly 10 billion people. The aggregate increase in the consumption of food which includes protein and other animal-based food, such as meat, dairy, fish and eggs, would widen the potential food gap, i.e. the difference between the food required to feed the global population and the food produced.

Meanwhile, according to the World Resources Institute (WRI), by the year 2050, the global average per capita protein consumption is projected to rise to nearly 80 grams per day (from 68 grams in 2009), which is set to drive the growth in the demand for animal-based foods. The total intake is projected to increase by nearly 80% between 2006 and 2050, versus 59% growth between 1961 and 2009. Less resource-intensive plant based protein intake increased only 14% over this period.

The production of high protein foods, which represents a large share of dietary requirements in developed regions, is responsible for the majority of diet-related emissions. Looking ahead, in aggregate, the consumption of beef, lamb and goat meat is estimated (by the WRI) to increase by 88% between 2010 and 2050. Beef is an energy-intensive food source, which requires 20 times more land use and discharges 20 times as many GHGs per gram of edible protein (than plant based proteins such as beans, peas and lentils). Figure 2 provides a comparison of GHG intensity across a range of proteins.

Figure 2: Greenhouse gas intensity of different foods



Source: Our World in Data, Clark and Tilman 2017

### 3. Smarter technology to feed the world

We look at a number of key technologies available today which are believed to make farms and the agriculture sector smarter, hence addressing environmental and other concerns from food production.

#### Technologies and robotics

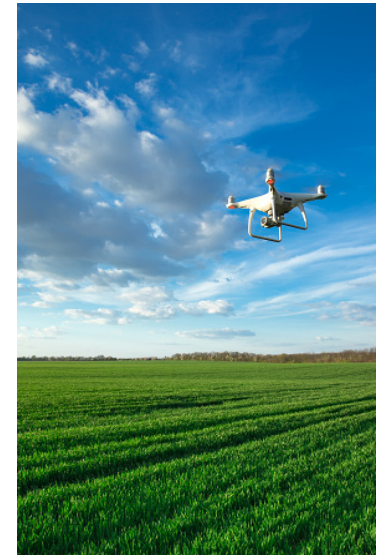
Digital technologies and robotics can help create fully autonomous solutions that are sustainable, in the sense they can be more resource-efficient, and cost effective because they help reduce overall labour costs. Emerging applications of robots or drones in agriculture include weed control, cloud seeding, planting seeds, harvesting, environmental monitoring and soil analysis.

Automation and robotics for smart farming encompass a range of technologies, including:

- ◆ **Autonomous tractors** – These vehicles enable driverless farming to help ensure quality and lower labour costs. Further, e-tractors exchange data on use and charging needs to optimise energy consumption.
- ◆ **Harvesting robots** – Vegetable picking robots, equipped with machine learning to identify and harvest a specific agricultural crop, are enabling automated harvesting.
- ◆ **Robotic milking systems** – Milking robots are the largest and most established agricultural robot technology.
- ◆ **Drones** – Remote-controlled consumer drones are used for aerial image acquisition
- ◆ **Controlled environments** – This involves the use of building automation solutions for vertical farms, where optimised growing conditions for plants and other foodstuff products are created in a reliable and energy-efficient way.

#### Digital farming

Digital farming is primarily about the use of data-driven insights to optimise farm management. With Artificial Intelligence and cloud computing systems, the data generated at different levels through precision farming tools can generate insights on the right time of sowing and tilling, what crop to sow, how much and what fertilizers to apply and more. The return on investments seems compelling, with some sources indicating a USD55-110/acre increase in profits using digital agriculture.<sup>2</sup>



<sup>2</sup> According to Accenture

## Vertical farming

Vertical farming (i.e. indoor farming) is growing plants/crops in vertically stacked layers in warehouse, containers, rooftops or even skyscrapers. These farming techniques stimulate the plant growing processes through artificial control of lights but are grown without soil and use 95% less water. Vertical farming in one acre of land can produce as much food as a 390-acre traditional farm<sup>3</sup>, while the Bank of International Settlements estimates the market size will grow to nearly USD20bn by 2026, up from USD5.5bn in 2020.

## Aquaculture

This is the process of rearing, breeding, raising and harvesting aquatic species, both animals and plants, in controlled aquatic environments such as the oceans, lakes, rivers, ponds and streams. The sector has a significant and growing role in providing food, nutrition and employment, with the World Bank estimating that, by 2030, 62% of all seafood produced for human consumption will be sourced from aquaculture.

## Alternative proteins

These are foods where plant-derived proteins replace those derived from animals. Versions of these products, e.g. tofu and rice milk, have been around for many years, but recent technological advances have led to a huge expansion in the range and quality of products, especially with meat. Some products offer virtually the taste and texture of meat but are entirely plant derived. Advances in fermentation technology will also increasingly allow products derived from fungi to replicate meat.



<sup>3</sup> Estimate provided by Aerofarms, a start-up company

## 4. Conclusion

There's heightened awareness from society as a whole, companies, innovators and investors for the need to feed and grow the world in a more sustainable manner. With 60% more food estimated to feed the global population by 2050, the Food & Agricultural sector will need to increase the efficiency of food production whilst seeking to lower GHG emissions and reducing farmland usage. Smarter farming including digital technologies, vertical farming, aquaculture and alternative proteins may support the path to achieve global food security whilst limiting associated emissions.

Whilst 2050 is only a generation away, many more radical changes can take place on technological advances. Investors should take note of emerging developments from companies aimed at lowering emissions, as they will play a key role in decarbonisation efforts and to limit global warming. We believe that companies who adapt with foresight to the risks and opportunities are better placed to outperform their competitors in the longer run.

# Embedding ESG into Fixed Income

ESG in fixed income is now mainstream. The number of funds which now label themselves as sustainable or have some type of sustainable objective is increasing rapidly. For example, 14% of bond funds in EUR now have a form of explicit sustainability in their names.

Investors incorporate ESG into their decision making in myriad ways; through the exclusion of certain issuers or sectors, the purchase of green and labelled bonds, by investing in issuers with better ESG or by factoring in issuer’s decarbonisation goals into their portfolios. ESG has exploded not just in the number of green bonds outstanding or in the number of funds that now target ESG criteria but also in the ways in which it is applied. We aim to illuminate how different styles of ESG impact fixed income markets.

Fixed income investors have good reason to take ESG seriously. ESG risks can shape the fate of whole sectors. ESG investment styles can tarnish or burnish bond prices depending on how issuers fare on key ESG criteria. The shape of fixed income markets can be fundamentally altered as the structure of securities are changed to incorporate ESG KPIs.

There is not a direct linear relationship though between “good” ESG and tighter spreads or lower yields. Complex ESG issues like efforts to decarbonise the economy require investors to look at not just the current state of play, but also how issuers are likely to fare over the longer run. At its most developed, ESG asks investors to consider how well an issuer will adapt to future challenges, not just how well it performs today.

## Types of labelled bonds



### Green bonds

- ◆ Fund environmental projects
- ◆ Not secured against projects



### Sustainability bonds

- ◆ Fund a mix of environmental and social projects
- ◆ Not secured against projects



### Social bonds

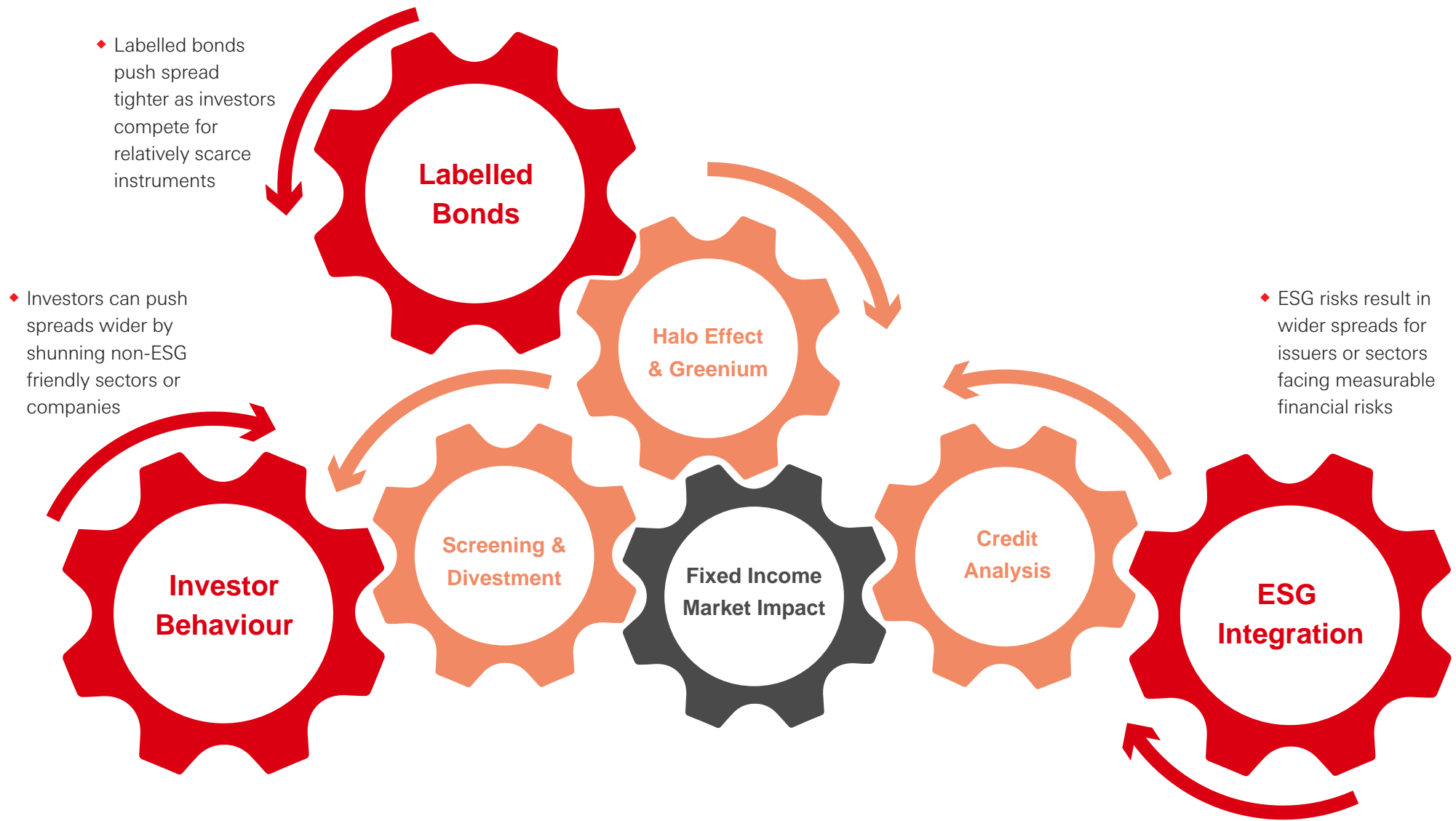
- ◆ Fund social projects
- ◆ Not secured against projects



### Sustainability-linked bonds

- ◆ Do NOT fund projects – can be used for opex, capex, refi
- ◆ Instead, coupon or principal increases if environmental or social targets missed

# 1. ESG moves fixed income markets in three key ways



Even for investors who would not naturally consider themselves to be ESG investors, we still think ESG matters. That is because ESG impacts prices in three key ways:

1. Green bonds are more in demand than non-green bonds as investors have set up specific funds that can only buy green bonds. **Higher demand tends to result in better pricing for issuers and tighter primary market and secondary market spreads.** In addition, we also note that issuers who issue labelled bonds for the first time have a “Halo effect” – at the time of the issuance of the first green bond all other bonds from the issuer out-perform.
2. Credit analysis – Buying labelled bonds is not the only approach to fixed income ESG. ESG related risks, such as increased regulation or fines, can impact an issuer’s financial profile either by changing their profitability or balance sheet or both. **This will result in a change in their risk profile which might then feed through into spreads.** We have seen this trend globally, from Asian steel companies to European power producers. An ESG integration approach helps investors identify and mitigate the impact of ESG risk factors on performance.
3. Investors now routinely factor in ESG considerations into their decision making. If enough investors pursue similar ESG policies, this can have a clear and demonstrable impact on bond pricing. A prominent example is the collective decision to avoid Tobacco bonds, which has led to the underperformance of that sector in recent years. **We are starting to see a comparable process play out in the Oil & Gas sector in some regions.**



## 2. A range of approaches to embedding ESG

	Integration	Negative screening	Norms screening	Positive screening	Thematic – Bond level	Impact – Issuer level
<b>Description</b>	Considering ESG risk factors in credit analysis	Excluding issuers based on activity / sector	Excluding issuers based on behaviour	Including issuers based on “best-in-class” metric	Investing in use-of-proceeds bonds	Assessing issuer impact on sustainability theme
<b>Aim</b>	Better risk adjusted returns	Increase cost of funding to “harmful” sectors	Re-inforce good behaviour	Promote better ESG performance across corporates	Reduce cost of funding for desirable projects	Positive real world impact
<b>Key features</b>	Highlighting key risk factors and impact on credit quality	Blanket ban on certain sectors often driven by client requirements	Often refers to broad international standards (e.g. UN treaties)	Typically would use some form of ESG scoring to determine best-performers	Limited, but expanding range of bonds	Adding an additional dimension to investment by setting non-financial goal

Source: PRI, HSBC

Embedding ESG into fixed income portfolios is different from that in equities in two key ways. Firstly, investors can access multiple instruments from the same issuer. Issuers can therefore issue specific bonds which fund investments which contribute to environmental or social objectives allowing investors to clearly demonstrate impact. Secondly, the downside matters more than upside and is inherent to the DNA of fixed income investing. This means that ESG risks have greater emphasis than opportunities.

With those two principles in mind, fixed income investors can apply a range of different approaches to implementing ESG principles. Most commonplace is **integration** in which ESG factors are incorporated directly into the investment process through analysis of the key risks facing the issuer.

Whilst many investors will use an integration approach across all fixed income funds, both sovereign and credit, more specific criteria can also be used, which are tailored to individual portfolios. There are a variety of portfolio screening approaches that can be used to enhance ESG credentials. **Negative screening**, whereby a sector or issuer is removed from the portfolio due to a negative ESG connotation of its business profile are relatively common in fixed income and can often be driven by asset owner priorities. **Norms based screening** can be applied in sovereign portfolios to remove exposure to countries failing to meet certain international standards of behaviour.



Screening processes need not solely focus on negative ESG factors though – **positive screening** involves using ESG scores and positively tilting a portfolio towards issuers that score well.

Many investors will have specific sleeves which can only invest in green or social bonds. This increases the demand for labelled bonds compared to non-labelled bonds and results in a **negative greenium**, which reduces the cost of capital for ESG related projects. In theory, these bonds can be raised by any issuer if they have qualifying expenditure, although in practice certain issuers have found it hard to access this market due to the nature of their business activities or a lack of capex.

**Issuer level thematic investing** introduces a third dimension into fixed income investing. Investors consider not only the traditional axes of risk and return but also “impact” on one or more social and environmental objectives. This approach has been used most widely in assessing the impact of a portfolio climate change objectives. Investors measure the carbon intensity or decarbonisation ambition of issuers in which they invest and exclude or reduce exposure to issuers who increase the portfolio’s carbon intensity or have weak climate ambition, and promote issuers with low intensity or ambitious emission reduction targets.

### 3. Key questions in Fixed Income ESG

	Integration	Negative screening	Norms screening	Positive screening	Thematic – Bond level	Impact – Issuer level
<b>Process</b>	How should I factor ESG into my credit assessment?	Should I exclude certain sectors because of negative ESG issues?	Should I exclude issuers because of weak ESG?		Should I distinguish between different shades of green?	Should I set a threshold for minimum ESG standards per issuer or across my portfolio?
<b>Performance</b>	Should I expect to out-perform by using ESG?	How does negative screening impact bond performance?	Can we link weak ESG performance to bond performance?	Can we demonstrate that ESG generates out-performance in credit?	Do green bonds out-perform? Do darker green bonds out-perform?	Do I need to sacrifice return to pursue my impact based strategy?
<b>Factors</b>	What are the main ESG risk factors impacting credit?		Should I prioritise E,S or G in my norms screening?	What are the key issues which investors care about?	What are the key projects that green bonds finance?	How should I calculate carbon intensity?
<b>Financial Products</b>		Can issues from more controversial ESG sectors still issue labelled bonds?		Is there a role for GSS or SLB in my best-in-class portfolio?	What are the differences between green bonds and SLB bonds?	
<b>Measurement</b>	Should I use scoring to screen for ESG?	Should I try and distinguish between issuers in “bad” ESG sectors?		What data providers for ESG scoring are there?	Do green bonds really generate additional impact?	Do I need different measures for each sector?
<b>Marketing</b>	What’s the best way to demonstrate my ESG practices?			Does positive screening still leave me with potentially controversial issuers and can I explain this to my clients?		What are my competitors doing in this field?

Source: HSBC

This chapter is an extract from our Fixed Income & ESG handbook. [Download](#) the full version

All market data included in this publication is dated as at close 13 April 2022, unless a different date and/or a specific time of day is indicated in the publication

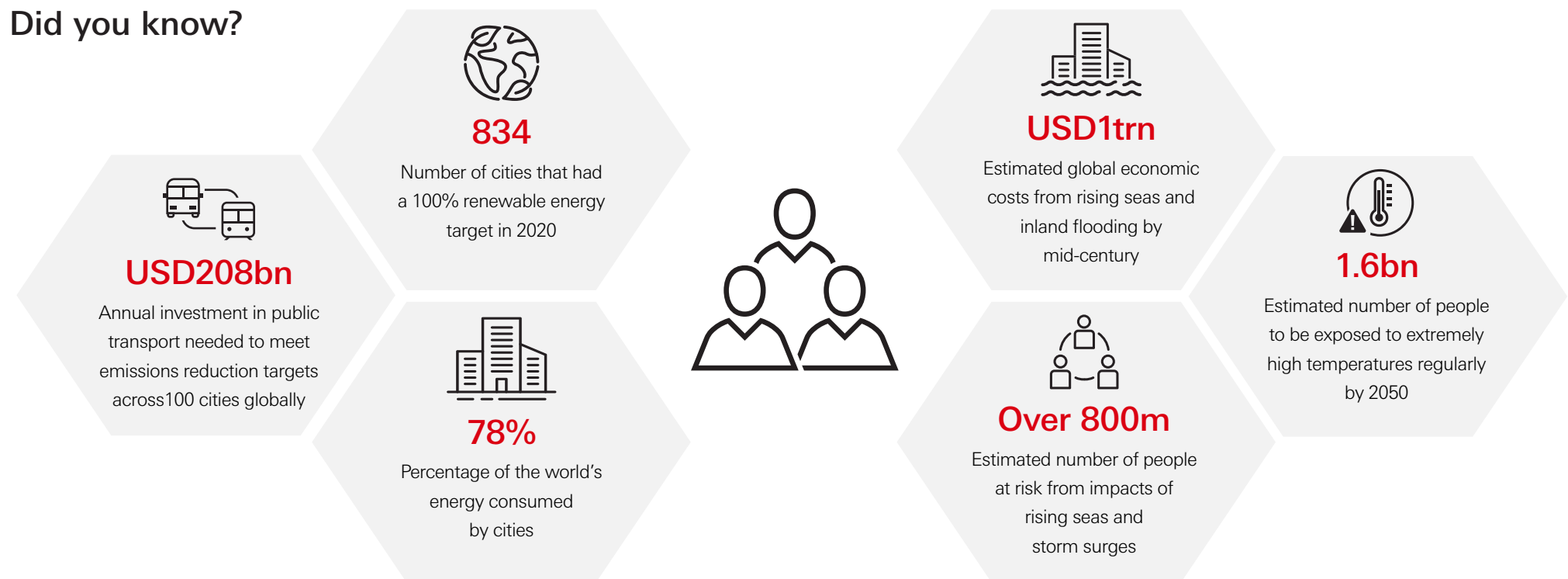
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# Cities and Climate Change

The United Nations Climate Change Conference (COP26) ended with modest progress across most climate issues. Yet one fact became clear: cities around the world must work towards radical decarbonisation as atmospheric emissions continue to accumulate. Urban areas consume 78% of the world’s energy and produce more than 60% of greenhouse gas (GHG) emissions, and are likely to feel the impact of climate change more acutely and disproportionately. Coastal cities face the direct challenge of flooding, tsunamis and hurricanes, while some cities may face extreme temperatures, droughts and water scarcity.

We discuss the potential impacts of climate change on cities and how they should respond. We also highlight some of the financial instruments that will help fund mitigation and adaptation efforts in urban areas.

## Did you know?



# 1. How does climate change affect urban areas?

For cities, climate change is likely to mean higher temperatures, higher sea levels, air pollution, and destruction of property following extreme events. It could also affect the water and food supply, and the overall health and prosperity of people living in urban areas.

## Rising temperatures

Global warming increases the earth's surface temperature. Today, nearly one-third of the world's population is exposed to life-threatening levels of extreme heat for at least 20 days each year<sup>1</sup>. With temperatures soaring, higher energy demand is likely as more household devices are needed to beat the heat.

The cooling industry consumes up to 30% of global electricity and generates 8% of GHG emissions worldwide. By 2030, the number of air conditioners is projected to increase by two-thirds from the two billion units currently installed, and electricity demand for cooling in buildings could also rise by as much as 50% globally<sup>2</sup>.



<sup>1</sup> The future we don't want, C40 cities, February 2018.

<sup>2</sup> IEA (2020), Cooling, IEA, Paris

**Water: too much or too little?**

Higher sea levels due to climate change increase the chances of flooding and tsunamis for coastal cities (Figure 1), putting assets at risk. Asia and Northern Europe may see heavy precipitation, putting dwellings at a high risk of coastal and high tide flooding, and tsunamis. But equally, if climate change makes weather more erratic, some regions, such as the Middle East and South America, may face extreme droughts and water shortages.

Less rainfall, a lack of renewable water resources, and poor urban management or pollution could lead to water scarcity. This may become more pressing if water demand increases by 20-30% by 2050 (as expected by the UN). In emerging markets, cities such as São Paulo, Bangalore, Cairo and Beijing, could all face water stress in the coming years. In developed markets, Tokyo, Miami and London could experience similar issues, with the Greater London Authority suggesting that the latter could have serious water shortages by 2040.

**Figure 1: The top 20 cities exposed to coastal flooding**

Rank	Country/region	Urban Area	Exposed Assets in Future (USDbn)
1	US	Miami	3,513.04
2	Mainland China	Guangzhou	3,357.72
3	US	New York-Newark	2,147.35
4	India	Kolkata	1,961.44
5	Mainland China	Shanghai	1,771.17
6	India	Mumbai	1,598.05
7	Mainland China	Tianjin	1,231.48
8	Japan	Tokyo	1,207.07
9	Hong Kong SAR	Hong Kong	1,163.89
10	Thailand	Bangkok	1,117.54
11	Mainland China	Ningbo	1,073.93
12	US	New Orleans	1,013.45
13	Japan	Osaka-Kobe	968.96
14	Netherlands	Amsterdam	843.70
15	Netherlands	Rotterdam	825.68
16	Vietnam	Ho Chi Minh City	652.82
17	Japan	Nagoya	623.42
18	Mainland China	Qingdao	601.59
19	US	Virginia Beach	581.69
20	Egypt	Alexandria	563.28

## 2. What should cities do?

The C40 initiative – a global network of city mayors aiming to tackle climate change – will be key to sharing best practices and driving the discussions further in the coming years. While much of the climate policy is set at a national level, local authorities are responsible for policy that could be far more important. Cities need to react to the threat of climate change. The solutions are two-fold: mitigation and adaptation.



### Mitigation:

Actions to reduce GHG emissions, and put the world on a path to deliver global 'net zero' emissions and limit future average temperature rises.

### Mitigation: the essential big steps

In many cities, after decarbonisation of the power sector, transport and building emissions still remain the most significant. To date, over 1,000 cities and regions globally have committed to being net zero, covering over one-fifth of the global urban population. Much more must still be done, however, if the world is to avoid hitting crucial climate tipping points.

Urban climate mitigation will centre on transport policy – more public transport, greater incentives to walk or cycle, and cutting down on the use of petrol or diesel-powered vehicles. There are many ways to do this, but Amsterdam and Copenhagen may offer a blueprint for providing the infrastructure to make cycling and walking easier, safer, and more appealing (see Figure 2). While electric and autonomous vehicles will likely play a large part in cutting urban emissions, there's still a significant role for public transport. In fact, if global warming is to stay on track at 1.5°C, public transport in cities across the world will need to double in capacity by 2030 (this was also announced by the C40 initiative during COP26). The exact type of transition will depend on city size, geography and wealth, but investment is needed across the board.

During COP26, world leaders were called on to ensure that "everyone living in urban areas has safe, frequent, affordable and accessible public transport within a 10-minute walk from their home<sup>3</sup>". In addition, USD208bn (equivalent to 0.2% of global GDP) was requested as annual investment to upgrade public transport in 100 C40 member cities, accounting for 25% of the global economy.

Greener buildings will also be a key part of the story – urban buildings, including homes, workplaces, schools, and hospitals, are responsible for an estimated 40% of global emissions – as will changing the energy mix that fuels cities. A step towards a more circular city could help too, cutting waste and increasing re-use and recycle rates. For example, Berlin aims to replace hard surfaces with green space and water-permeable surfaces, to combat the urban heat island effect and enable the city to adapt to heavy rains. Planting rooftops with mosses or grasses increases the ability to absorb water and creates an evaporative cooling effect.

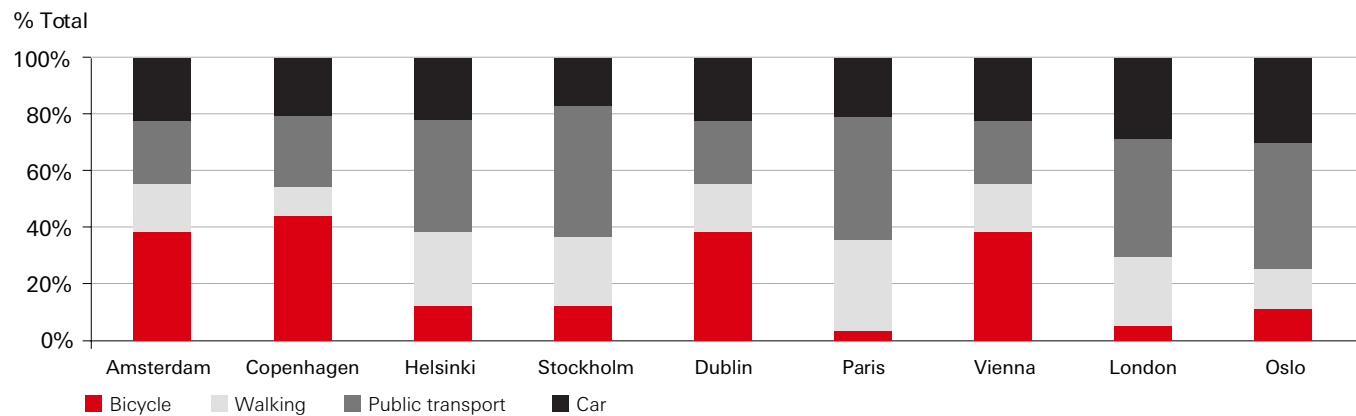


**Adaptation:**  
Steps taken to adjust assets, populations and economies to withstand, and be able to operate in, an expected future changing climate system.

**Adaptation**

While an estimated 95% of global funding on climate action goes to mitigation, there’s a growing acceptance of the need to prioritise adaptation. That is, adapting to become more resilient in the face of the climate risks that will invariably arrive. Some cities have already taken action to adapt to a changing climate. At COP26, the goals for adaptation were focused on financing resilience, habitat protection and restoration, and communication. It was agreed that adaptation finance flows will reach USD40bn by 2025 (“at least double” of 2019 levels) – to help meet global needs.

**Figure 2: Amsterdam and Copenhagen are cycling towards net zero**



### 3. Where will the funding come from?

To tackle the substantial environmental and social challenges created by climate change, we expect cities to step up their investment in coming years. This is clearly a significant funding cost – and while much of it will have to come from national governments, both private-public partnerships and capital markets are likely to play a role.

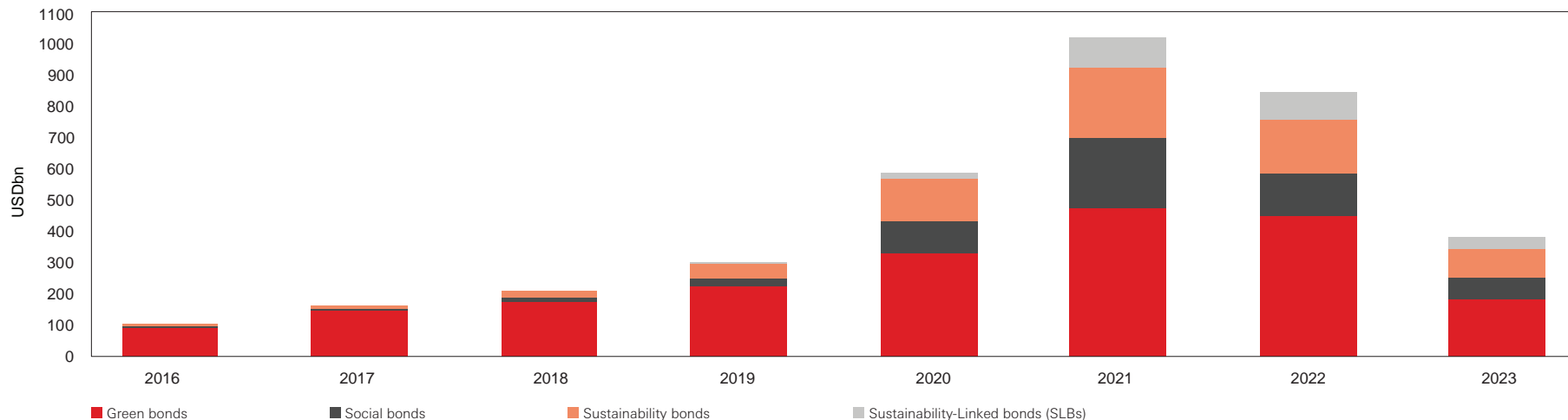
Green, social, sustainability and sustainability-linked bonds, collectively known as ‘labelled bonds’, are currently USD2.2trn in size. Three green project types stand out as being particularly suited to funding cities: clean transportation, climate change adaptation, and green buildings. Social bonds could also be aimed at providing affordable housing and are well suited to funding cities. Issuers could be sovereigns, regional authorities, or even corporates, especially those in real estate.

Green, social and sustainability bonds also offer two advantages: visibility of the underlying projects and cheaper funding – the ‘greenium’, or spread at which green bonds trade to non-green bonds, is on average slightly negative.

#### Types of labelled bonds

 <p><b>Green bonds</b> fund but are not secured against designated environmental projects</p>	 <p><b>Sustainability bonds</b> fund a mix of environmental and social projects</p>
 <p><b>Social bonds</b> fund but are not secured against designated social projects</p>	 <p><b>Sustainability-linked bonds (SLBs)</b> do not fund projects, instead the coupon or principal steps up if the issuer fails to meet pre-agreed environmental or social targets</p>

**Figure 3: Global labelled bond markets**



Source: HSBC calculations, Dealogic, Bloomberg as of 12 May 23

**Other financial instruments used for environmental, social and governance (ESG) activities are highlighted below:**



**Green loan:** A form of financing that seeks to enable and empower businesses to finance projects with a distinct environmental impact, or rather, which are directed towards financing ‘green projects’.



**ESG-linked loan:** The proceeds of the loan are used for general corporate purposes, rather than ‘green projects’. However, the loan pricing is based on the borrower’s ESG score or overall sustainability achievements, such as emission reductions. If the borrower achieves its sustainability target(s), it benefits from favourable interest rates on the loan.projects’.

Several large real estate investment trusts have tapped the green bond market over the past year, drawing new, sustainability-focused investors to commercial real estate debt and raising money to finance Leadership in Energy and Environmental Design (LEED)-certified development projects. LEED is the internationally known rating system and symbol for sustainable and environmentally sound buildings.

## 4. Conclusion

Cities and climate change go hand in hand. While the focus of climate policy has been at the national level in recent months, what the world’s urban areas do is likely to be just as important, if not more so. And with a more geographically mobile labour force, making cities work better – with improved public transport and lower levels of pollution – will be key to attracting people to live in them in years to come.



# IPCC on Climate Science

The Intergovernmental Panel on Climate Change (IPCC) of the United Nations published a report on the physical science of climate change in August 2021. Findings include estimates on how much the climate has changed, whether limiting further change is possible, and risks by region.

We discuss the significance behind the IPCC’s latest report and why it puts greater urgency in the fight against climate change. As we continue to experience extreme temperatures and precipitation, the report is another wake-up call for world leaders to set more ambitious climate targets and adopt policies for immediate action.

## 1. The IPCC and key report messages

The IPCC originated in 1988 and was set up by two UN agencies (The World Meteorological Organisation and the UN Environment Programme) to assess the science relating to climate change. It consists of hundreds of scientists from around the world and while they do not conduct any proprietary research, they assess scientific papers on the relevant subject matters. The IPCC publishes Climate Assessment Reports every 6-7 years and is currently in the sixth assessment cycle (AR6) in 2021.

The August report of the AR6 is entitled “The Physical Science Basis” and is a compendium of updated climate science since the AR5 in 2013. Written by 234 authors and totaling 4,000 pages long, it forms as one of the four final reports that the IPCC will release during this cycle<sup>1</sup>.

**Figure 1: The IPCC’s AR6 series of reports**



Source: IPCC websites

This report incorporates observations and advanced modelling to estimate on how much the climate has already changed, provisions of further change and whether any of such can be limited, as well as risks that lie in global regions. One key message is that climate change has been observed in “every region and across the whole climate system”, and another capturing global attention with: “it is unequivocal that human influence has warmed the atmosphere, ocean and land”<sup>2</sup>.

<sup>1</sup> <https://www.ipcc.ch/report/ar6/wg1/>

<sup>2</sup> Ibid

The report outline can be found in the “Summary for Policymakers” (SPM) which contains the following:

**Figure 2: Outline of the SPM**

<p><b>1 The Current State of the Climate</b></p>	<ul style="list-style-type: none"> <li>• Comprehensive view of the climate system and its changes</li> <li>• Human influence on climate variables, including climate and weather extremes</li> </ul>
<p><b>2 Possible Climate Futures</b></p>	<ul style="list-style-type: none"> <li>• Projections of the changes in climate system in the near-term (2021-2040), mid-term (2041-2060) and long-term (2081-2100) at five emissions scenarios</li> </ul>
<p><b>3 Climate Information for Risk Assessment and Regional Adaption</b></p>	<ul style="list-style-type: none"> <li>• Climate response and possible outcome at global, regional and local scales</li> </ul>
<p><b>4 Limiting Future Climate Change</b></p>	<ul style="list-style-type: none"> <li>• Possible future control to assess the affect of projected climate and air pollution</li> </ul>

Source: IPCC, AR6, SPM

## 2. Summary of report findings

From our perspective, the key findings of “The Physical Science Basis” can be summarised as:

- ♦ The **effect of human activities on all parts of the climate system** is, in essence, much clearer now. Human influence is compounding extreme weather and climate events, with observations that these are either happening at the same time, or similar events are happening across different locations.
- ♦ Our **atmospheric greenhouse gases (GHGs)**, with the majority components being carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O), also **measure at new highs**. And, while our lands and oceans have absorbed 56% of CO2 emissions since 1970, cumulative atmospheric emissions have continued to increase over time, resulting in less CO2 being proportionately absorbed.
- ♦ The **earth’s surface is also rising in temperature** by 1.4-1.7x faster than the oceans. Our lands are measuring approximately 1.09°C higher in 2011-20 than in 1850-1900. This is expected to trend upward until mid-century, where even the Paris Agreement goals of limiting temperature rises to 1.5°C and 2°C could be exceeded, unless deep reductions in GHGs take place in the coming decades.
- ♦ The rate of **average precipitation is increasing** across most regions, with frequency and intensity rising with temperature. The warmer it gets, the heavier the precipitation and extreme daily precipitation is projected to intensify by about 7% for each 1°C of global warming.

- ◆ Global **sea levels have soared** by 20cm since the beginning of the 20th century. Half of this is attributed to thermal expansion: 42% from glacial and ice sheet loss, and 8% from changes in land water storage.
- ◆ Although CO<sub>2</sub> can be removed and stored (e.g. in the form of a carbon sink), its effects are mixed. **CO<sub>2</sub> removal would gradually reverse temperature** increases on land, although not all climatic effects would be reversed.
- ◆ **Climate change cannot be reversed in short time frames.** For example, the effects on oceans – surface temperatures, acidification, and deoxygenation, sea-level rises and ice sheet melt, as well as permafrost may not reverse for hundreds of years.
- ◆ **Highly disruptive events** that have a low likelihood of occurrence, but with catastrophic effects, **cannot be eliminated.** These can include the collapse of ice sheets or abrupt changes to ocean circulation. The aftermath effects would be highly disruptive to weather patterns and the water cycle.
- ◆ The **carbon budget** is an estimation of permissible CO<sub>2</sub> emissions while keeping within the limits of temperature increase. Historic CO<sub>2</sub> emissions levels from 1850-2019 already translates to a 1.07°C temperature increase. From 2020, it is estimated that **only 400 gigatonnes of CO<sub>2</sub> can be emitted** before breaching the 1.5°C warming threshold.



### 3. Implications for investors

The AR6 has incorporated more details on the climate impact on various geographies. This will have implications for economic and business planning, both in the short and long term.

As a bottom-up approach, we think investors have now an even stronger case to demand more actions from businesses and governments to implement decarbonisation measures. For companies involved in high-carbon activities, the demand is to rethink business models and strategies, as well as providing more investor transparency by adopting stronger ESG principles. For industries, the demand is to be more innovative in lower carbon solutions. For all segments of the economy, the demand is to prepare for the impact of climate change.

Major economies such as the US, Europe and China that have pledged to accelerate their climate ambitions will look to deploy green solutions in scale, thus creating opportunities for investors. In particular, sectors, including power generation, transport, buildings and industrials, are expected to see an emphasis in radical decarbonisation to reverse atmospheric emissions.



## 4. Conclusion

The IPCC's latest report is a testament that the science of climate change is clear. It also serves as a stark reminder that the goals set forth in the Paris Agreement could be missed without deep and rapid emissions cuts. As the race to climate neutrality becomes more critical, so will the calls from global citizens and investors for governments and companies to make radical changes and deliver change. Investors should be prepared to ride on the accelerated transition as more decarbonisation pledges take centre stage and more solutions are developed to achieve these targets.



# The European Green Deal

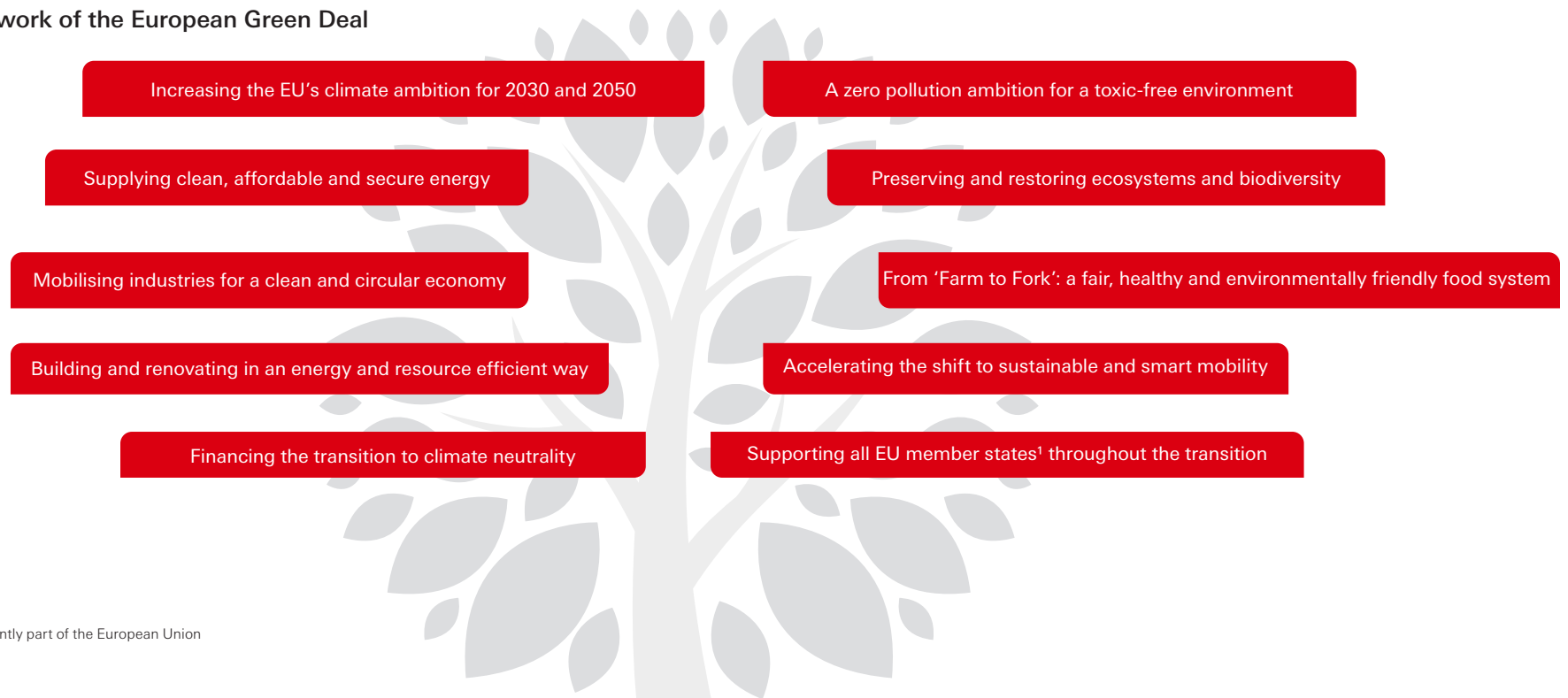
The European Green Deal was first unveiled in 2019 by the European Commission (EC), with the primary objective for the EU to be the “first climate-neutral continent” by 2050. Since then, the EC have formally proposed a Climate Neutrality Law and announced elevated targets to achieve 55% net reduction in greenhouse gas (GHG) emissions by 2030, compared to 1990 levels. In 2021, the EU formalised these targets as a renewed pledge ahead of the Leaders’ Summit on Climate on Earth Day, with new details released in mid-July.

We discuss these recent developments on the European Green Deal and their significance towards achieving climate neutrality. We also delve into the Carbon Border Adjustment Mechanism, a world-first carbon tariff policy and why this could potentially be a strong catalyst for decarbonisation within and outside of the EU.

## 1. An Overview

The Deal is a multi-year project which aims to revise existing regulation and propose new policies. There are essentially “fifty actions for 2050” which touch upon climate, industry, agriculture, taxation, financing, and investing - as highlighted in Figure 1.

Figure 1: The Framework of the European Green Deal



Source: HSBC

<sup>1</sup> Applicable to the 27 nations currently part of the European Union

Specific to climate neutrality, there are two parts:

- ♦ Reducing emissions by decarbonising in all parts of the economy
- ♦ For residual emissions, maximising the potential of natural carbon sinks and carbon capture & storage

The EC announced its Climate Neutrality Law in 2020, which is designed to “enshrine” the 2050 climate neutral objective into legislation and provide a long-term direction of travel for EU climate policies. The targets will be an EU-wide collective objective, which implies that not all member states have to achieve individual neutrality.

Significant developments were made recently in July, when the EC announced

a work programme aligned with the EU Green Deal and Climate Neutrality Law. The programme includes revisions to existing legislation and new proposals under the “Fit for 55” package, designed to place the EU on course to reach the 55% net reduction in GHG emissions by 2030. These revisions and proposals can be categorised under three areas – see Figure 2:

With Europe as the third highest CO2 emitting region in the world, the European Green Deal is an illustration of extensive government initiatives, that provides a wide range of support to sustainable investments. These top-down government measures will also be increasingly important for companies to be forward-looking and ride on the sustainability trend, and similarly for investors to look for opportunities in companies with sound ESG practices and/or innovative green solutions.

**Figure 2: Summary of updates to the "Fit for 55" package**

Carbon pricing <sup>2</sup>	Climate targets	Emissions rules
<p><b>REVISION</b></p> <p><b>EU Emissions Trading System:</b> to lower the annual GHG emissions cap from certain sectors as well as extend to transport and buildings</p>	<p><b>REVISION</b></p> <p><b>Effort Sharing Regulation:</b> strengthen GHG emissions target assigned to each EU member state</p>	<p><b>REVISION</b></p> <p><b>EU clean car standard:</b> require average emissions of new cars to reduce by 55% (from 2030) and 100% (from 2035) compared with 2021 levels</p>
<p><b>REVISION</b></p> <p><b>Energy Taxation Directive:</b> align taxation of energy products with EU energy and climate objectives</p>	<p><b>REVISION</b></p> <p><b>Regulation on Land Use, Forestry and Agriculture:</b> strengthen overall EU target for carbon removals via natural sinks by 2030</p>	<p><b>REVISION</b></p> <p><b>Alternative Fuels Infrastructure Regulation:</b> require EU Member States to expand charging capacity in line with zero-emission car sales; build new infrastructure</p>
<p><b>NEW</b></p> <p><b>Carbon Border Adjustment Mechanism:</b> taxation on emissions for imports</p>	<p><b>REVISION</b></p> <p><b>Renewable Energy and Energy Efficiency Directive:</b> increased target to produce 40% of energy from renewable sources by 2030</p>	<p><b>NEW</b></p> <p><b>ReFuelEU Aviation Initiative:</b> suppliers to blend increasing levels of sustainable aviation fuels</p>
	<p><b>REVISION</b></p> <p><b>Energy Efficiency Directive:</b> more ambitious binding annual target for reducing energy use at EU level</p>	<p><b>NEW</b></p> <p><b>FuelEU Maritime Initiative:</b> more sustainable maritime fuels and zero-emission technologies</p>

Source: EU, HSBC

<sup>2</sup> Denotes cost of greenhouse gas emissions borne by the EU public

## 2. The Carbon Border Adjustment Mechanism

A significant recent proposal is the Carbon Border Adjustment Mechanism (CBAM), a world-first tariff policy on carbon emissions embedded in imported goods based on the EU carbon price. In its transition phase to be soft-launched from 2023, the CBAM will be imposed on five carbon-heavy sectors: iron & steel, aluminum, cement, fertilisers and electricity (more in Figure 3).

Other sectors could also be extended into CBAM's scope after full implementation in 2026. The EC expects to raise about EUR10 billion a year as tax revenue for the EU's budget and own resources. We believe that the CBAM will also accelerate multilateral decarbonisation and initiate the global race on climate ambitions.

The EC's proposal on CBAM is expected to kick-start a series of domestic and international discussions and debates. With the complexity and controversy that it brings, implementation of the CBAM will require extensive dialogue between EU member states and their trading partners. This could influence the target launch timelines, even for the transition phase planned for 2023.

And while approval is likely within the EU, pressure from trading partners such as China, Russia and the US will likely arise given their much publicised criticism on the CBAM. The proposal could also face headwinds from the World Trade Organisation, the global body is responsible for the rules of trade between nations.

There could also be cost impact applied to sectors heavily reliant on imported goods, such as construction and automotive. EU importers may face the scenario of foreign suppliers passing the carbon cost onto them, which will increase costs down the value chain eventually. However, the CBAM proposal could also see importers receiving some level of compensation for the carbon price paid to their origin's regulators, thereby alleviating this cost impact.

**Figure 3: Highlights of the EU Carbon Border Adjustment Mechanism**



**When?**

A transition phase will start in 2023. Importers will start paying a financial adjustment after full implementation in 2026.



**What sectors?**

Iron & steel, Aluminum, Cement, Fertilisers and Electricity.



**Which country?**

All non-EU countries except members of the European Economic Area and Switzerland.



**How does it work?**

Importers have to purchase and surrender CBAM certificates to cover emissions embedded in goods.



**How much?**

The CBAM certificates link to the price of the EU ETS allowance. The EU expects to raise EUR 10bn a year from the CBAM.

Source: EU, HSBC

Aside from these potential headwinds, the CBAM could be one of the most effective and strongest instruments to promote multilateral decarbonisation and climate ambitions. It could also be effective in reducing carbon leakage in the EU's Emission Trading System, or the risk of carbon-intensive companies moving to other developing countries to avoid being subject to climate rules, and also protect selected European industries from foreign competitors that are not subject to stringent climate policies.

It also incentivises countries that have bold climate rules or credible carbon pricing schemes. We expect that more countries to tighten their climate policies and consider similar initiatives to protect their domestic industries in response to the CBAM and carbon leakage. In tandem with the release of the proposal, Canada, Japan, UK and US are also examining the feasibility of introducing a carbon border tax.

### 3. Conclusion

As the EU continues to unveil the next proposals of its European Green Deal, major economies such as China and the US have also made further announcements in 2021 to accelerate their climate ambitions. In addition to the CO<sub>2</sub> emissions reduction targets in their 14th Five Year Plan, China has launched its national emissions trading scheme in July. The scheme will initially focus on the power sector and subsequently expand to others in working towards lower carbon developments. Meanwhile, the US has returned to climate leadership with its rejoining of the Paris Agreement and introduced a series of net-zero pledges, including an Infrastructure Framework announced in June to invest in green infrastructure.

In the race to combat climate change, we believe that not only will this momentum be carried by other global economies in the coming year, but also infiltrate into the corporate sector. We believe that companies who adapt with foresight to the risks and opportunities are better placed to outperform their competitors in the longer run. Investors should prepare for an accelerated transition to a lower carbon economy as more pledges around the world are made, more solutions are developed to achieve these goals, more controls on ESG disclosures are enforced and more likelihood for net-zero emissions to become the norm.



# The ESG impact of cyber crime

The speed and breadth of technological adoption highlights the ease of doing things digitally. However, as the global economy becomes more interconnected, countries, companies and individuals face increased risks of cyber crimes. The cost of these attacks globally is expected to reach USD10trn by 2025, up from USD6trn today and equivalent in size to the world’s third largest economy. While spending to counter these activities is forecasted to grow 7.7% annually, this may not be enough, particularly if digitisation accelerates faster than expected in a post-pandemic world.

We discuss the increasing need for companies and industries to protect themselves from cyber threats. We also delve into the related Environmental, Social and Governance (ESG) issues, which are rising in significance for companies, and highlight the industries that set to benefit from the rise of cybersecurity spend.

## Did you know?

**USD10trn**

Expected damages from global cybersecurity crimes by 2025, tripling from 2015

**7.7%**

Forecasted annual growth in cybersecurity spend from 2020-2026

**20-30%**

Yearly average increase in cybersecurity insurance premiums

**6x**

Increase in losses from cyber crimes in 2020

**USD20bn**

Forecasted size of the global cybersecurity insurance market by 2025, from USD7bn currently

**GBP17.5m  
(or 4% of company turnover)**

Maximum fine under the UK’s Data Protection Act 2018



# 1. The growing need for cybersecurity

As digitisation grows, so too will digital vulnerabilities, allowing damages from cyber crime to grow. The threat of cyber crime can come from a multitude of sources including hackers, insiders, competitors, industrial spies, organised crime groups, nation states and terrorists.

The intention behind cyber crime is often financial gain, but there are other motives too, including theft and spying. Common types of attacks include:

- ◆ Malware - malicious software
- ◆ Denial-of-service attacks - access prevention
- ◆ Phishing - fake communication
- ◆ Domain Name System (DNS) tunneling (which acts as a 'directory' of internet, encoding DNS protocols)

Figure 1 highlights the implications of cybersecurity from an ESG perspective (left) and other factors relevant for investors (right).

**Figure 1 - Cybersecurity and investor insights**

**Governance** - companies are experiencing more severe cyber attacks, resulting in significant financial and reputational damage

**Cloud computing** - as industries become more digitised, cybersecurity for cloud-based products follow suit

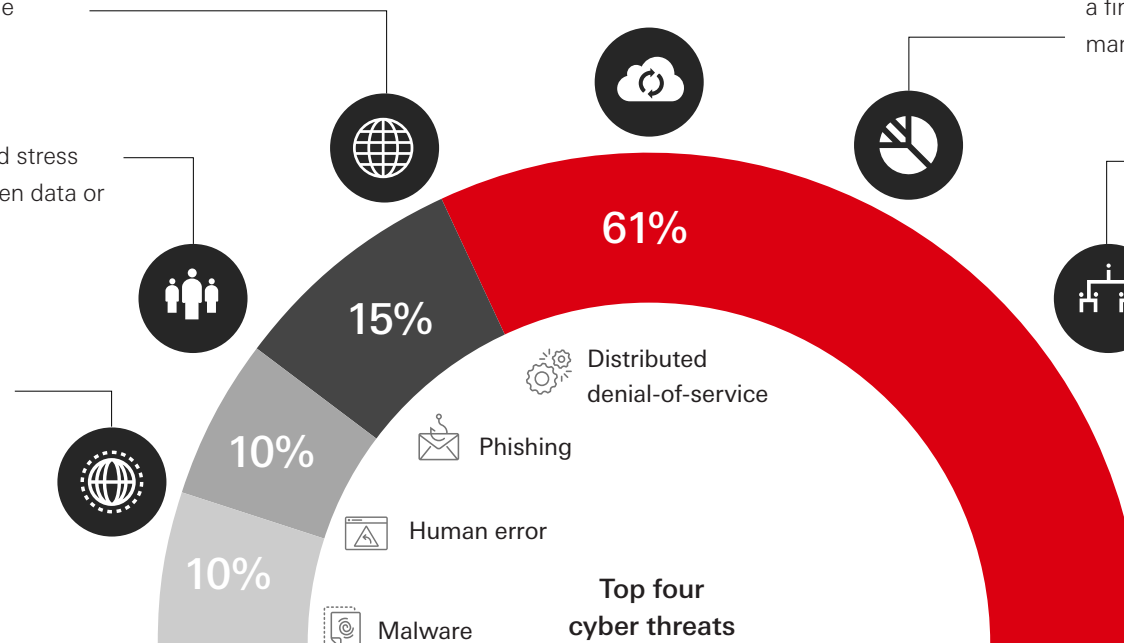
**Financial impact** - cyber attacks and data breaches can have significant impact on a company, both from a financial/operational perspective and via stock market moves

**Social** - substantial disruption and stress created for individuals due to stolen data or loss of confidence in digitisation

**Enterprise cybersecurity** - global and regional players supply network security and services to enterprises in multiple sectors

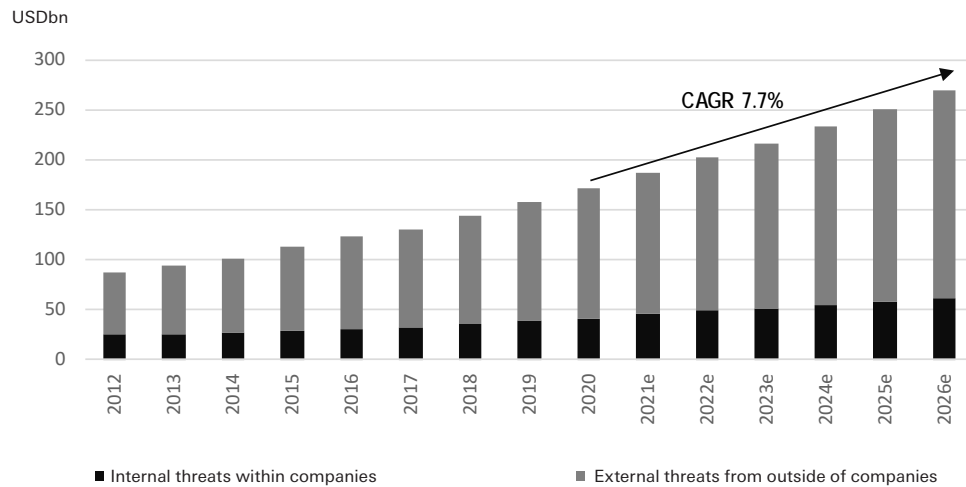
**Environment** - threats of cyber attacks pose a significant operational challenge for utility companies, rather than data breaches

**Governments** - become more efficient and offer enhanced digital services to continue to strengthen security



With the threat of cyber crime rising, spending to counter it could reach USD270bn per year by 2026 (see Figure 2).

**Figure 2 - Global cybersecurity spend by companies is projected to grow at CAGR 7.7% from 2020-2026**



Source: HSBC, Cybersecurity Intelligence



**Industry impact**

A range of industries consume cybersecurity products and services to safeguard their businesses. These include:

**Healthcare**, which has seen a 60% increase in attacks globally since the start of the pandemic<sup>1</sup>



**Transport and logistics** facing increasing threats as the uptake of internet-of-things devices grows

**Financials** also face significant costs from data breaches, and experienced a 54% increase in reported cyber incidents in the first half of 2020 compared to the year before<sup>2</sup>

1. Bitdefender  
2. Investors Chronicle analysis, Information Commissioner’s Office

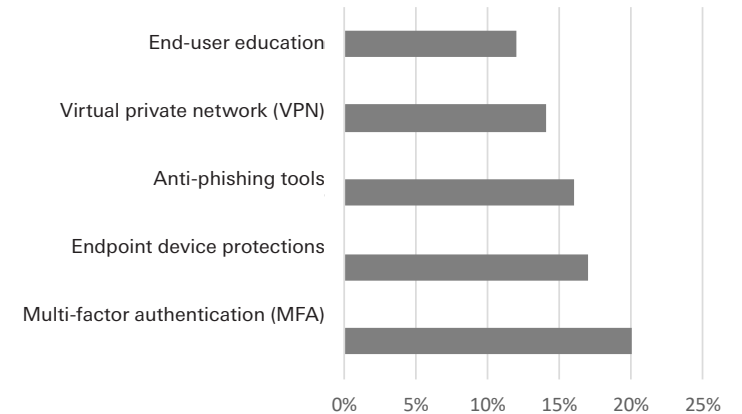


### How 2020 changed cybersecurity

With the pandemic accelerating remote working, the challenges of cybersecurity for businesses have evolved and costs have increased. It's estimated that total IT spending by businesses fell by 8% in 2020, attributed to pandemic-related cost cutting, but cybersecurity spend continued to increase, by 2.4%.

As shown in Figure 3, since the start of the pandemic, cybersecurity investments have been related to working from home, with user authentication reigning high during this time.

Figure 3 - Top cybersecurity investment since Covid-19



Source: Microsoft



## 2. ESG implications from cybersecurity

Cybersecurity threats touch upon all three components of ESG, with implications from disrupted connections to national infrastructure, to loss of confidence in technology and reputational damage to firms. Investors should take note of these impacts, as discussed below.



### Environmental

The related concerns lie with attacks that can cause environmental damage or prevent organisations from operating. Sectors where we believe cyber attacks pose threats to include agriculture, manufacturing, power and renewable energy.

The power sector will face significant challenges given the increasing reliance on remote monitoring, intelligent connected devices and automation. With renewable energy expected to expand by 10% in 2021, these companies could become a target for cyber attacks, attributing to downstream risk with the global transition to net-zero emissions.

A notable example was the 2019 denial-of-service attack on a US-based solar power energy generation provider, which disconnected the generation source with the power grid. Often hackers aim to create power shortages rather than stealing data, which highlights concerns over future attacks on renewables as economies become more reliant on them.



### Social

Cyber attacks also have social impact on the public, from anxiety and stress caused by stolen data, to the loss of confidence in technology. The older population is particularly targeted, as seen in the UK where people aged 55 and over lost approximately GBP3.7m between 2018 and 2019 due to cyber crimes<sup>3</sup>.

Less economically-developed regions such as Africa are also particularly vulnerable because they lack cybersecurity infrastructure and knowledge. Cyber crime is claimed to have cost the continent USD3.5bn in 2017, with 96% of incidents unreported or unsolved<sup>4</sup>.

3. 'Uncovering the extent of cybercrime across the UK', Age UK, 2020

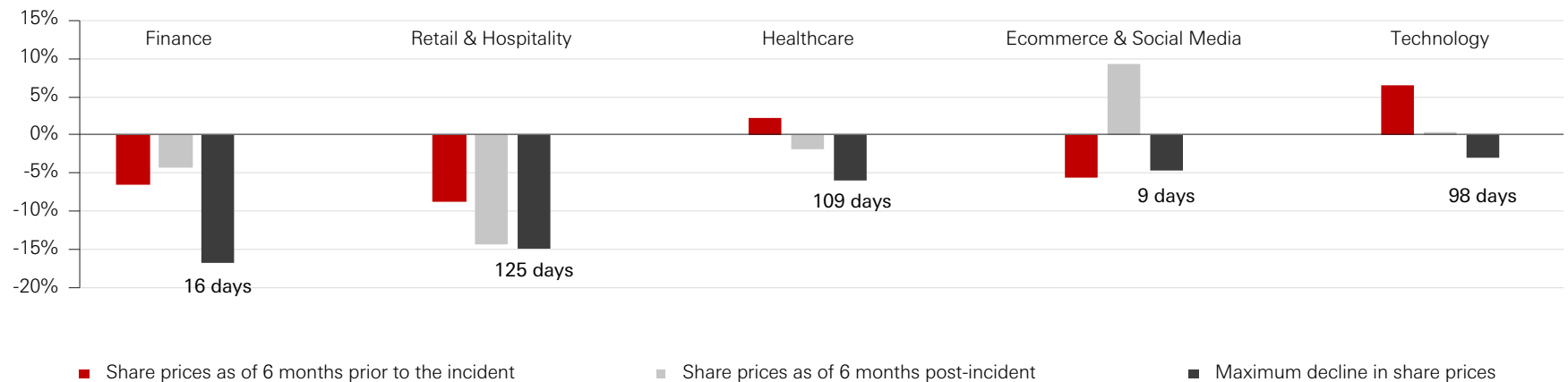
4. 'Africa Cyber Security Report 2017', Serianu, 2017



## Governance

In addition to the direct cost of a data breach, firms can suffer reputational damage that has long-term implications, including an impact on stock market values. Figure 4 shows the impact of a company's share price (post a data breach incident) when compared to the NASDAQ. Breaches involving more sensitive data in the Finance sector led to an average decline of 17% over 16 days, versus the Retail and Hospitality industry which saw an average decline of 15% but over a 3-month period.

**Figure 4 - Impact on companies' share prices by industry vs the NASDAQ (2007-2020)**



Source: HSBC, Comparitech

Note: Data labels on bars represent the number of days to reach maximum decline in share price value, following an industry data breach incident.

On average, business reputation doesn't begin to recover until eight quarters following a data breach announcement<sup>5</sup>, with the average cost estimated at nearly USD4 million per breach<sup>6</sup>.

Although cyber risk is progressively becoming a principal concern for corporations, for a long time, that has not been reflected in the composition of boards. Directors with expertise are now being appointed, but the focus should be on strengthening training for the entire executive team.

5. Rotman School of Management

6. 'Cost of a Data Breach Report', Ponemon Institute, 2020

### 3. Industries providing cybersecurity solutions

In this section, we look at industries with growing cybersecurity revenues - grouped into either managed security service providers or cyber insurers. These are also opportunities for investors to explore.

#### Managed security services providers

These firms manage and monitor the security aspects of their customers' IT infrastructure, providing end-to-end protection. Adoption is growing as pressures from cybercrime, skills shortages and compliance requirements impact under-pressure IT departments and boardrooms that are increasingly worried about the business impact of data breaches.

The managed security services market was estimated at USD27.7bn in 2020 and is expected to reach USD64.7bn by 2026, a growth rate of 15% over the period 2021-26. North America represents the biggest global market (c.45%), while Asia Pacific represents c.15% but is growing quickly.

Three types of players are leading the space of managed security providers:



**IT services companies**  
with integration capabilities  
and proximity to digital  
transformation projects



**Telecom services providers**  
leveraging networks' assets



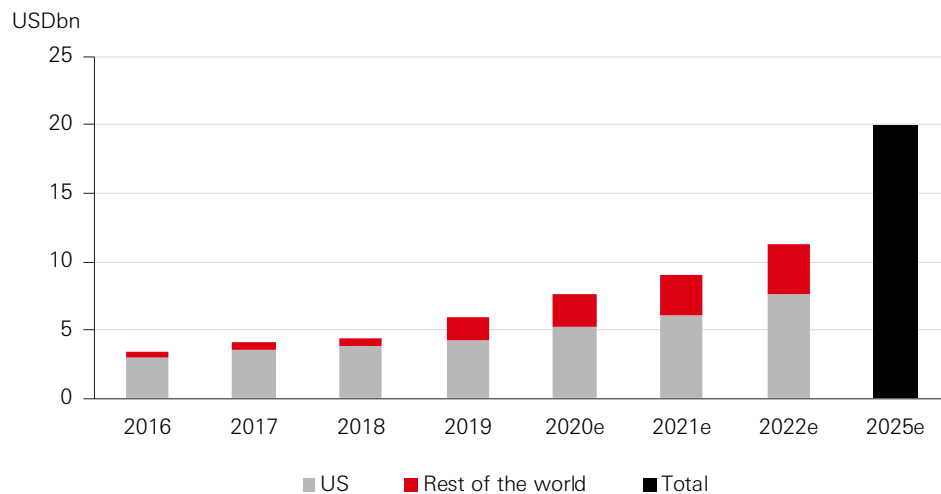
**Independent pure players**  
(companies with products &  
services that are digital only),  
**cloud service providers** and  
**value-added resellers**

### Cyber insurance

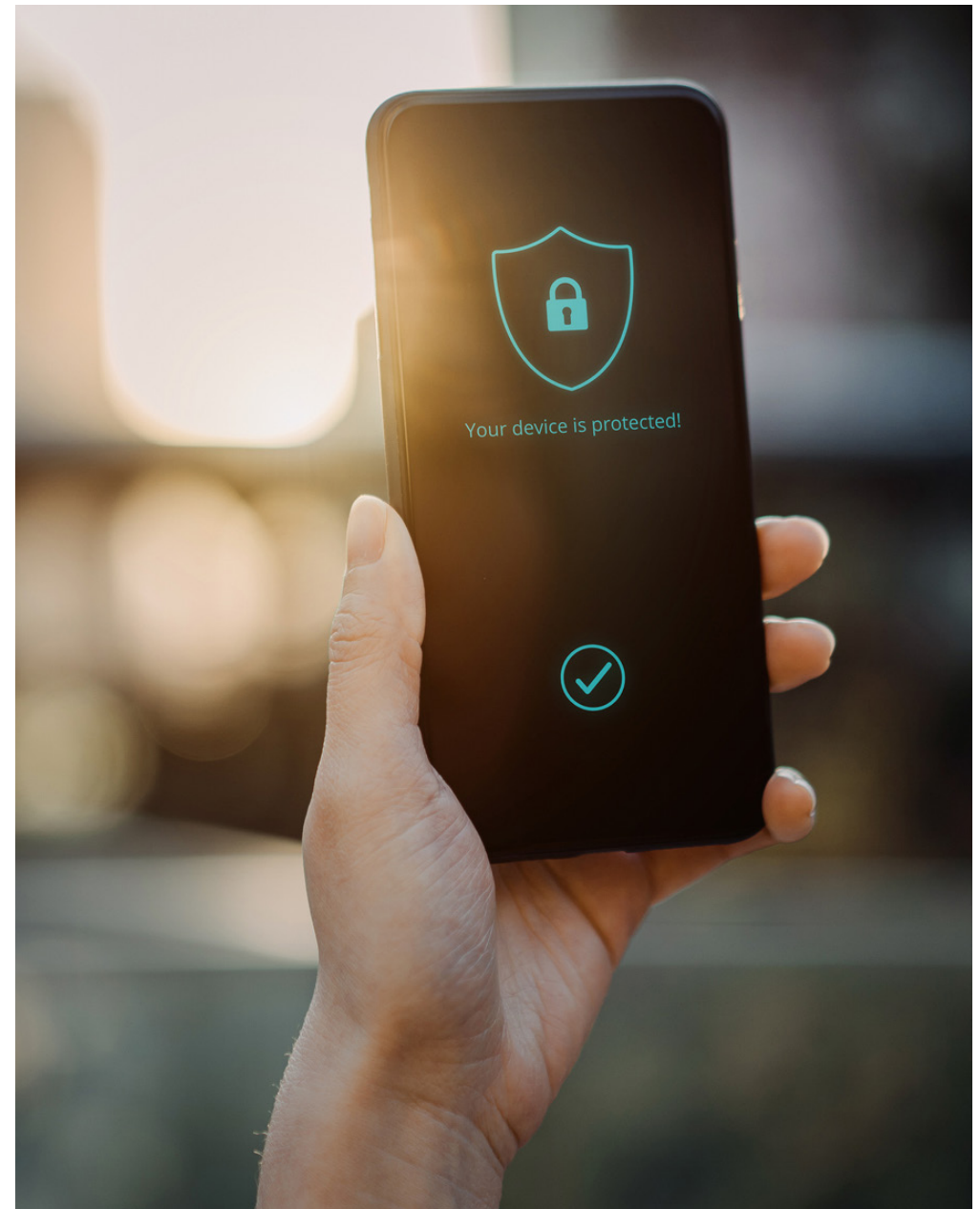
Cyber insurance is one of the few true growth areas within the insurance industry. As the cyber ecosystem grows, the need for insurance as a risk management tool naturally increases. In the US (the largest cyber market) cyber premiums are now estimated at USD2.26bn, while the overall cyber insurance market is estimated to be around USD5bn by Standard & Poor’s (S&P).

However, this market is growing rapidly. One Fintech publication<sup>8</sup> expects cyber premiums to increase by 21% in 2021, while S&P forecasts premiums to increase by 20-30% per year on average. Other insurance companies expect global cyber premiums to reach USD20bn by 2025 (see Figure 5).

Figure 5 - Global cyber premiums



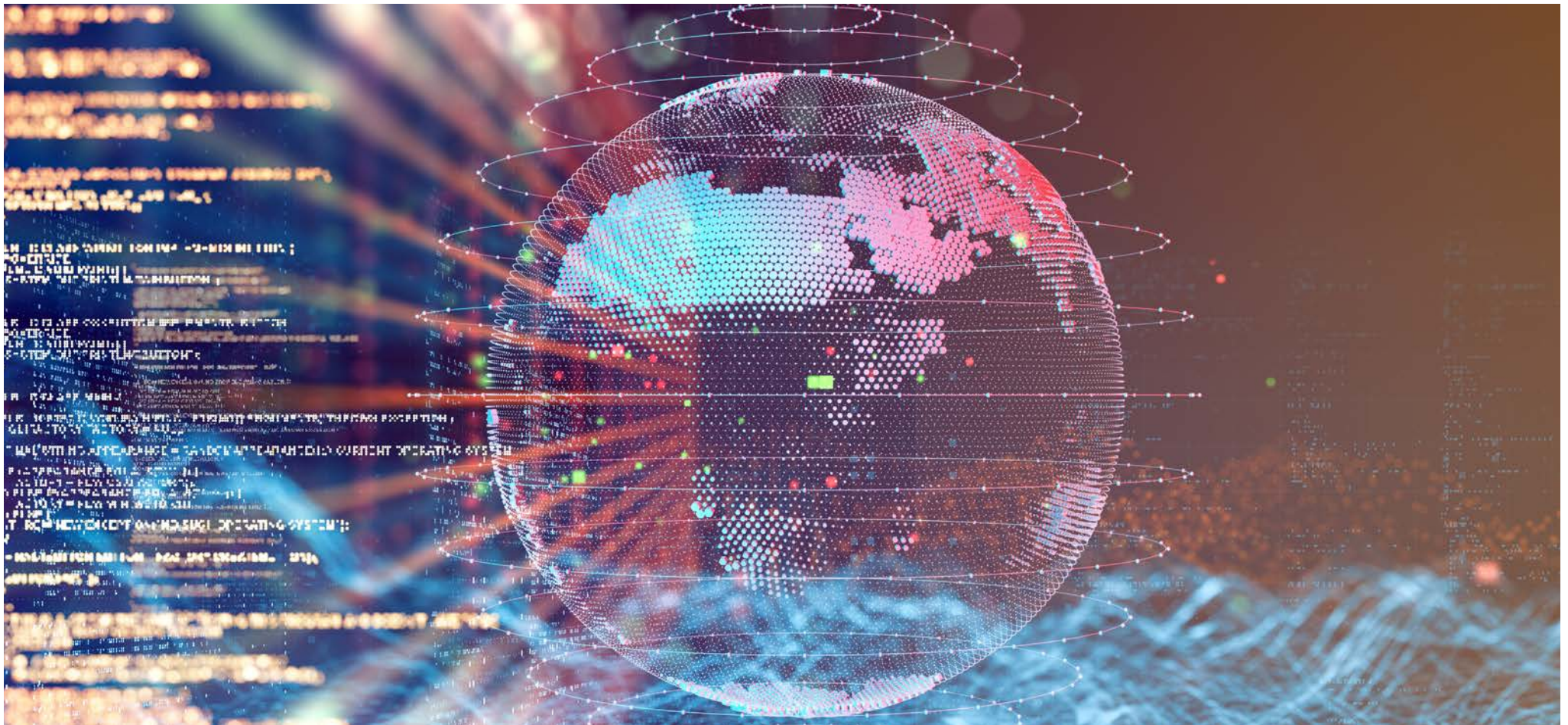
Source: Munich Re, Allianz



## 4. Conclusion

With the rapid increase in digitisation leading to a growing threat of cyber crime, spending on cybersecurity across industries is set to rise. This will help companies and their investors to protect against ESG risks, which include infrastructure outages, loss of personal data and reputational damage.

Investors should also be aware of industries that are set to benefit from companies boosting their defenses against cybercrime, such as IT service companies, telecoms and cloud service providers. With clear indicators of continued growth in cybersecurity, this will offer investors more opportunities within the technology theme.

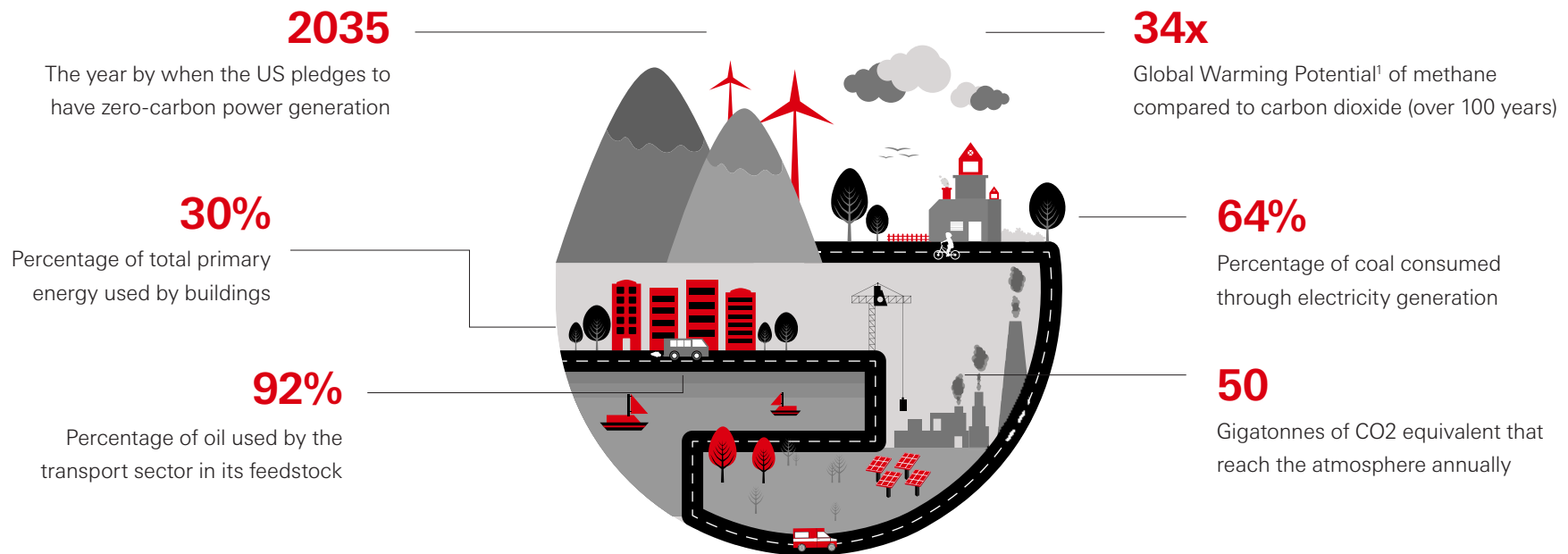


# Four pathways to global decarbonisation

Carbon dioxide emissions, primarily from burning fossil fuels, account for 70% of greenhouse gases (GHGs) in the atmosphere. This and other emissions (including methane) come from a wide range of human activities across the world. As they continue to have a profound effect on global warming, governments, companies and investors project greater focus to net-zero policies, in efforts to accelerate economy-wide decarbonisation.

We look at the catalysts that drive radical decarbonisation. We explore how technological innovation and energy efficiency can reduce major sources of emissions across four sectors: power generation, transport, buildings and industrials. Investors can regard these as 'decarbonisation pathways' with the potential to reduce total emissions by 81% by 2050.

## Did you know?



Source: International Energy Agency (IEA), The World Resources Institute, HSBC

<sup>1</sup> The Global Warming Potential is a measurement that compares the warming impact of different greenhouse gases in the atmosphere. US Environmental Protection Agency.

# 1. Decarbonisation across sectors

Radical decarbonisation across the four sectors can be connected via one trend: electrification – or the shift to electricity as a power source. With increased methodologies to generate renewable power at scale, this single transition driver can gradually replace fossil fuels, thus lowering emissions across land-based transport modes, in buildings (e.g. heating/cooling) and multiple industrial activities. Achieving energy efficiency and technology innovation are also key – less energy demand will have a positive impact on emissions.

## Power generation

- ◆ This sector emits over a quarter of total GHGs, with fossil fuels accounting for 64% of world total
- ◆ Solar, wind and energy storage solutions are seen as dominant drivers for decarbonisation
- ◆ Electricity will be a key enabler to reduce fossil fuels for other sectors

## Transport

- ◆ Oil is the key energy feedstock (92% of total sector)
- ◆ Batteries and hydrogen fuel cells will be essential for a low-carbon transition
- ◆ Global regulations to help limit shipping and aviation emissions



## Buildings

- ◆ Building emissions generated from fossil fuels used for heating/cooling and electricity consumption
- ◆ Retrofitting existing buildings with green technology can enable the use of less fossils and increase energy efficiency
- ◆ Hydrogen gas may form as a future energy feedstock

## Industrials

- ◆ Electrification can play a major role to replace fossil fuels in mining and production of some metals
- ◆ Cutting methane emissions will also be crucial from oil & gas production and coal mining
- ◆ Clean hydrogen can also play a role in multiple industrial sectors

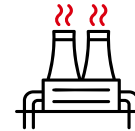
## 2. Power generation

Power generation is the highest emitting sector – at 26.2% of total GHGs and within that, 35.4% of CO<sub>2</sub> emissions. This sector has also received the most attention in driving decarbonisation, with increasingly cost-efficient, scalable alternatives and emerging technologies to fossil fuel combustion.

### Leading the transition:



**Nuclear** fission spins turbines with steam to generate electricity. This is the second largest source of low-carbon power (29% of total in 2018).



**Geothermal** power uses subterranean energy that heats water and spins turbines.



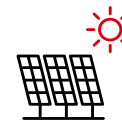
**Hydroelectric** plants use water and gravity to produce power. This energy source is widely used in Brazil, China and the U.S.



**Wind** rotates turbines, thus generating electricity. The structures can be built offshore (on seabeds) or onshore (on land) and a significant number have been installed in recent years.



**Biomass**, such as scrap lumber and other organic matter, can be used as combustion fuel for electricity. This energy source is expected to increase 25% in the years 2019-2024.<sup>2</sup>



**Solar** energy is used in more than 100 countries in large scale. Solar heat can also be used to generate steam from water, producing energy in downstream processes.

### Emerging technologies



**Green hydrogen** is produced from water via renewable energy sources. It has potential to displace fossil fuels, used as a carbon-free gas in turbines to generate electricity.



**Ammonia** has a higher energy density and is easier to transport than hydrogen gas. It is seen as more practical for energy transportation, storage and use for power generation.



**Energy storage** can enable electricity to be stored until needed, increasing the potential for more intermittent renewables (such as solar and wind) to be included in the energy mix.



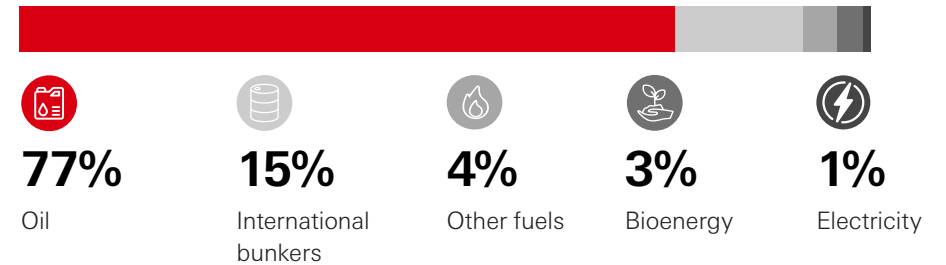
**Carbon capture** and storage technologies capture carbon waste during power generation (e.g. from fossil fuels) and reduces CO<sub>2</sub> emissions from reaching the atmosphere.


<sup>2</sup>IEA, HSBC


### 3. Transport


Transport uses oil and its derivatives, containing carbon as majority component, for 77% of its fuel consumption. Bunkers – the heavy, residual oil left over from refining processes – account for another 15%. Oil alone already makes up for 92% of total transport fuel, leaving electricity, bioenergy and others as minority alternatives (see Figure 1).

Figure 1: Transport fuels in 2019



- 

Technological advance and supportive policy for **automobiles** are catalysing energy transition. Electric vehicles (EV) are the clear leader to replace burning oil in combustion engines. New EV registrations saw record highs in 2020 (e.g. Germany at +263% and France at +202%), with the positive momentum continuing into 2021. Additionally, more than 350 EV models will be launched globally through to 2025.
- 

**Heavy goods vehicles** (HGVs) are responsible for 27% of GHGs in transport. Energy alternatives for HGVs include natural gas, battery-electric, hydrogen fuel cells and biofuels from sugar crops. Other large vehicles such as buses account for 4% of transport emissions. Government policies can support deployment of low-carbon buses, especially with subsidies to help overcome cost barriers.
- 

In 2017, **aviation** accounted for 12% of GHGs in transport. Growth in flying had earlier led to increased emissions, and while improving fuel efficiency was beneficial, it was insufficient to offset the outputs from air traffic demand. As a result, aviation emissions were still rising in absolute terms through to 2019.

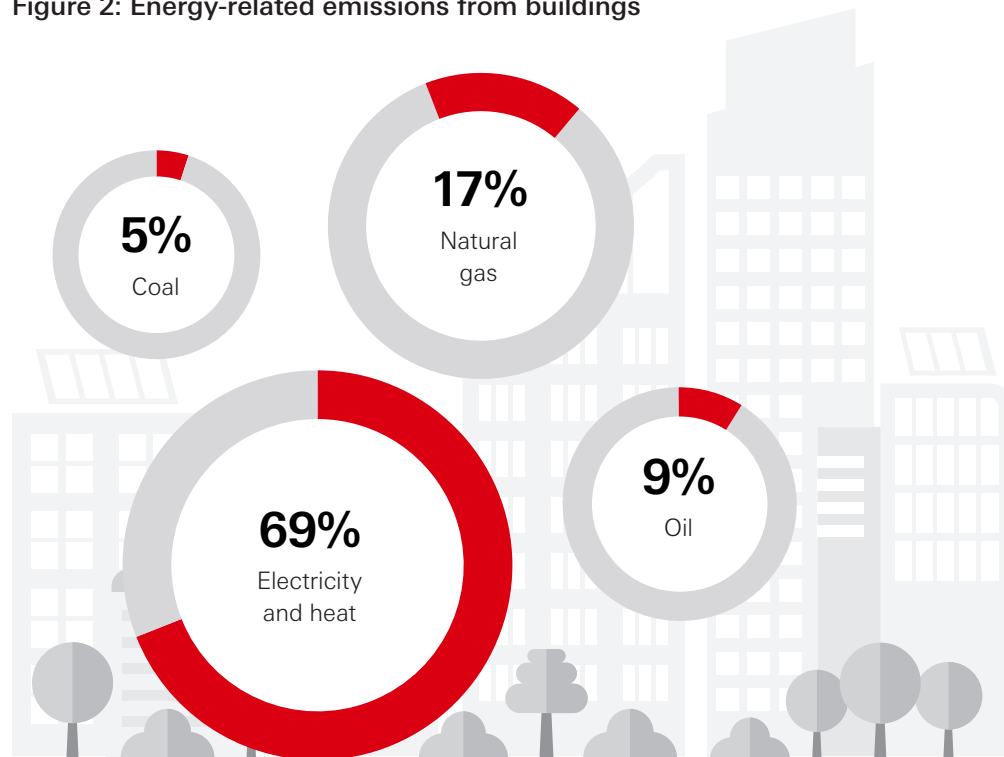


## 4. Buildings

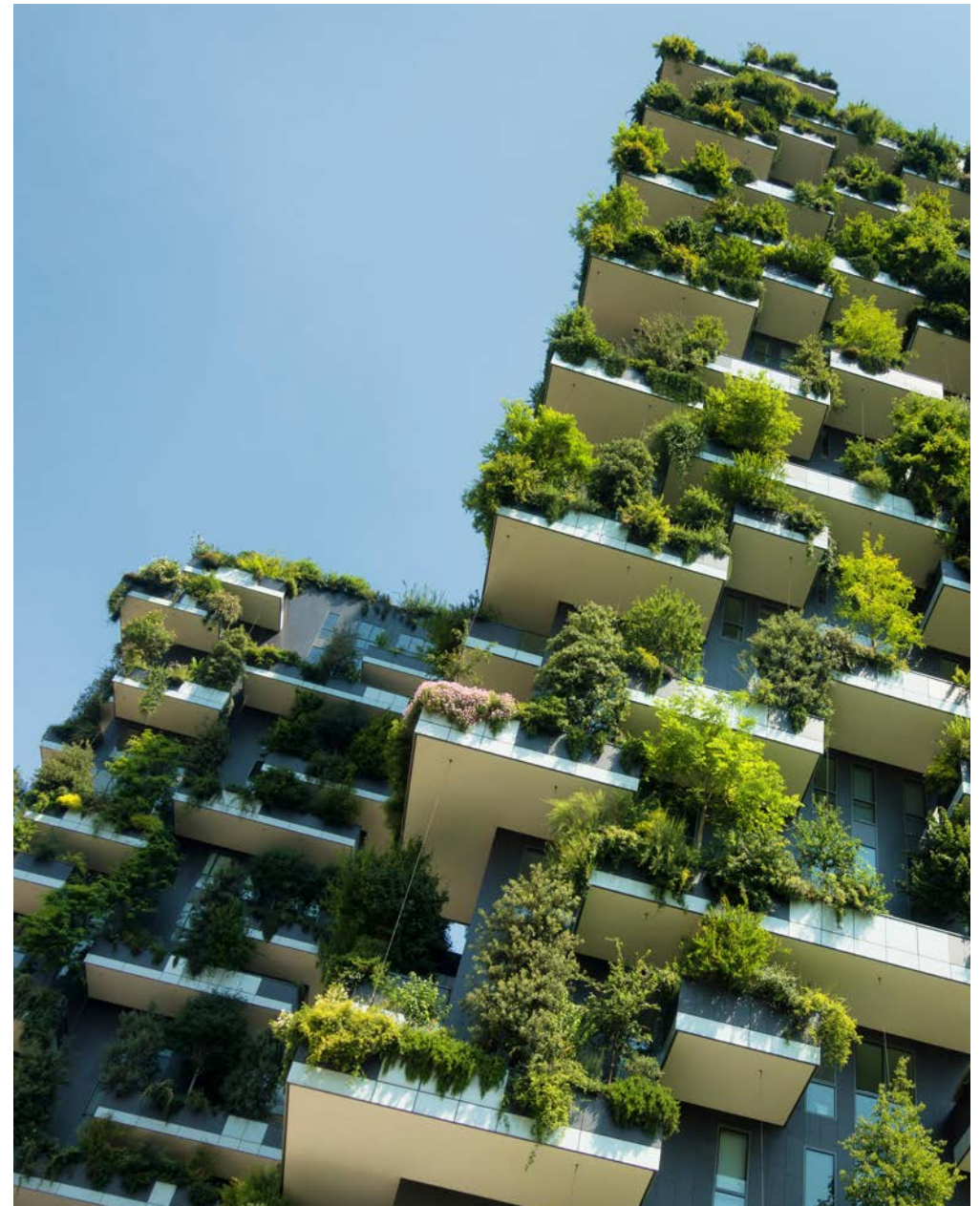
Buildings account for 30% of global primary energy consumption for heating/cooling, utilities, and appliances. The attributes to emissions are comprised of electricity and heat, natural gas, oil and coal (see Figure 2).

To achieve energy efficiency, measures can be introduced from the building's design and construction phase. Areas of opportunity include the building envelope (i.e. insulation, façade, roof, and glass), building materials, heating equipment and appliances. Environmental regulation has also made buildings more efficient globally, and we expect more to come as the sector is increasingly a focus in meeting Paris Agreement targets.

Figure 2: Energy-related emissions from buildings



Source: IEA, HSBC



## 5. Industrials

Industrial activities account for 21% of global emissions. This is a complex and diverse sector, covering metals and mining, oil & gas, cement, gases and chemicals. Multiple pathways are necessary for decarbonisation, with materials efficiency, recycling, electrification and hydrogen all playing a role.

Decarbonisation pathways are diverse – energy efficiency has been a larger focus so far, via higher levels of heat integration, updating equipment and utilities, smart process control and monitoring, and predictive maintenance. Some electrification may be underway, and we are yet to see build-out of carbon capture and clean hydrogen deployment in the sector.



**Mining** consumes energy use from burning fossil fuels – typically oil derivatives for machinery. Methane (CH<sub>4</sub>), a by-product of coal mining, is a highly potent greenhouse gas that is emitted into the atmosphere.



For **oil & gas**, emissions and energy transition are increasingly important. A large part of emissions happen in the consumption, majority via transport as well as for chemicals as feedstock. Some companies have made ambitions to cut carbon intensity in energy supply mix, or even become net carbon neutral.



**Chemicals** are a significant consumer of fossil fuels. Production of primary chemicals, transformed into products such as plastics and fertilisers, is energy intensive, accounting for nearly 67% of the sector's total energy consumption.

## 6. Conclusion

As the world shifts towards the ambitious targets of the Paris Agreement, technological innovation and energy efficiency deployed across major pathways can help reduce major sources of emissions. Investment in specific technologies can increase the rate at which emissions can descend towards net zero. While 2050 is only a generation away, many radical changes can take place in terms of politics, policies, economics and technological advances. Investors should take note of emerging developments aimed at lowering emissions, as they will play a key role in decarbonisation efforts and to limit global warming.

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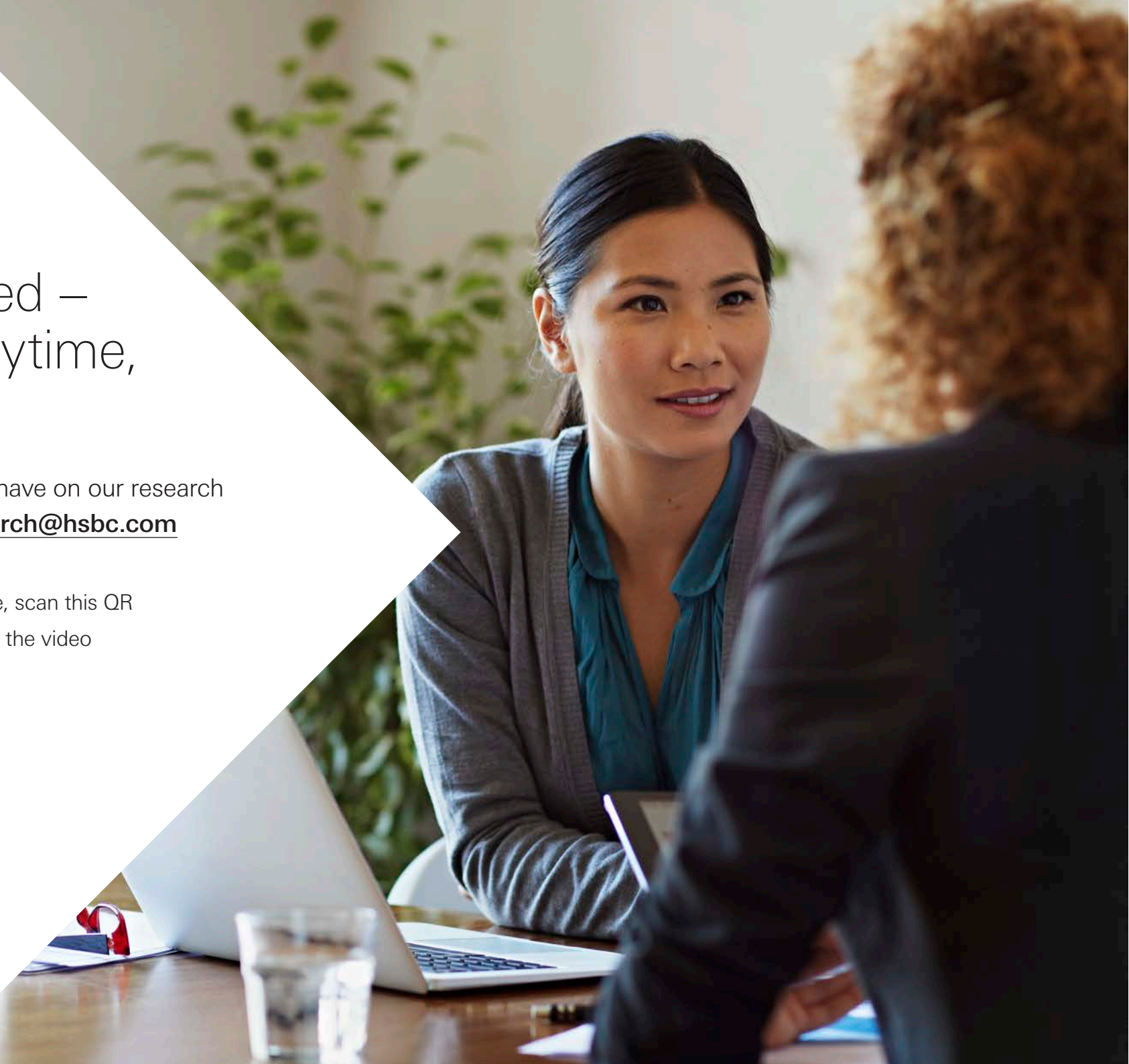
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