#WhyESGMatters | The Handbook | 3rd edition

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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 the slivers of progress from COP27, the importance of stakeholder actions to curb deforestation in the Amazon, and how the Food & Agriculture sector needs to use more environmentally-friendly production processes. These complement a range of other topics from how "green" hydrogen is set to play a more significant role to combat climate change to the ESG impacts of cyber crime. Choose your topic and expand your knowledge.

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Ask Research – your questions, our answers

Wai-Shin Chan Head, ESG Research introducing the HSBC Global Research #WhyESGMatters handbook

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COP27 – Slivers of progress

After two weeks of intense negotiations at this 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.

In this edition of #WhyESGMatters, 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: UNFCC, US Department of State, WMO, International Partners Group
[1] Called for by the World Meteorological Organisation, 7 November 2022
[2] Provided by the International Partners Group (co-led by the US, EU, Japan, Canada and the UK)
[3] To pre-arrange finance and political guidance foe vulnerable groups against climate events

1. COP27 – Slivers of progress

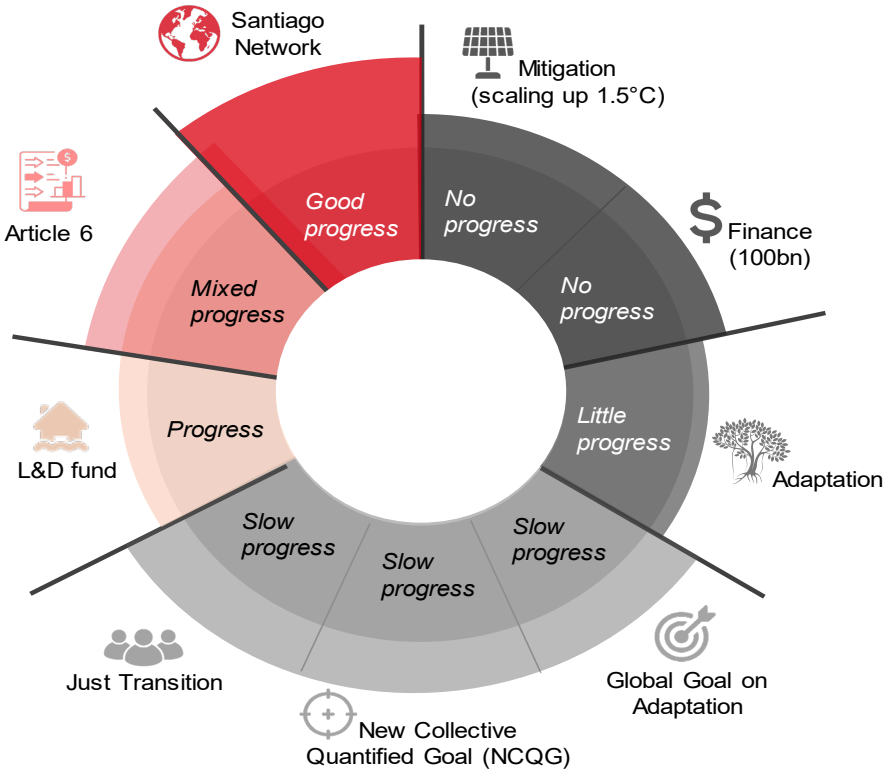
COP27 hosts Egypt were looking for "progress across the board" on all climate issues "in a balanced and equitable manner". Although there was some progress, we do not think it was balanced across the board, in our opinion it was more inconsistent progress (see Figure 1).

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 last 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 next year, 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.

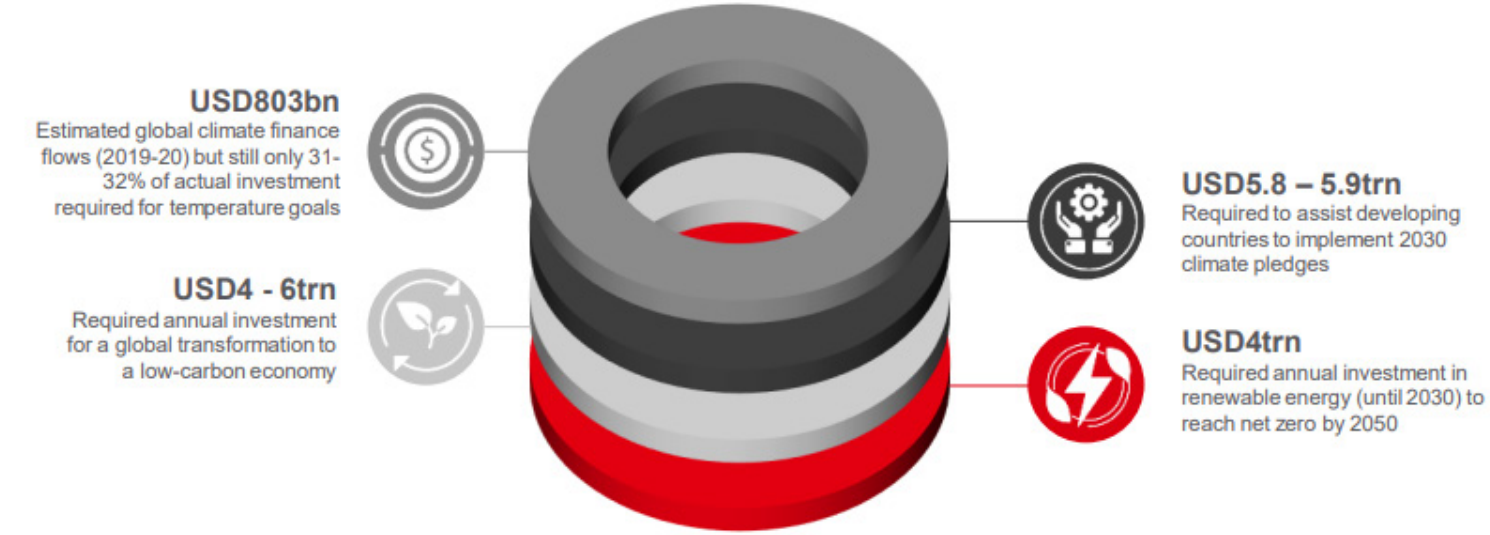
Other key issues

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.

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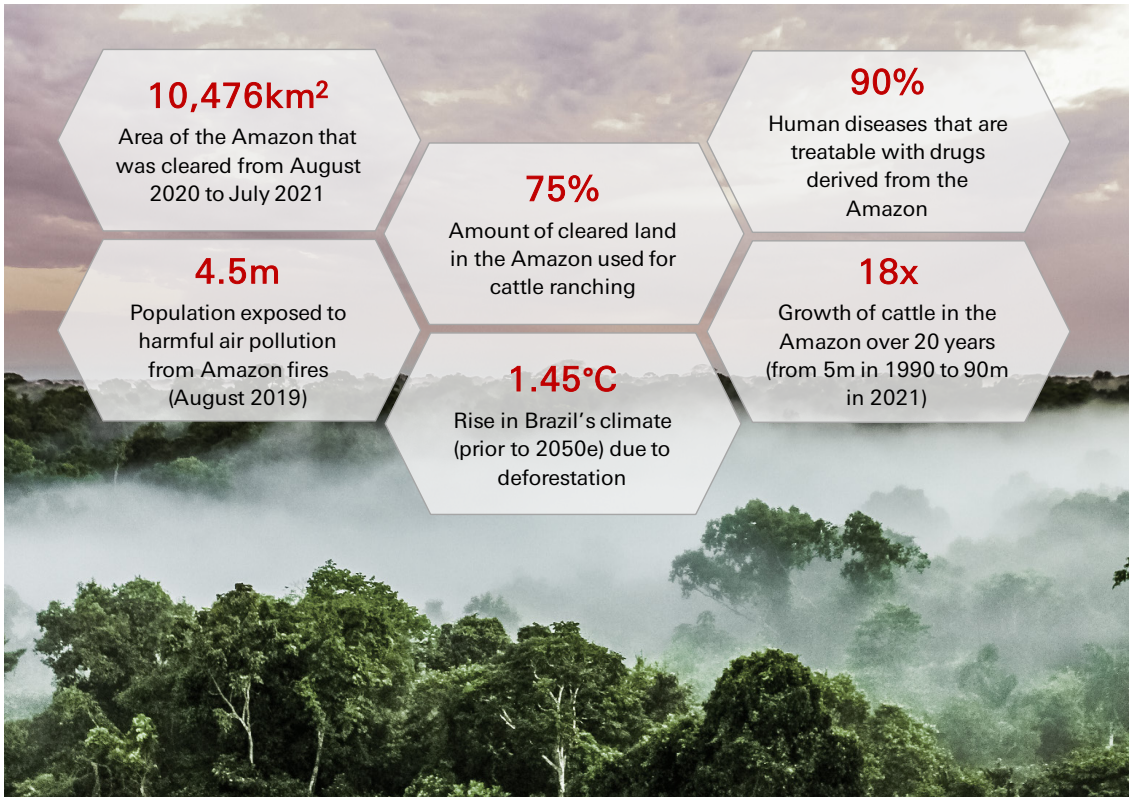
The deforestation crisis

The Amazon rainforest spans 6.9 million sq km on the South American continent, with the majority contained in Brazil.[1] 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.[2]

In this issue of #WhyESGMatters, 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), MapBiomas (2022), Nature (2021), The Guardian (2021), IPAM (2017), Human Rights Watch (2020), Rainforest Trust (2013), EIA (2019), ANA (2020), HSBC

[1] WWF, About the Amazon

[2] An area or ecosystem that absorbs more carbon dioxide (CO2) 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.[3] Towards to east lies the Cerrado region, a very rich tropical savannah and wetland that contains 5% of all biodiversity in the world.[4] Together, the Amazon and Cerrado natural biomes make up over 70% of Brazil's area.[5]

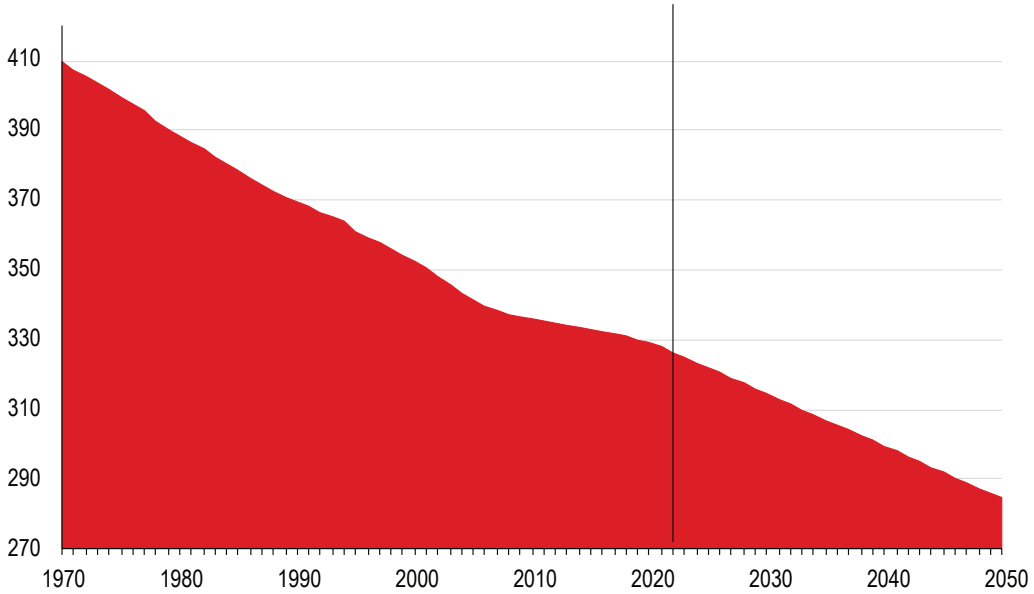
Severity of the issue

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.[6] Over 20% of the Amazon's original forest cover has been cleared, with cattle ranching occuping over 75% of the deforested areas.[7] This is consistent with the global trend where cattle ranching is responsible for more than one in every eight hectares of forests destroyed.[8,9]

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.[10]

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.[11,12]

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



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

[3] WWF, Inside the Amazon
[4] WWF, Cerrado
[5] 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
[6] Greenpeace, Slaughtering the Amazon, 9 June 2009
[7] Reuters, Indigenous leaders push new target to protect Amazon from deforestation, 5 September 2021
[8] WWF, Unsustainable cattle ranching
[9] Greenpeace, Amazon cattle footprint, 2010
[10] Mongabay, As its end looms, Cerrado tracker records 6-year deforestation high, 12 January 2022
[11] WWF, New study finds 94% of deforestation and habitat destruction in Brazil's Amazon and Cerrado could be illegal 17 May 2021
[12] 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

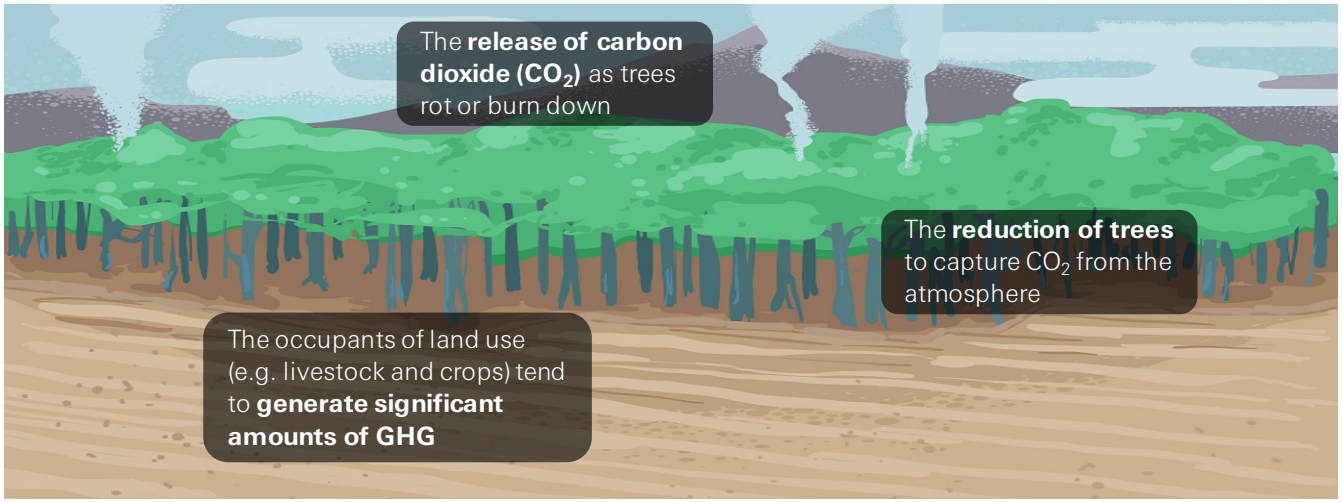
Brazil has become a top three global producer of sugar, soybean, corn, ethanol, wood pulp, cotton, fruit juice, coffee, and protein among other things.[13,14] The cattle herd has also grown to over 210 million heads in recent years and the agricultural sector now accounts for more than one fifth of Brazil's GDP.[15] 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.[16]

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.[17,18,19]

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.[20,21,22,23,24,25]



[13] Embrapa, Brazil is the world's fourth largest grain producer and top beef exporter, study shows, 01 June 2021
[14] Observatory of Economic Complexity, Brazil
[15] Brazilian Institute of Geography and Statistics; IBGE (2022)
[16] Mongabay, Brazil's key deforestation drivers: Pasture, cropland, land speculation, 19 March 2019
[17] The Guardian, Amazon rainforest now emitting more CO2 than it absorbs, 14 July 2021
[18] Chain Reaction Research, Cerrado deforestation disrupts water systems poses business risks for soy producers, 02 October 2018
[19] Landscape News, The Amazon rainforest is nearing its tipping point – but what does that mean?, 16 September 2021
[20] 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
[21] Lovejoy, TE., and Nobre, C., Amazon Tipping Point, Science advances, 21 February 2018
[22] Amigo, I., When will the Amazon hit a tipping point?, Nature, 25 February 2020
[23] WWF, Brazil Gets Tough to Stop Amazon Deforestation, 01 October 2008
[24] Reuters, Indigenous leaders push new target to protect Amazon from deforestation, 05 September 2021
[25] 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).[26] 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.[27] 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[28]
- **Blockchain-based solutions:** by leveraging on shared data that is stored cryptographically, users would rely on the voluntary supply of information from ranches

[26] Amazônia 2030, Brazilian Land Tenure Law Encourages Land Grabbing and Deforestation in the Amazon, 28 April 2021
[27] Stabile, M. et al., Solving Brazil's land use puzzle: Increasing production and slowing Amazon deforestation, Land Use Policy, 2020
[28] Visipec

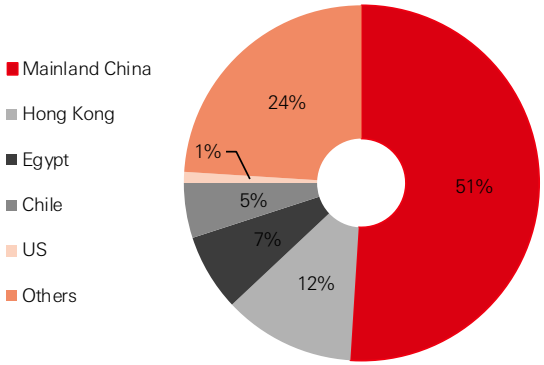
3. Driving change

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

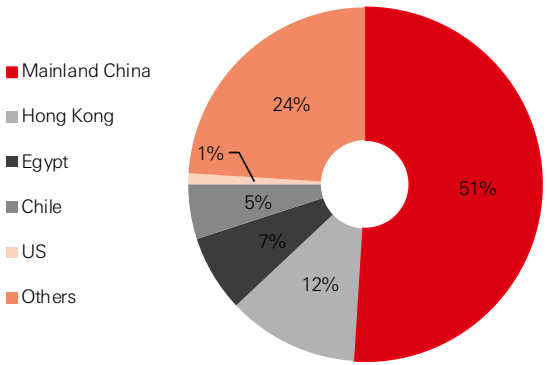
Mainland China, Hong Kong and the US today are the world's top three importers of beef (Figure 1), and are the beneficiaries of 64% of Brazilian beef exports (Figure 2). Given these volumes, any beef sourcing policy adopted by these countries that would require Brazil beef exporters to ensure full cattle traceability from birth to slaughter – similar to the European Union – would be instrumental.

Figure 2: Mainland China, Hong Kong and the US are the top 3 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.[29]

[29] O Globo Politica, 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.

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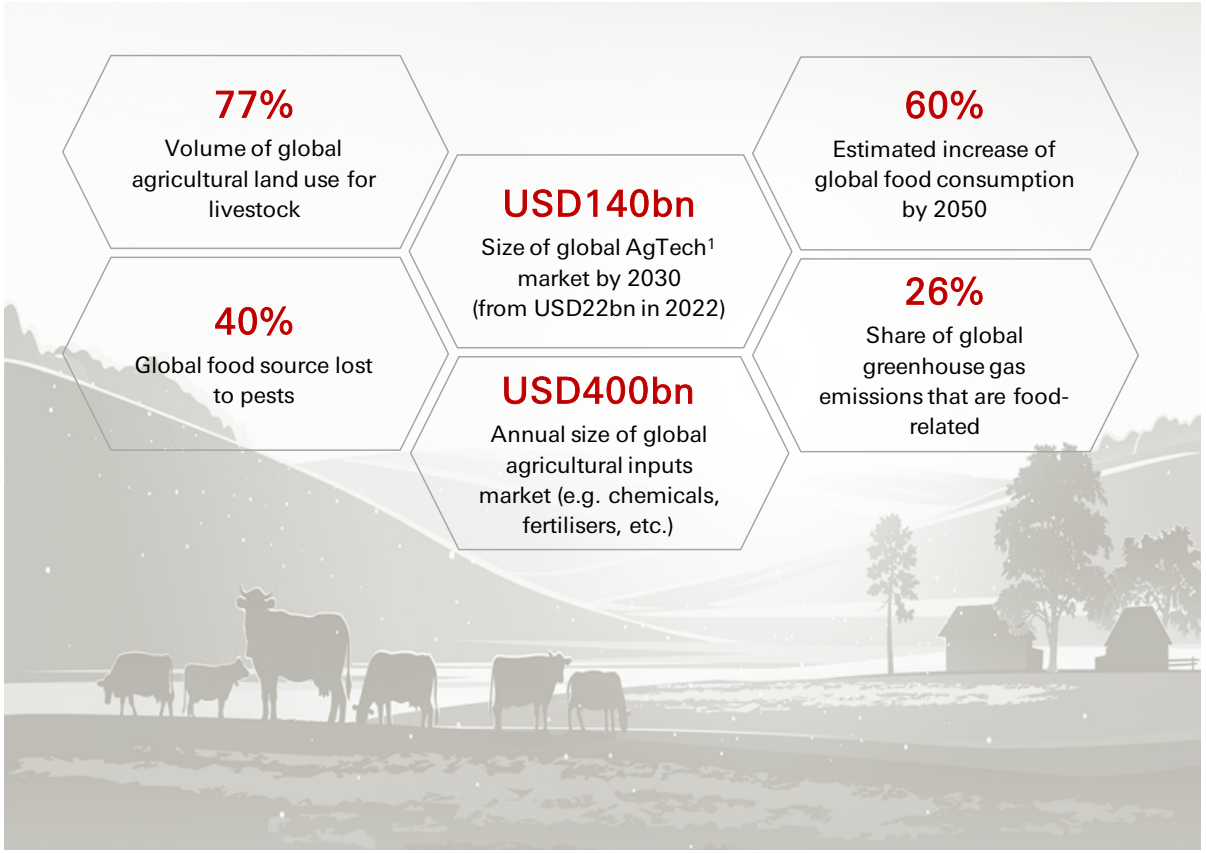
Sustaining global food security

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.

In this issue of #WhyESGMatters, 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?



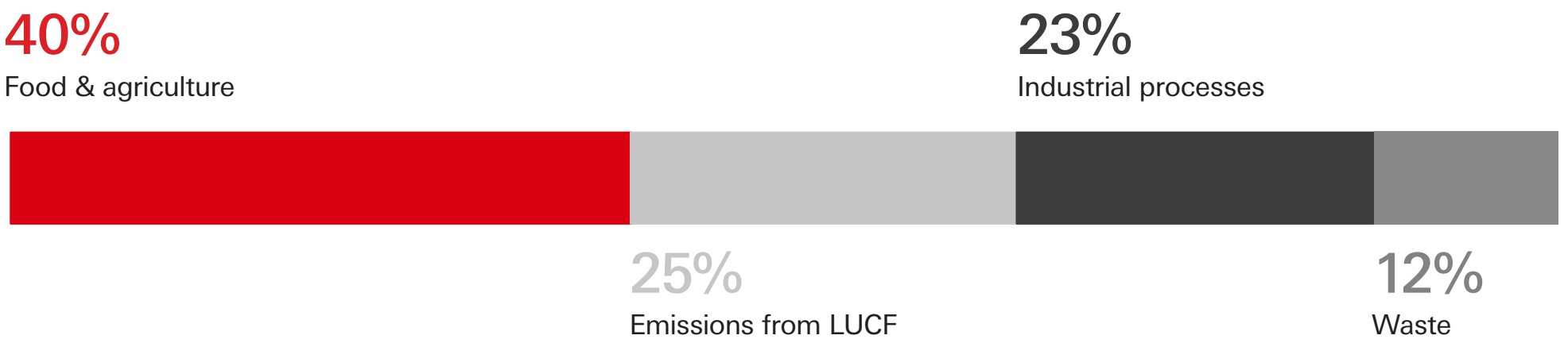
Source: Food & Agriculture Organisation, Finistere Venutres, HSBC

[1] 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 Caron 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%).

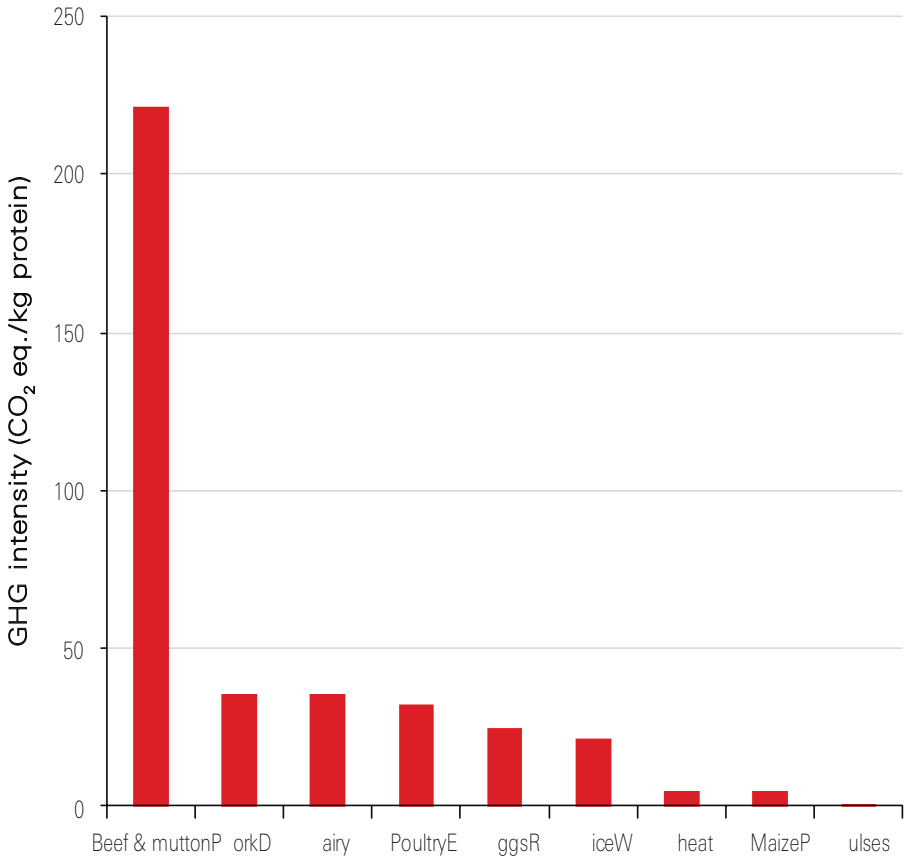
2. Rising demand for global resource-intensive food

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.[2]

[2] 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[3], 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.

[3] 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.

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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, 10% of mutual funds in EUR now have a form of explicit sustainability objective, up from just over 6% two years ago.

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 green and social projects
- Not secured against projects

Social bonds

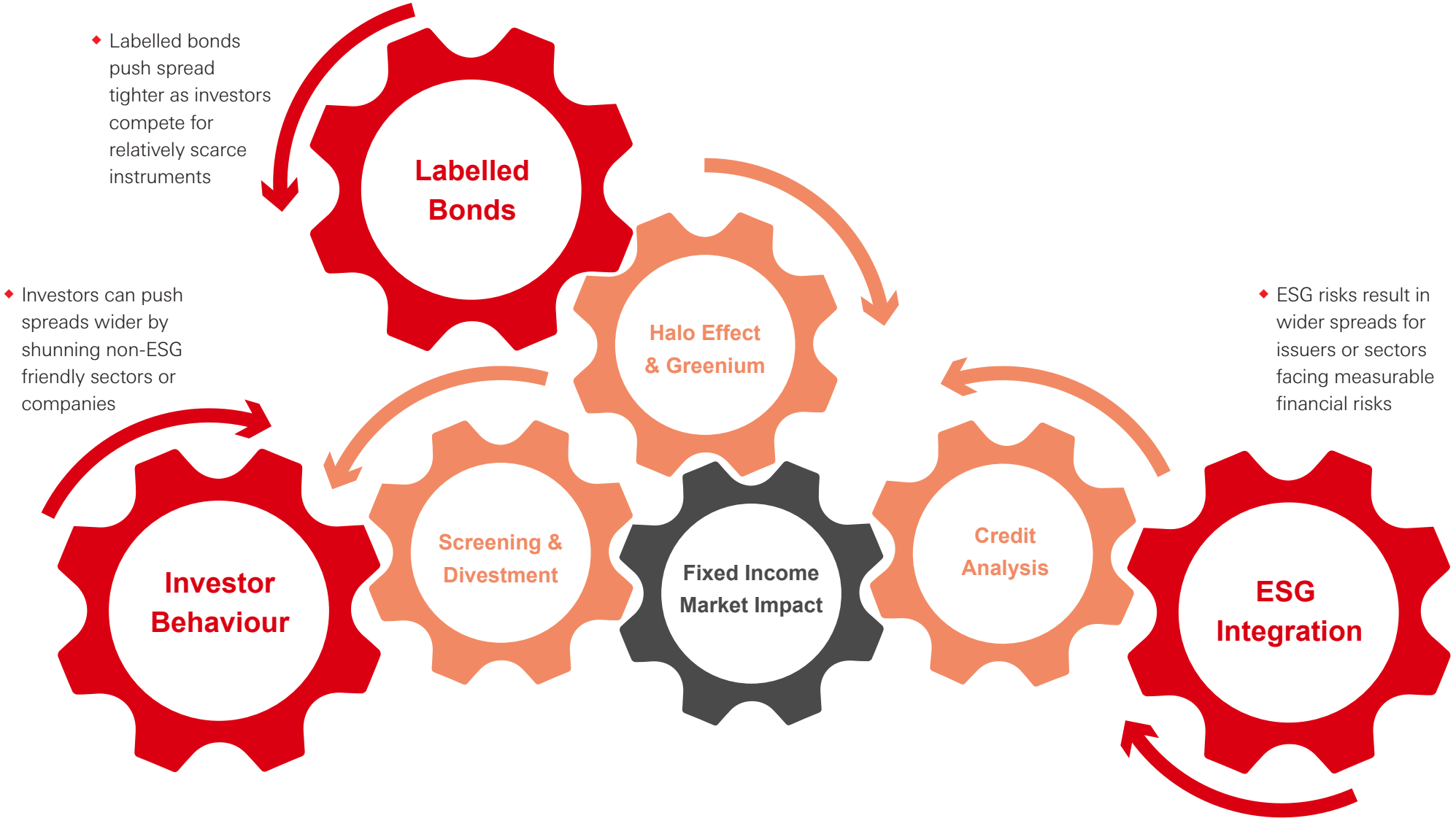
- Fund social projects
- Not secured against projects

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

- Labelled bonds push spread tighter as investors compete for relatively scarce instruments



- Investors can push spreads wider by shunning non-ESG friendly sectors or companies
- ESG risks result in wider spreads for issuers or sectors facing measurable financial risks

Source: HSBC

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
Description	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
Aim	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
Key features	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
Process	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?
Performance	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?
Factors	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?
Financial Products		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?	
Measurement	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?
Marketing	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

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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.

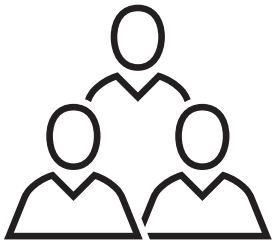
We discuss the potential impacts of climate change on cities and how they should respond. We also highlight some of the financial instruments that will help fund mitigation and adaptation efforts in urban areas.

Did you know?

834
Number of cities that had a 100% renewable energy target in 2020

USD208bn
Annual investment in public transport needed to meet emissions reduction targets across100 cities globally

78%
Percentage of the world's energy consumed by cities



USD1trn
Estimated global economic costs from rising seas and inland flooding by mid-century

1.6bn
Estimated number of people to be exposed to extremely high temperatures regularly by 2050

Over 800m
Estimated number of people at risk from impacts of rising seas and storm surges

Source: UN-Habitat, Global report on human settlements 2011, OECD, Sustainable Buildings Market Study 2019, Ramboll Buildings, The future we don't want, C40 cities, February 2018.

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[1]. 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[2].

1 The future we don't want, C40 cities, February 2018.
2 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

Source: Nicholls et al (2007), OECD, Paris The rank is based on the amount of assets exposed in future.

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[3]". 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.

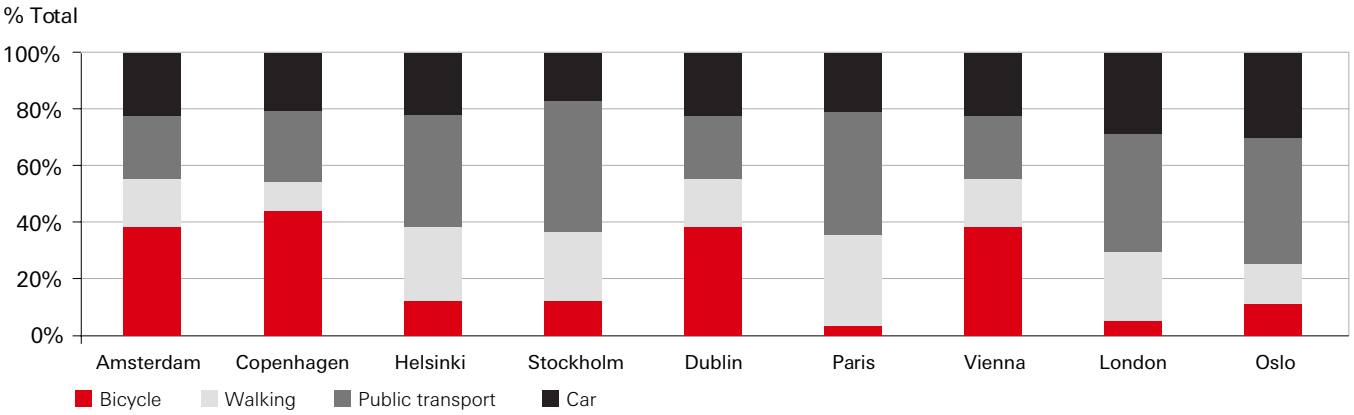
3. C40.org

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



Source: Eurostat

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. ◆ environmental and

Types of labelled bonds

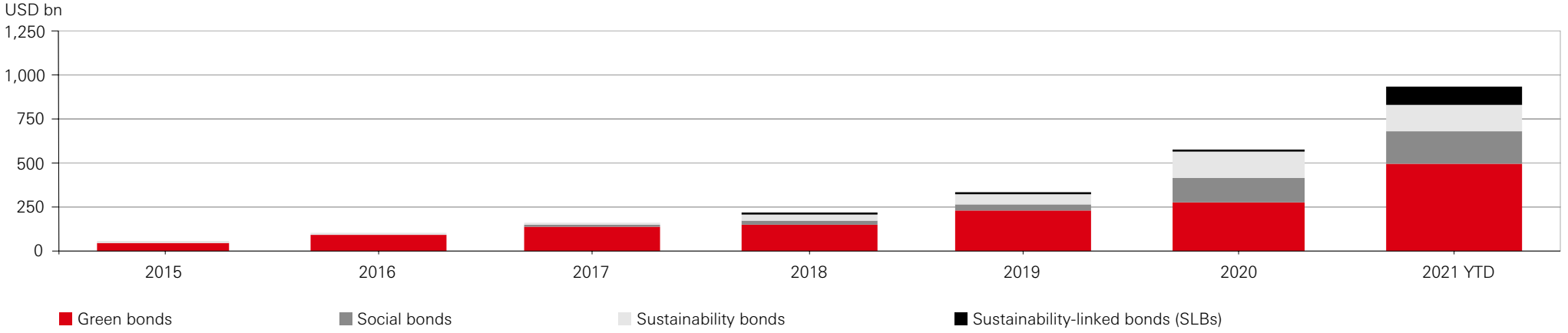
Green bonds fund but are not secured against designated environmental projects

Sustainability bonds fund a mix of environmental and social projects

Social bonds fund but are not secured against designated social projects

Sustainability-linked bonds (SLBs) do not fund projects, instead the coupon or principal steps up if the issuer fails to meet pre-agreed environmental or social targets

Figure 3: Global labelled bond markets



Source: HSBC calculations, Dealogic, Bloomberg (as of 26 November 2021)

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[1].

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"[2].

1 https://www.ipcc.ch/report/ar6/wg1/

2 Ibid

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

Figure 2: Outline of the SPM

1 **The Current State of the Climate**	• Comprehensive view of the climate system and its changes • Human influence on climate variables, including climate and weather extremes
2 **Possible Climate Futures**	• 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
3 **Climate Information for Risk Assessment and Regional Adaption**	• Climate response and possible outcome at global, regional and local scales
4 **Limiting Future Climate Change**	• Possible future control to assess the affect of projected climate and air pollution

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_2 can be removed and stored (e.g. in the form of a carbon sink), its effects are mixed. **CO_2 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_2 emissions while keeping within the limits of temperature increase. Historic CO_2 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_2 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.

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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

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

Source: EU, HSBC

[2] 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 CO2 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 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.

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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

20-30%

Yearly average increase in cybersecurity insurance premiums

USD20bn

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

7.7%

Forecasted annual growth in cybersecurity spend from 2020-2026

6x

Increase in losses from cyber crimes in 2020

GBP17.5m

(or 4% of company turnover)

Maximum fine under the UK's Data Protection Act 2018

Source: Cybersecurity Ventures, 2020, Cybersecurity intelligence, Beazley, 16 Dec 2020, Standard & Poor's, Munich Re, Allianz, DPA Piper

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
- Phishing - fake communication
- Denial-of-service attacks - access prevention
- 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

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

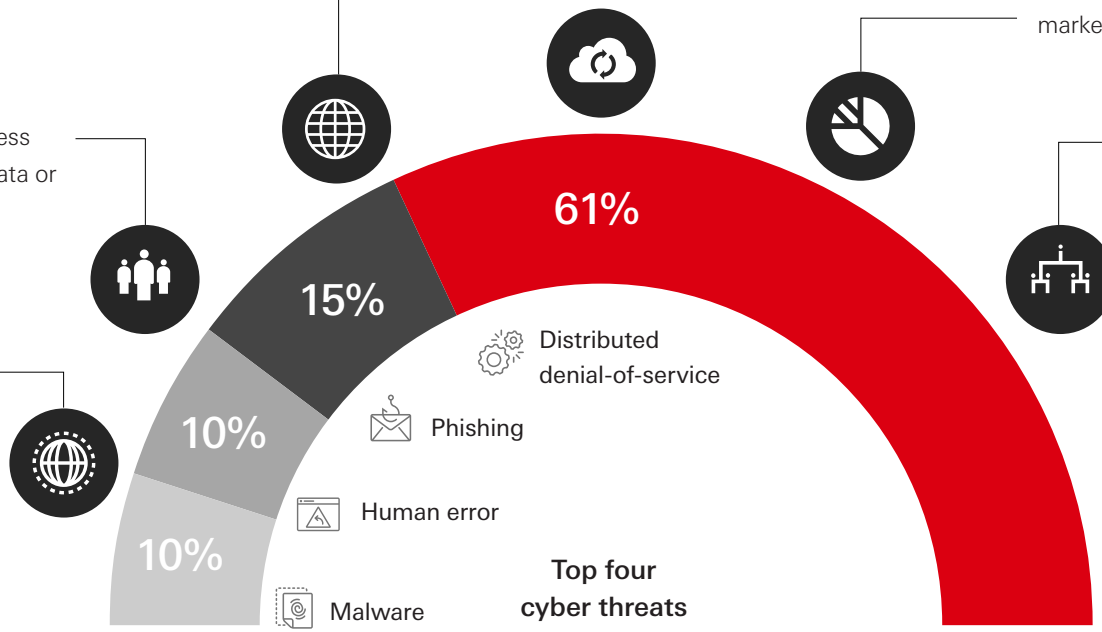
Environment - threats of cyber attacks pose a significant operational challenge for utility companies, rather than data breaches

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

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

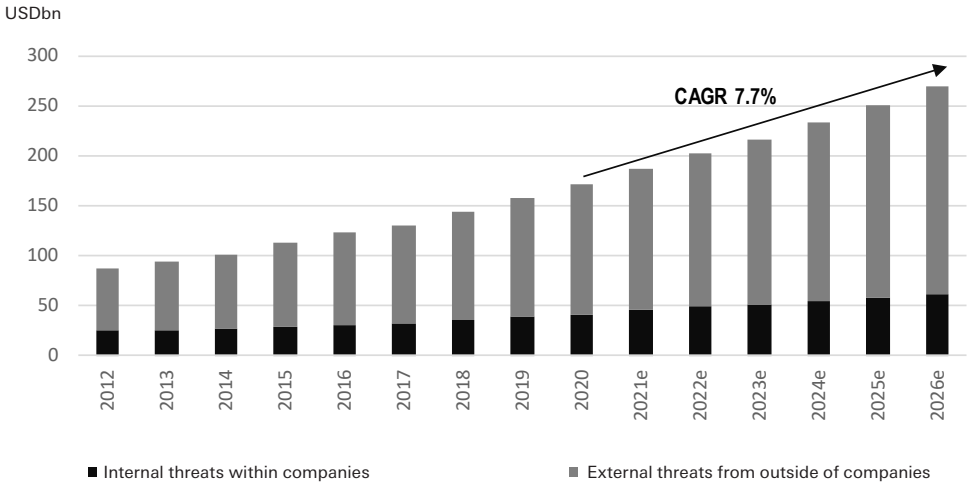
Governments - become more efficient and offer enhanced digital services to continue to strengthen security



Source: SBC, Comparitech, Cybersecurity Ventures, Verizon, Munich Re

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 pandemic1

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[2]

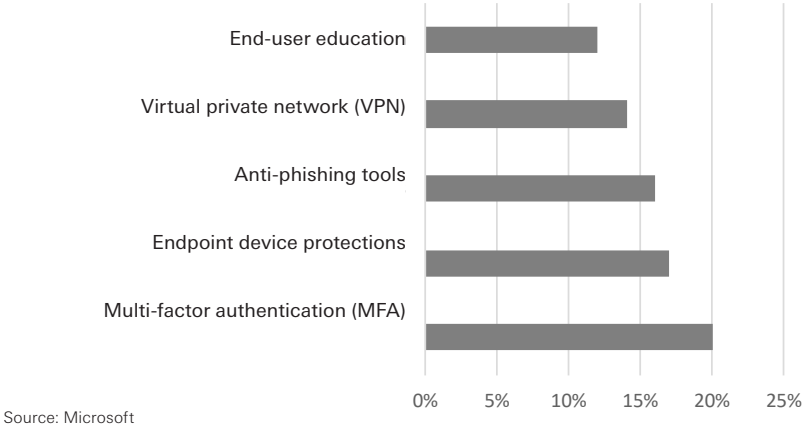
1. Bitdefender
2. Investors Chronicle analysis, Information Commissioner's Office

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[3].

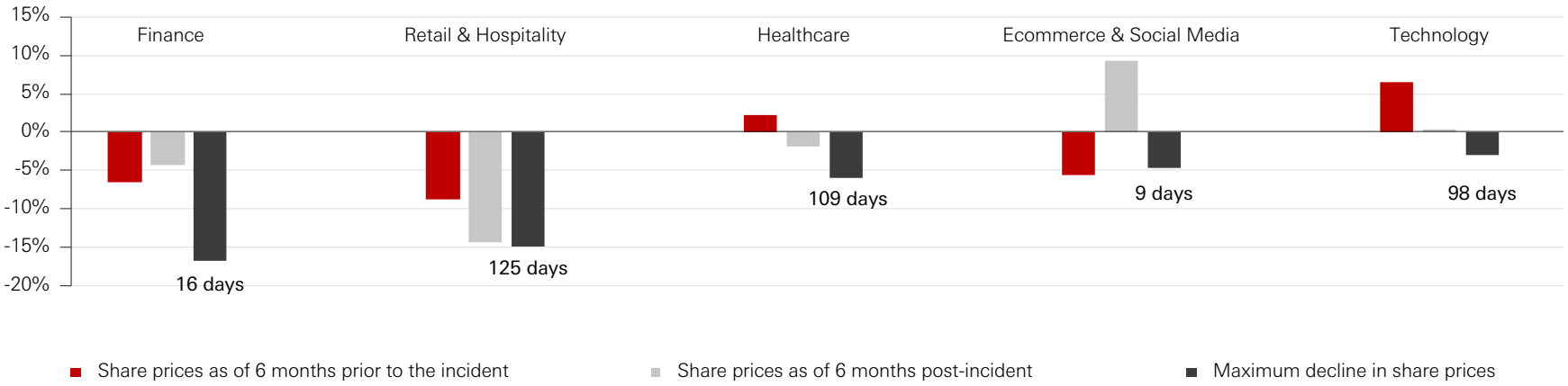
Less economically-developed regions such as Africa are also particularly vulnerable because they lack cybersecurity infrastructure and knowledge. Cyber crime is claimed to have cost the continent USD3.5bn in 2017, with 96% of incidents unreported or unsolved[4].

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[5], with the average cost estimated at nearly USD4 million per breach[6].

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 2021-267. 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**

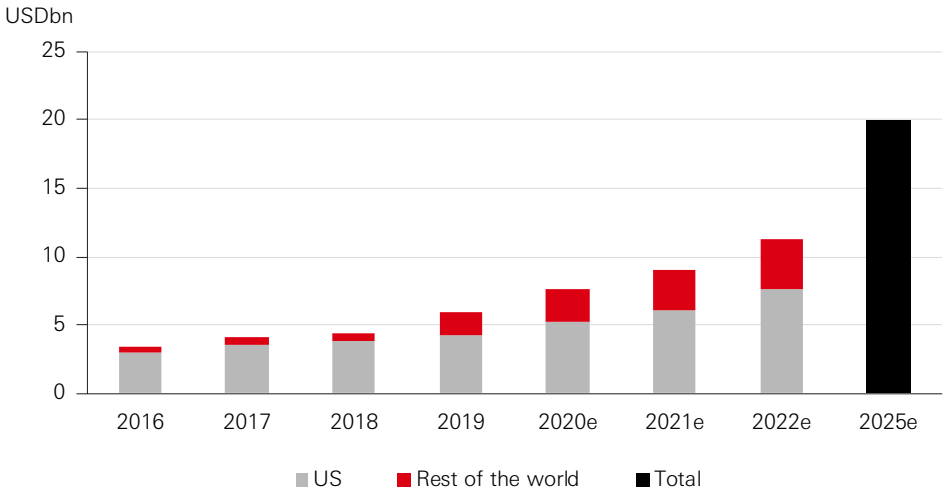
7. Managed Security Services Market - Growth, Trends, COVID-19 Impact, and Forecasts (2021 - 2026), Mordor Intelligence

Cyber insurance

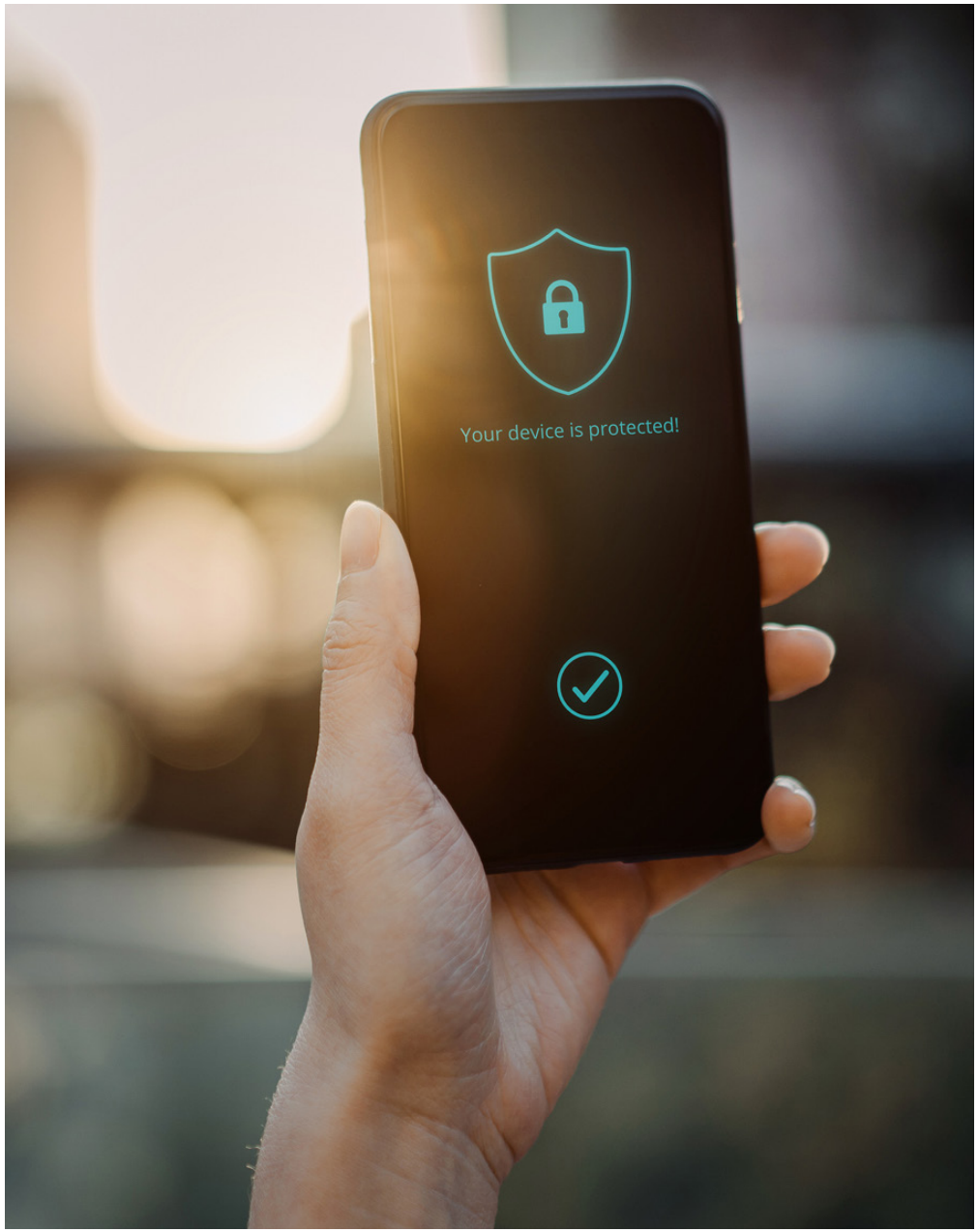
Cyber insurance is one of the few true growth areas within the insurance industry. As the cyber ecosystem grows, the need for insurance as a risk management tool naturally increases. In the US (the largest cyber market) cyber premiums are now estimated at USD2.26bn, while the overall cyber insurance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

However, this market is growing rapidly. One Fintech publication[8] 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



8. Finaria.it

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.

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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.

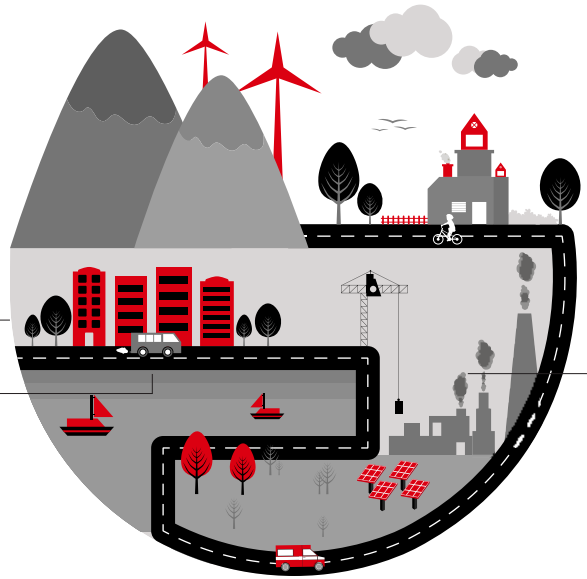
In this issue of #WhyESGMatters, We look at the catalysts that drive radical decarbonisation. We explore how technological innovation and energy efficiency can reduce major sources of emissions across four sectors: power generation, transport, buildings and industrials. Investors can regard these as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

Did you know?

2035
The year by when the US pledges to have zero-carbon power generation

34x
Global Warming Potential[1] of methane compared to carbon dioxide (over 100 years)

30%
Percentage of total primary energy used by buildings



64%
Percentage of coal consumed through electricity generation

92%
Percentage of oil used by the transport sector in its feedstock

50
Gigatonnes of CO2 equivalent that reach the atmosphere annually

Source: International Energy Agency (IEA), The World Resources Institute, HSBC
[1] 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

Source: UNEP, HSBC

2. Power generation

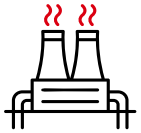
Power generation is the highest emitting sector – at 26.2% of total GHGs and within that, 35.4% of CO2 emissions. This sector has also received the most attention in driving decarbonisation, with increasingly cost-efficient, scalable alternatives and emerging technologies to fossil fuel combustion.

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).

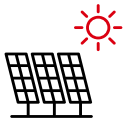
Hydroelectric plants use water and gravity to produce power. This energy source is widely used in Brazil, China and the U.S.

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.[2]



Geothermal power uses subterraneous energy that heats water and spins turbines.

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.



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.

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.

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.

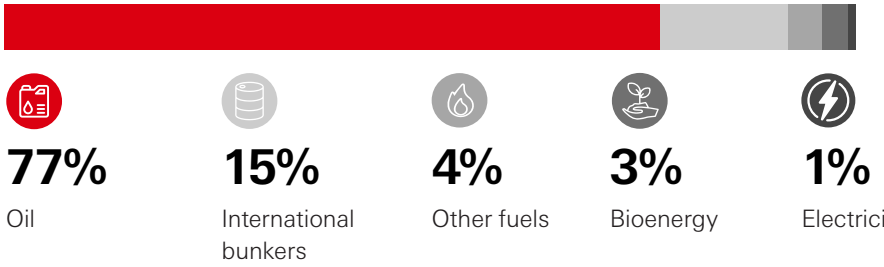
Carbon capture and storage technologies capture carbon waste during power generation (e.g. from fossil fuels) and reduces CO_2 emissions from reaching the atmosphere.

[2] 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).

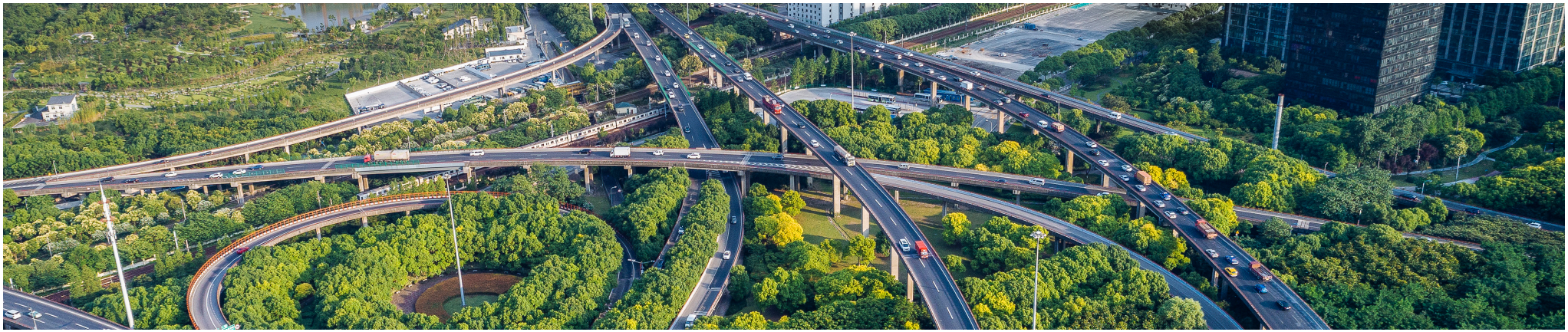
Figure 1: Transport fuels in 2019



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.

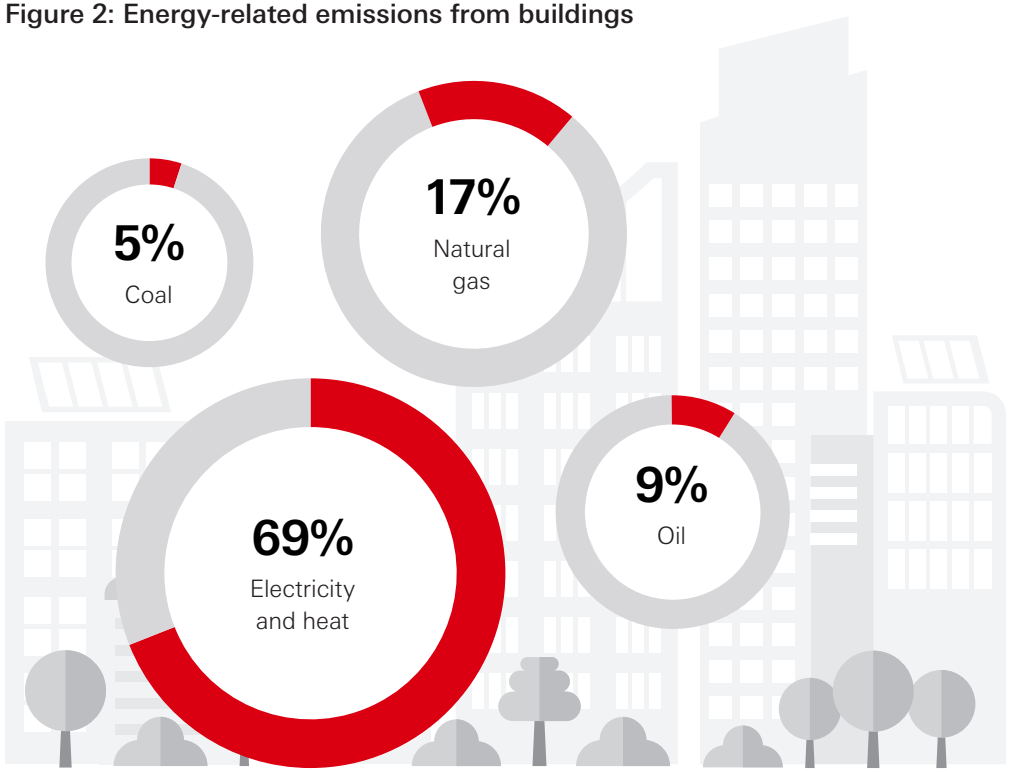


4. Buildings

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_4), 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 is 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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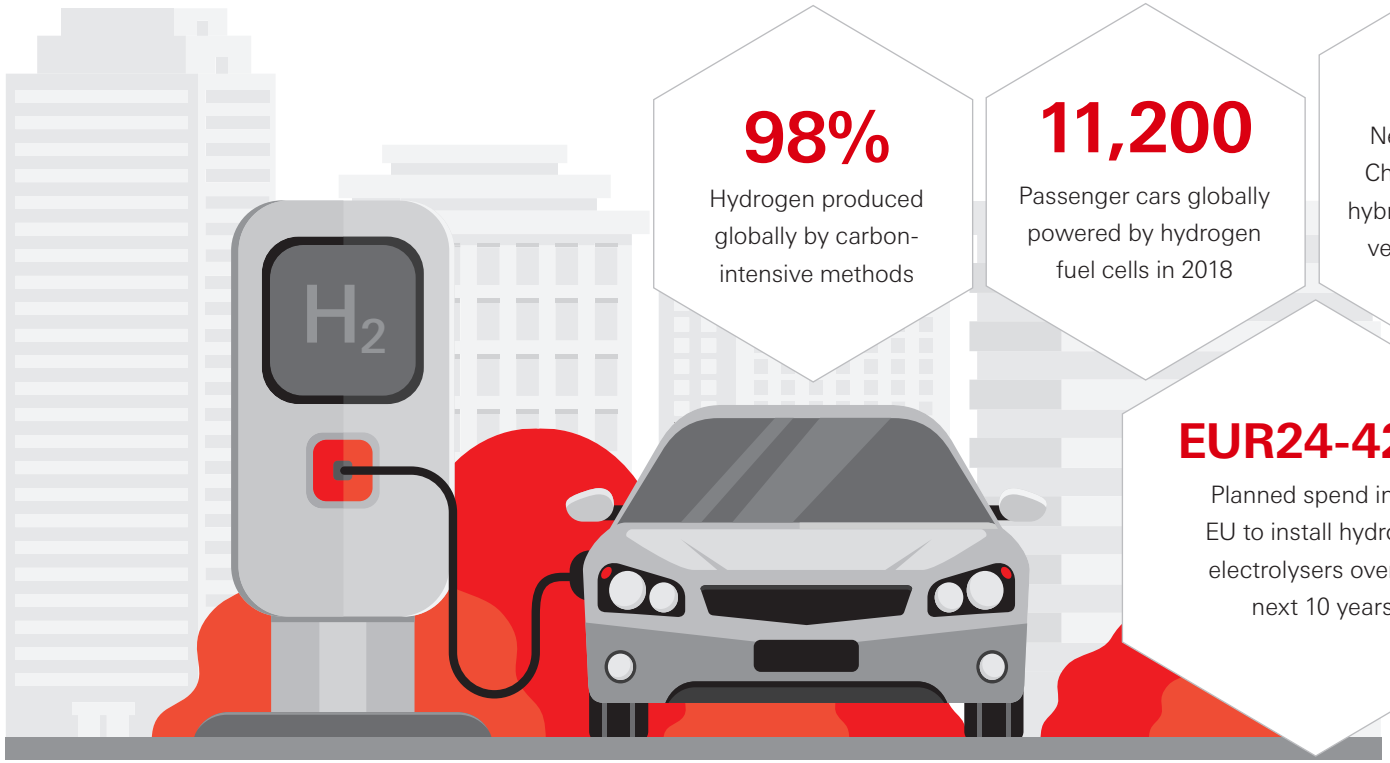
The rise of 'green' hydrogen

Hydrogen is set to play a more significant role as efforts to combat climate change becomes more urgent. It is abundant as an element and has great potential as a zero-emission fuel. In particular, 'green' hydrogen, a pure form of hydrogen produced via renewable energy sources, emits no carbon dioxide when converted into electricity.

In this issue of #WhyESGMatters, We look at how increased demand for hydrogen use across sectors, declining renewable energy costs, and favourable government policies are all providing support for the growth prospects of 'green' hydrogen. We explore how these advancements are elevating the profile of hydrogen in consumers' everyday life.

Did you know?



98%
Hydrogen produced globally by carbon-intensive methods

11,200
Passenger cars globally powered by hydrogen fuel cells in 2018

20%
New car sales expected in China from electric, plug-in hybrid and hydrogen-powered vehicles (up from 5% now)

18%
World energy demand forecast to come from hydrogen by 2050

EUR24-42bn
Planned spend in the EU to install hydrogen electrolysers over the next 10 years

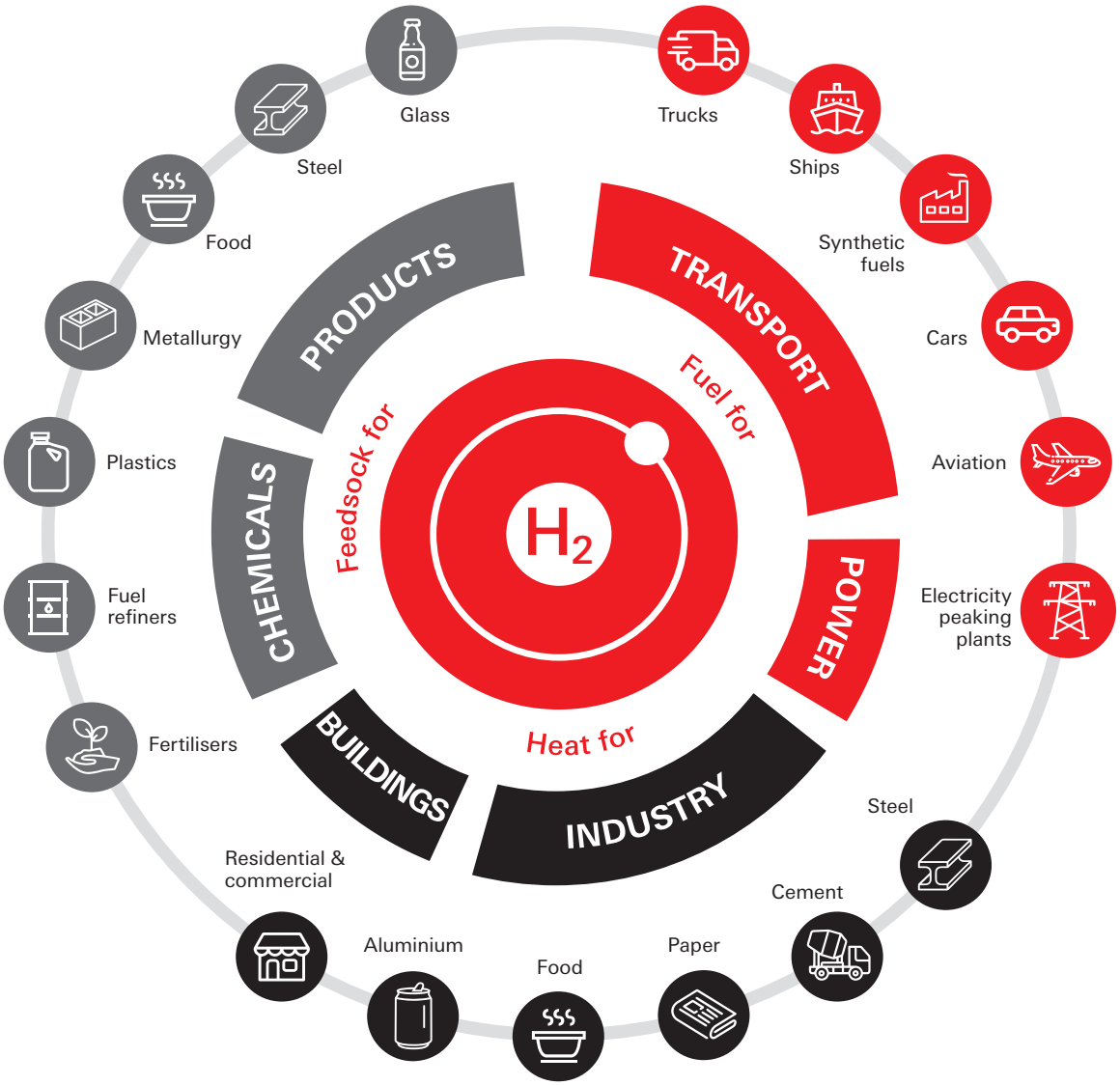
6.4%
Annual growth forecast for hydrogen demand through 2050

Source: EU Hydrogen Strategy, Hydrogen Council, The State Council of the PRC, HSBC estimates

1. Hydrogen's role in energy transition

Hydrogen is a versatile, non-toxic and lightweight gas that can be stored, transported and converted in clean power. More importantly, it has the potential to decarbonise a wide range of sectors. We believe the key to hydrogen's success will most likely be tied to its adoption beyond the power sector in feedstock for chemicals and end products, fuel for transport, and heat for buildings and heavy industries (see Chart 1).

Chart 1: A clean-green economy: Hydrogen can feed into a range of applications if produced on a large scale



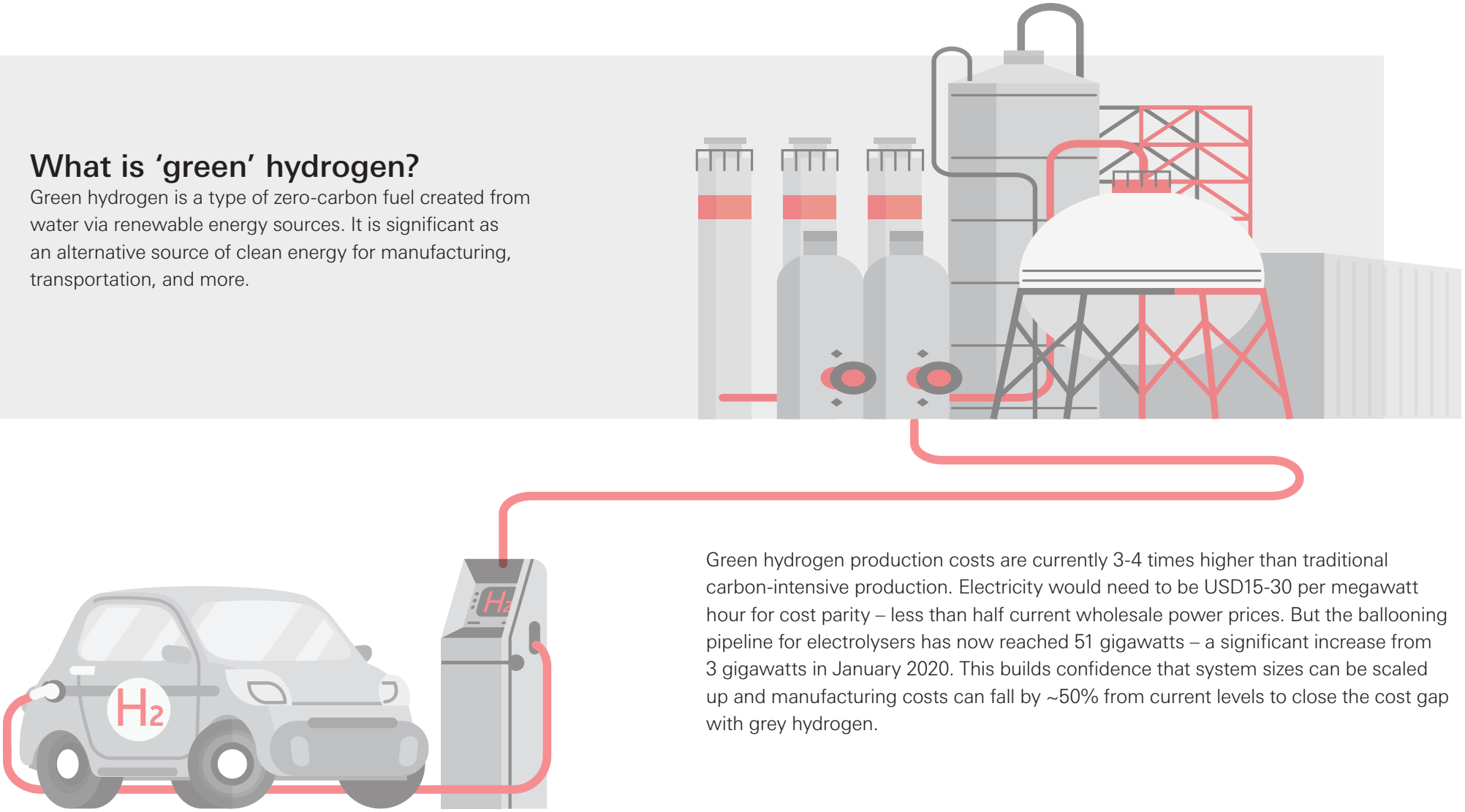
Source: BNEF, Element Energy, HSBC

Hydrogen: from grey to green

Hydrogen's potential can only be realised if its production first becomes carbon-free. Approximately 98% of pure hydrogen produced globally today is generated via carbon-intensive methods, using a natural gas or coal feedstock (so called 'grey' hydrogen). The remaining 2% of global hydrogen is produced via electrolysis, a chemical reaction that cracks water into its constituent parts: hydrogen and oxygen. If the electric current is powered by a renewable energy source, e.g. solar or wind, the end result is clean or 'green' hydrogen.

What is 'green' hydrogen?

Green hydrogen is a type of zero-carbon fuel created from water via renewable energy sources. It is significant as an alternative source of clean energy for manufacturing, transportation, and more.



Green hydrogen production costs are currently 3-4 times higher than traditional carbon-intensive production. Electricity would need to be USD15-30 per megawatt hour for cost parity – less than half current wholesale power prices. But the ballooning pipeline for electrolysers has now reached 51 gigawatts – a significant increase from 3 gigawatts in January 2020. This builds confidence that system sizes can be scaled up and manufacturing costs can fall by ~50% from current levels to close the cost gap with grey hydrogen.

2. The rising demand for hydrogen

The Hydrogen Council, a global advisory body to foster long-term clean energy transition, expects global hydrogen demand to reach 546 million tonnes by 2050. This is up from 70 million tonnes today with a 6.4% annual growth rate. We expect incremental demand for green hydrogen to stem from a variety of sectors, which could pose investment potential.

Industrials

Hydrogen can be applied as a raw material for industrial usage. Around 52% of demand comes from the oil refining sector where it is used for desulphurisation, or the removal of harmful sulfur compounds that could be released into the environment. This reinforces hydrogen's role as a critical component of 'clean fuels'. Another 42% of demand is for the production of ammonia, a basic agricultural fertiliser, and other chemicals. Hydrogen use in the chemicals sector should expand while steelmakers and other industries are set to become new users.

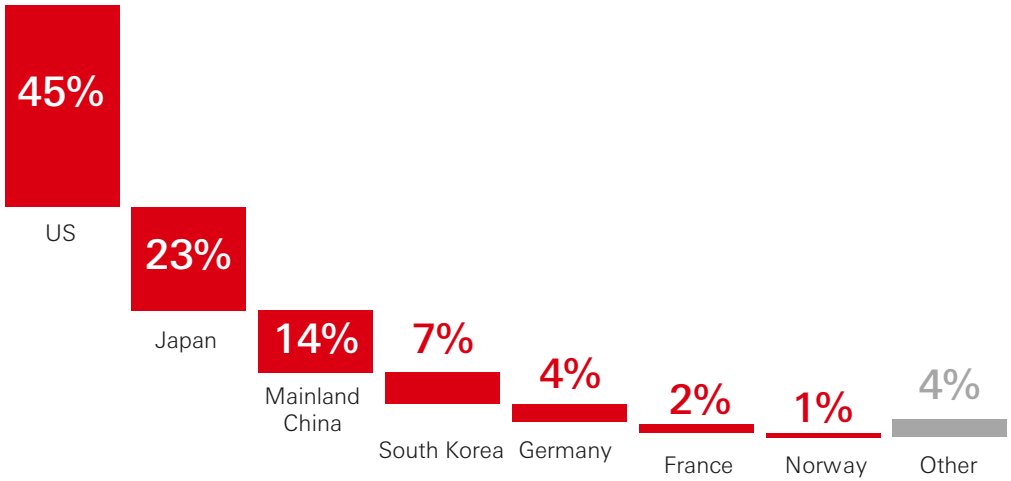
Utilities

Utility companies are considering green hydrogen as a clean alternative for natural gas as coal usage falls. Hydrogen can be blended into the existing grid so households don't need to upgrade appliances, which avoids the potential for any major structural transformation. It can also be injected into existing gas distribution to dilute the overall carbon footprint by up to 15%, with limited infrastructure investment needs.

Transport: Passenger cars

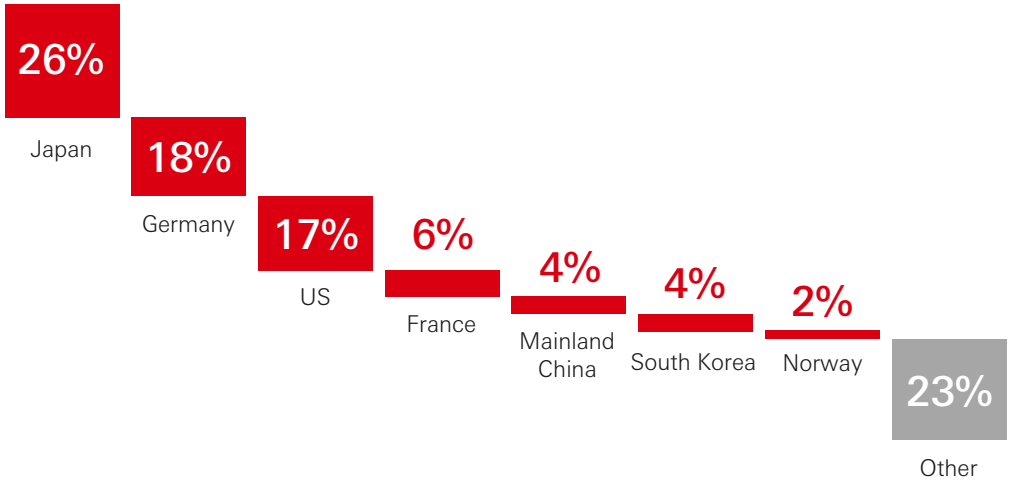
Hydrogen offers an alternative to battery-powered electric vehicles. A fuel cell and an on-board compressed hydrogen tank provide the power. But, to date, most electric-car makers have chosen battery power, with hydrogen part of a longer-term strategy. Only Toyota, Hyundai and Honda have commercial hydrogen-powered fuel cell electric vehicles in the passenger vehicle market, although Mercedes-Benz recently began leasing plug-in hybrid electric cars with a fuel cell. At the end of 2018 there were only 11,200 fuel cell passenger cars, compared to 5.1 million battery electric vehicles. Refer to geographical breakdowns in Charts 2 and 3.

Chart 2: Fuel cell passenger car stock breakdown by country, 2018



Source: IEA, HSBC

Chart 3: Hydrogen refuelling infrastructure breakdown by country, 2018

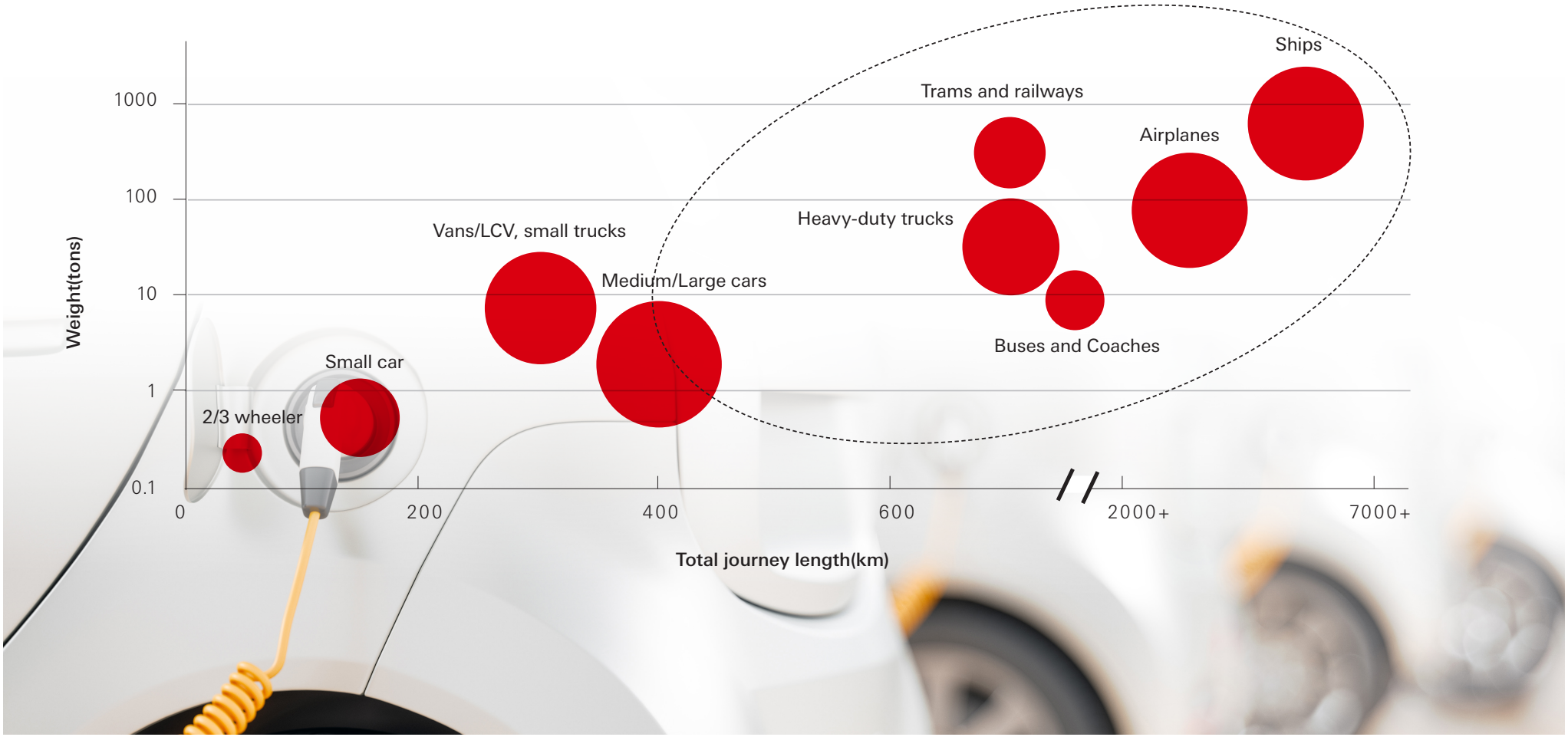


Source: IEA, HSBC

Transport: Heavy-duty vehicles

The promise of hydrogen in heavy-duty transport segments is rapidly developing. Its high energy density and shorter refueling times make it more attractive than batteries for long-distance transport (see Chart 4). In April 2020, Daimler and Volvo announced a EUR1.2bn joint venture to develop and produce fuel cell systems for trucks, buses and coaches, which we believe is the most significant development thus far towards commercialising hydrogen for heavy-duty commercial vehicles. Hydrogen buses and trucks are also gaining traction in China – where they account for over 95% of hydrogen vehicles.

Chart 4: Hydrogen fuel cells more suitable for heavy transport applications (trucks / trains / ships / airplanes etc.)



Source: FCH hydrogen roadmap Europe

3. Policy support for green hydrogen

We believe policy support is essential to driving investments in green hydrogen. Support has historically been strong in Asian markets such as Japan and South Korea, with rising momentum in other parts of the world. We look at recent policy developments in within regions that have continued to support the development of hydrogen.

Europe

The European Union regards hydrogen as a key driver for their post COVID-19 recovery. A formal hydrogen strategy was enforced in July 2020 and includes firm targets for green hydrogen production by 2024 and 2030. A number of EU member countries have since adopted national strategies to promote and develop hydrogen in their respective economies, driving further granularity on targets.

UK

The UK Department of Business, Energy and Industrial Strategy announced a plan to invest EUR22m in the national rollout of hydrogen to cut emissions. Local bus authorities are also demanding more action on clean air, and cutting particulates which are harmful to human health, linked to higher levels of cardiovascular and respiratory problems.

US

In July 2020, the Democratic presidential campaign unveiled their Plan for Climate Change and Environmental Justice. This includes commitment to electrolysing technologies for cost-effective green hydrogen production with fossil fuels by 2030. The US has also set a target of USD1m Fuel Cell Electric Vehicles (FCEVs) and 1,000 refueling stations by 2030. To help achieve this, the California government has announced consumer rebates ranging from USD4,500-7,000 on FCEVs.

China

In November 2020, the State Council of China forecasted that national sales of electric, plug-in hybrid and hydrogen-powered vehicles would rise to 20% of overall new car sales by 2025 (vs 5% from today). The State Council also advocates for technological improvements, construction of more efficient electric vehicle charging networks and greener vehicles in support of the world's largest automobile market.

4. Conclusion

Investors can expect the demand for green hydrogen across sectors and geographical regions to take off in the 2020s as global projects leveraging on the element increase in scale. Facing pressure to decarbonise, the most significant opportunities will come from oil and gas companies, which are also uniquely positioned to support green hydrogen production at a more cost efficient scale.

A strong pipeline for electrolyser projects could also provide the scale to substantially reduce production costs. But government support is still necessary and policy makers in Europe, Asia and other regions are aligning supportive policies for climate ambition. We expect hydrogen to become fully industrialised by 2030.

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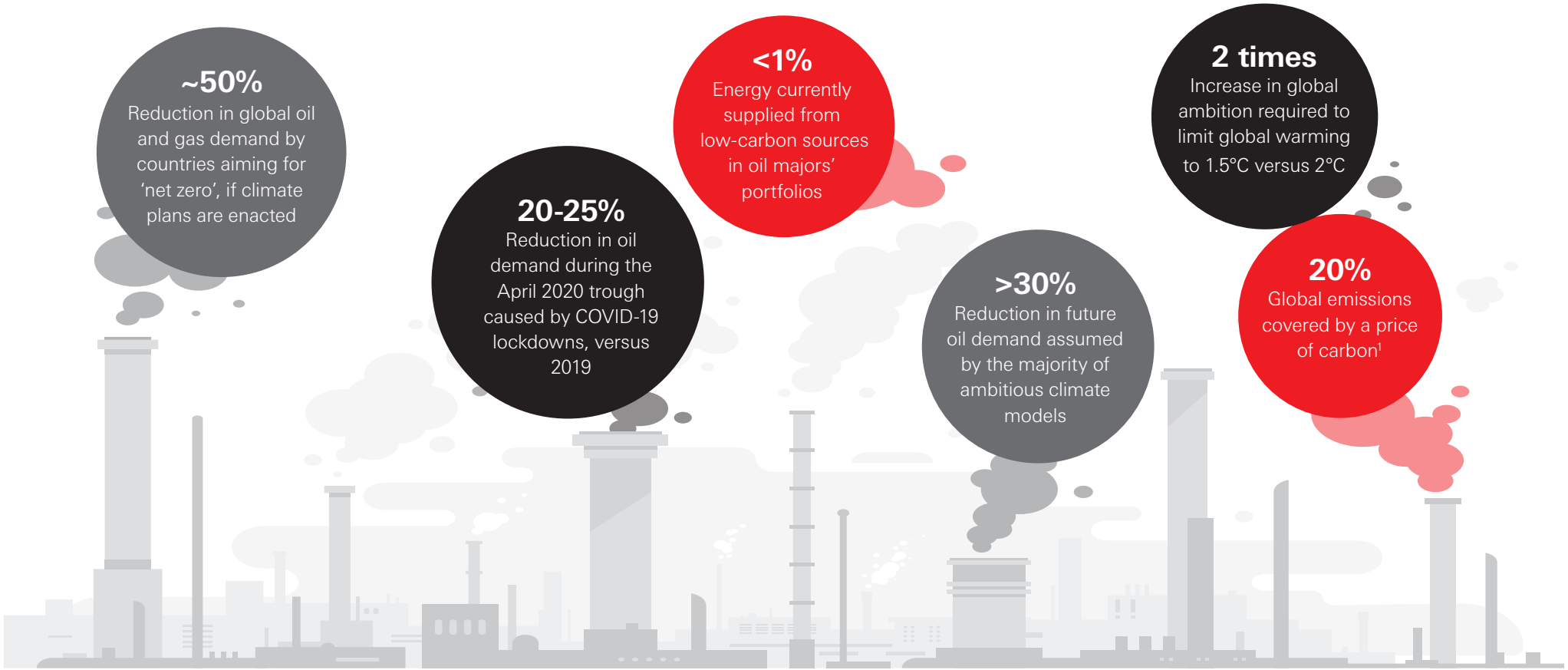
The path to 'net-zero' emissions

Against a backdrop of major disruption for global oil & gas markets due to COVID-19, the issue of the energy transition and climate has continued to rise up the agenda. Meanwhile, the consequences of global warming from increasing greenhouse gas (GHGs) emissions continue to be felt through extreme weather events such as floods, storms, droughts, and bushfires. Therefore, managing the transition to cleaner energy is likely to be the defining issue for the oil companies in the coming years.

We look at how Big Oil companies' climate ambitions are shifting in favour of net-zero emission strategies. We also discuss the progress of emerging market oil companies towards low-carbon energy production.



Source: US Energy Information Administration, International Energy Agency, Global CCS Institute, World Bank, HSBC

1. A price on carbon is a cost applied to carbon pollution to encourage polluters to reduce the amount of greenhouse gases they emit into the atmosphere.

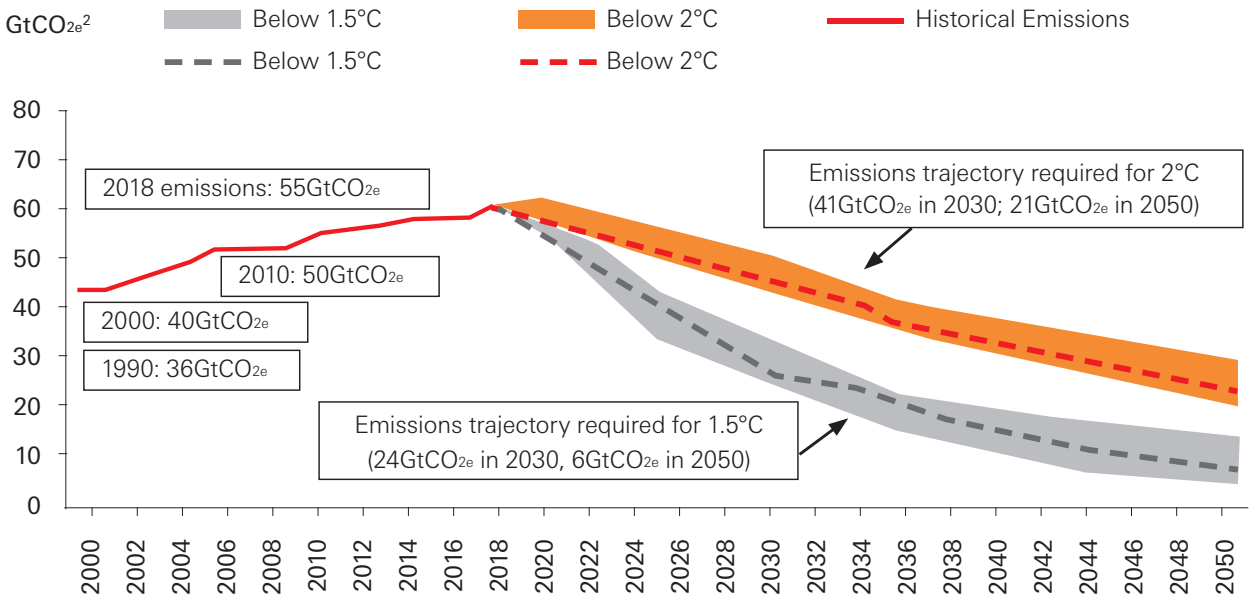
1. What is 'net zero' and why is it topical?

Moving to 'net zero'

The latest climate science (from the UN's climate science body) tells us that emissions need to be reduced significantly and eventually hit 'net zero' (see Box 1) if we are to limit global warming to within 1.5°C and stave off the most severe consequences of climate change. This requires a rapid shift of direction to that of a much lower carbon trajectory (Chart 1).

Box 1: Net zero', or carbon neutrality, means balancing the sources of emissions - such as fossil fuel combustion - with the sinks - such as forests and carbon removal technologies - so that the net impact on atmospheric concentrations of carbon dioxide and other GHGs is effectively zero.

Chart 1: The global emissions trajectory must change significantly downwards



GtCO2 means Gigatonnes of Carbon Dioxide

Emissions are still rising although at a modestly slower growth rate.....

… this means that any delay to policy requires even deeper cuts to get back 'on track

Source: Emission Gap report 2019

2. $GtCO_{2e}$ is an abbreviation of "gigatonnes of equivalent carbon dioxide" i.e. billions of tonnes of CO_{2e} (which is a simplified way to put emissions of various greenhouse gases on a common footing by expressing them in terms of the amount of carbon dioxide that would have the same global warming effect.)

Net-zero pledges on the rise

In 2021, a number of countries/regions announced plans to go net zero by mid-century including the European Union (by 2050), China (by 2060), South Korea (by 2050) and Japan, which in October 2020 brought forward its carbon-neutral pledge to 2050. In his climate plan (see Box 2), Joe Biden pledged for the US to also be net zero by 2050, with power generation to be net zero by 2035. Current pledges mean that around two-thirds of global emissions and 75% of world GDP could be set for full decarbonisation by mid-century.

Businesses too are responding with their own climate pledges. One example is Microsoft, which is seeking to become carbon-neutral by removing its entire historical corporate emissions footprint through measures to reduce its carbon dioxide and remove additional atmospheric CO2. But with emissions from fossil fuel energy (oil, gas and coal) accounting for around two-thirds of the total globally, oil & gas companies are key to the energy transition. Some of these companies have made public long-term ambitions to drastically cut the carbon intensity of their energy supply or even to become net zero.

Box 2: Key pledges in Joe Biden's Climate Plan

- **'Net zero' emissions by 2050** – significant as the US accounts for ~15% of global CO2 emissions and ~20% of global oil & gas production.
- **Zero-carbon electricity system by 2035** – by increasing investment in renewable power, and leveraging existing nuclear and hydropower capacity. Carbon capture is likely an important factor in natural gas's future role in a decarbonised electricity grid (see Chart 2).
- **Decarbonisation of transport** – the largest source of US emissions (see Chart 3). Plans include development of US electric vehicle market, new fuel economy standards for internal combustion engine vehicles, zero-emissions buses by 2030, and promoting advanced biofuels use in planes and ships.
- **Aggressive limits on methane emissions** – for new and existing oil and gas operations, potentially reversing a recent US Environmental Protection Agency regulatory loosening.
- **Climate-focused financial regulation** – such as increasing disclosure on climate risks and carbon emissions from public companies and high emitters such as oil & gas.
- **Aim for 'green' or zero-carbon hydrogen to reach cost parity** – with 'grey' hydrogen that is produced from shale natural gas. Green hydrogen is currently ~3x more expensive than grey.
- **Tax incentives for carbon capture, use and storage projects and possible carbon pricing policies targeting emitters** and a potential border carbon tax similar to those proposed in the European Union.

Chart 2: US electricity generation by fuel, 2019

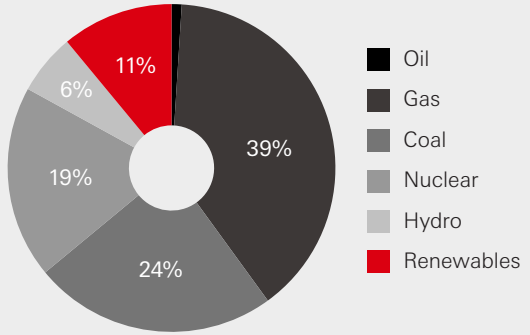
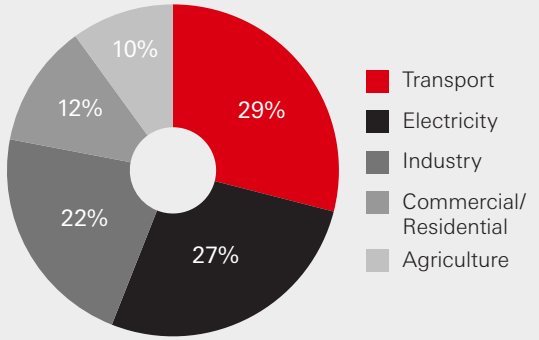


Chart 3: 2018 US emissions by end use



Source: US EIA, HSBC estimates

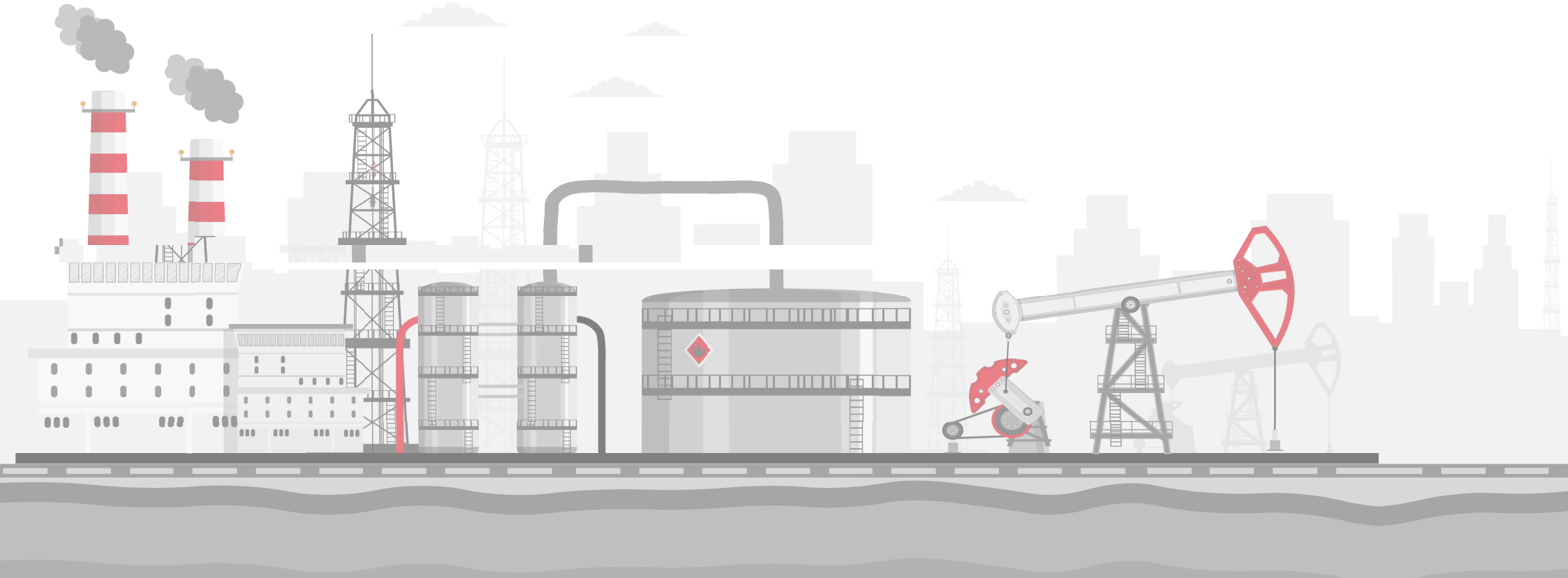
2. How is Big Oil responding?

A recent wave of Big Oil climate strategy announcements means ambitions are raised across the board to decarbonize in Europe, with US companies now further behind. We look at the nature of these long and short-term plans laid out by Big Oil companies to meet climate aims.

Long-term plans

The six European oil majors, for example (BP, Eni, Equinor, Shell, Repsol and Total), now all plan for their operations to be net zero by 2050 or earlier. These companies also have long-dated strategies that cover the total lifecycle of carbon emissions, including those from downstream customer activities (such as transportation) as well as their own production. Strategies to reduce emissions include a range of approaches, such as lowering emissions from the energy supply, new absolute emission reductions targets, investment in new energies, actions on specific sources of GHG emissions (e.g. natural gas flaring or methane leaks), and deploying technologies at scale (carbon capture and storage, biofuels, and renewable energy).

Climate ambition for US oil majors currently lags behind that of their European counterparts, and despite Mr. Biden's climate plans, we do not think overnight change is likely. However, two large US-based producers – ConocoPhillips and Occidental – recently announced 'net zero' emissions aims, firsts for US operators, indicating some level of change is underway.

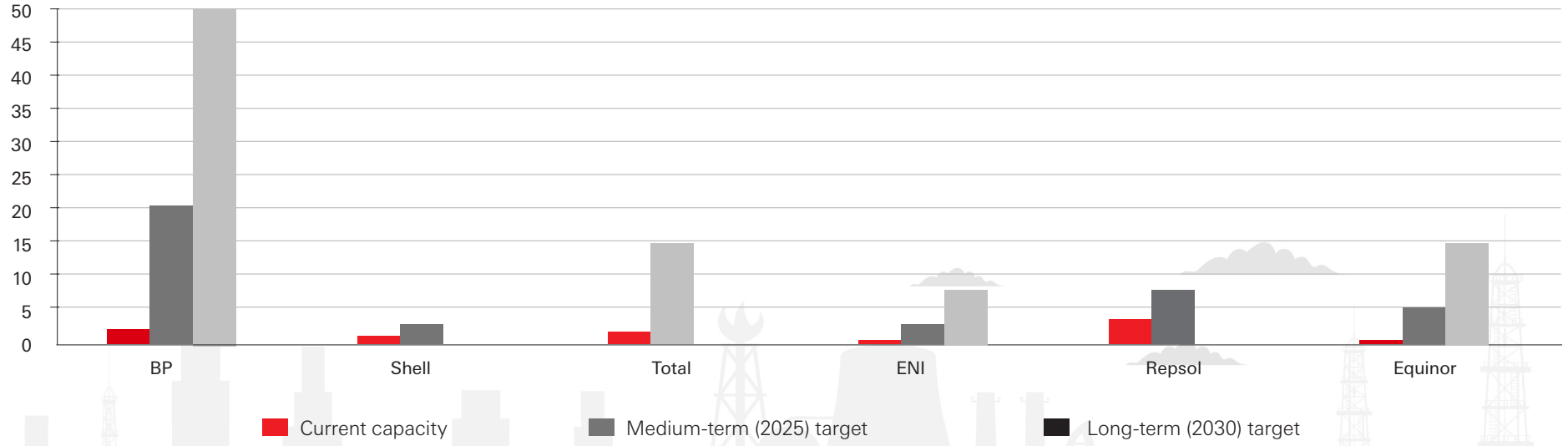


Shorter-term milestones

Visible change in the energy mix will likely be gradual given the long-term nature of the strategies, and indeed, a majority of companies do not even have shorter-term (e.g. 2025/30) milestones against their 2050 ambitions. But some institutional investor groups still are pushing to see long-term net-zero plans backed up by meaningful emissions reductions within five years.

However, some company ambitions are set to fundamentally change the shape of significant industry players within 10 years. BP, for example, has laid out 2025/30 markers towards its 2050 aims which entail a ~40% cut in oil & gas volumes and aggressive build-out of renewable energy (see Chart 4) – both of which imply an aggressive, and unprecedented, redeployment of capital.

Chart 4: Oil Major renewable energy targets (gigawatts)



Source: Company data, HSBC

3. The emerging market role in oil & climate

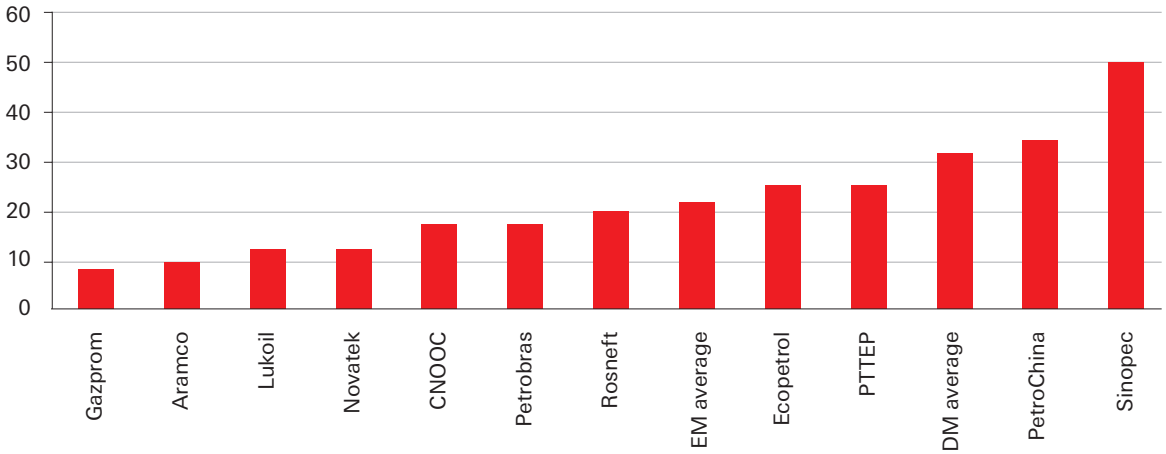
We now shift focus to emerging market (EM) oil and gas operators by looking at a sample of 13 companies (see Chart 5) that collectively account for ~30% of global oil & gas production in 2020. Our grouping of companies includes the world's largest oil exporters and natural gas producers, among others:

CNOOC (China), Ecopetrol (Colombia), Gazprom (Russia), Lukoil (Russia), Novatek (Russia), ONGC (India), PetroChina (China), Petrobras (Brazil), PTTEP (Thailand), Reliance Industries (India), Rosneft (Russia), Saudi Aramco (Saudi Arabia), Sinopec (China)

Less transformational change

We found, in general, EM producers are planning for less transformational change in the coming decades than some of their developed market (particularly European) peers, with the most common approaches being a combination of upstream (i.e. exploration and production) emissions efficiency and increasing gas in the production mix. This is a set of measures favoured by European majors around five years ago and is the current strategy of some large US majors. However, disclosure on climate-related information topics is also improving in EM companies, but is not without gaps in places – such as downstream emissions reporting.

Chart 5: Upstream emissions intensity (kg CO_{2e} per barrel oil equivalent production)



- Upstream emissions generally refer to the extraction process (extraction, processing, handling, transportation), while downstream emissions refer to what happens after the oil has left the pipeline and is consumed by its end-users.

Source: Company data, HSBC estimates

Broader implications

We also note that EM producers can, importantly, be accountable to differing stakeholders (shareholders or state ownership) or have more ingrained relationships with state objectives – e.g. directly contributing to national finances, energy policy goals or climate objectives. For example, as the world's largest energy importer, China's recent announcement of its intention to reach net carbon neutrality by 2060 could spell significant change for not only Chinese producers but also oil & gas exporters to the Chinese market.

4. Conclusion

The move towards net-zero emissions is gaining traction from shareholders, policy makers and civil society to combat the effects of global warming. More major oil and gas companies, particularly in Europe, have made public long-term ambitions to drastically cut the carbon intensity of their energy supply mix, or even become net zero – signalling the potential for significant future changes in their nature. The energy transition poses challenges, but also opportunities for those that can successfully transition while enhancing shareholder value.

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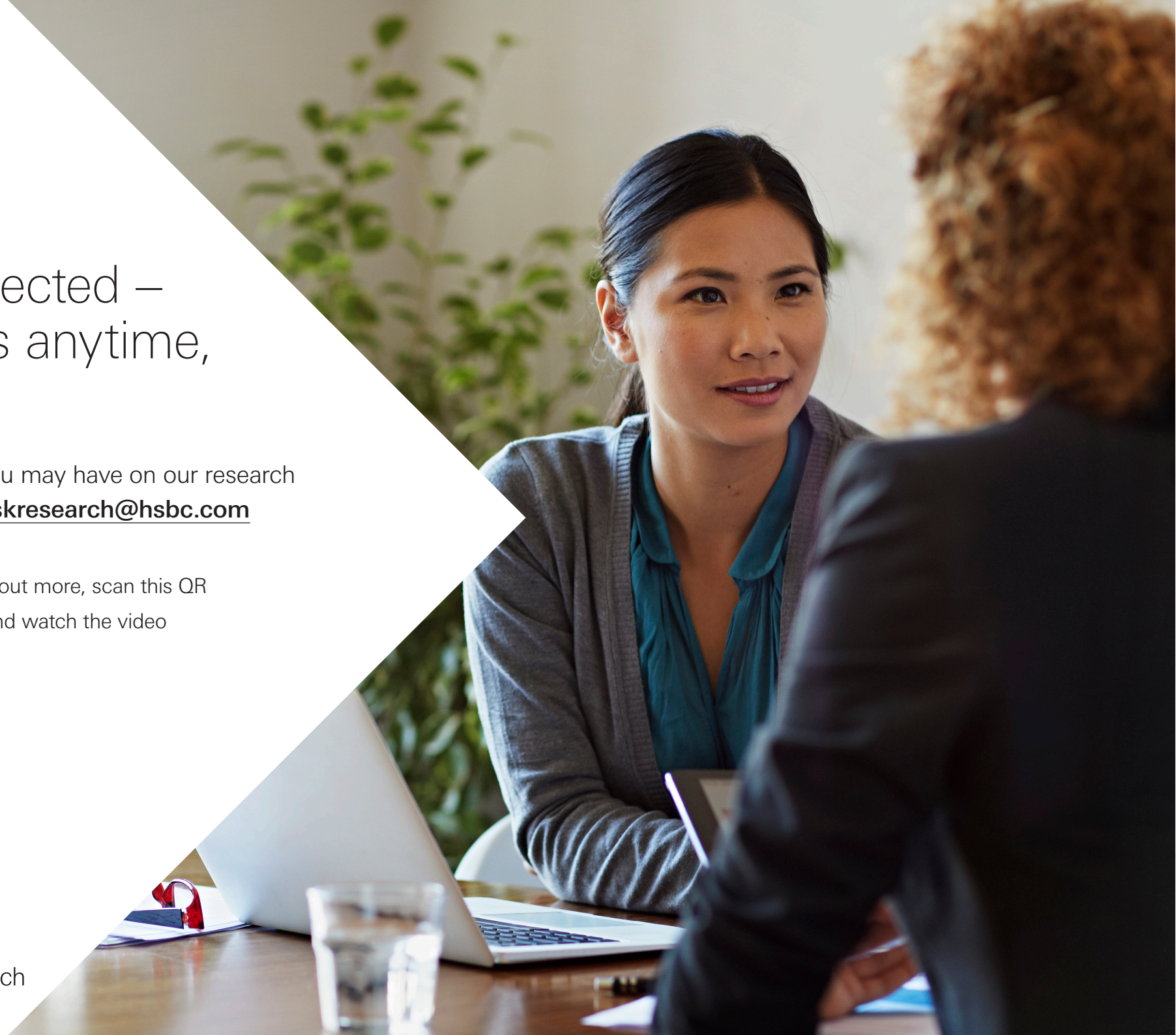

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