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Boston Consulting Group



The State of Climate Action: Major Course Correction Needed from +1.5% to -7% Annual Emissions

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Forewords



Pim Valdre Head of Climate Ambition Initiatives, World Economic Forum

The picture that comes out of this white paper is in line with the findings described in the UN's global stocktake report: we face a drastic gap in climate action, taking us further from the 1.5°C path by the day.¹ This situation leaves us with no choice but to double down on mitigation, focusing on three imperatives for all actors. First, all countries and companies should shift immediately towards delivering shorter-term targets and actions and making their net-zero transition plans public. Second, climate actions, funding and global

coalitions should rigorously prioritize solutions that promise immediate outsized impact, such as value-chain decarbonization partnerships, faster deployment of the most mature technologies – for example, solar photovoltaics (PV), wind and electric vehicles (EVs) – and related grid infrastructure and reductions in methane emissions. Finally, we must ensure a just transition, based on various levels of economic and social capabilities, adaptation challenges and responsibility, so that no one is left behind.



Patrick Herhold Managing Director and Senior Partner, Center for Climate and Sustainability, Boston Consulting Group

Without far more dramatic action, 1.5°C will slip out of reach and even “well under 2°C” will be at high risk. A 1.5°C path now calls for reductions in emissions of 7% every year until 2030; this is more than the impact from COVID-19 and against

the current trend of a 1.5% annual increase. To avoid catastrophic impacts on livelihoods and economies, we need to drastically step up national commitments and policies, corporate climate action, green-technology scaling and funding.

Executive summary

As 1.5°C is slipping out of reach, achieving it now calls for a 7% annual emissions reduction, more than the climate reduction impact from COVID-19 and against the current trend of a 1.5% annual increase. As the required path gets steeper, progress is still widely insufficient in all aspects:

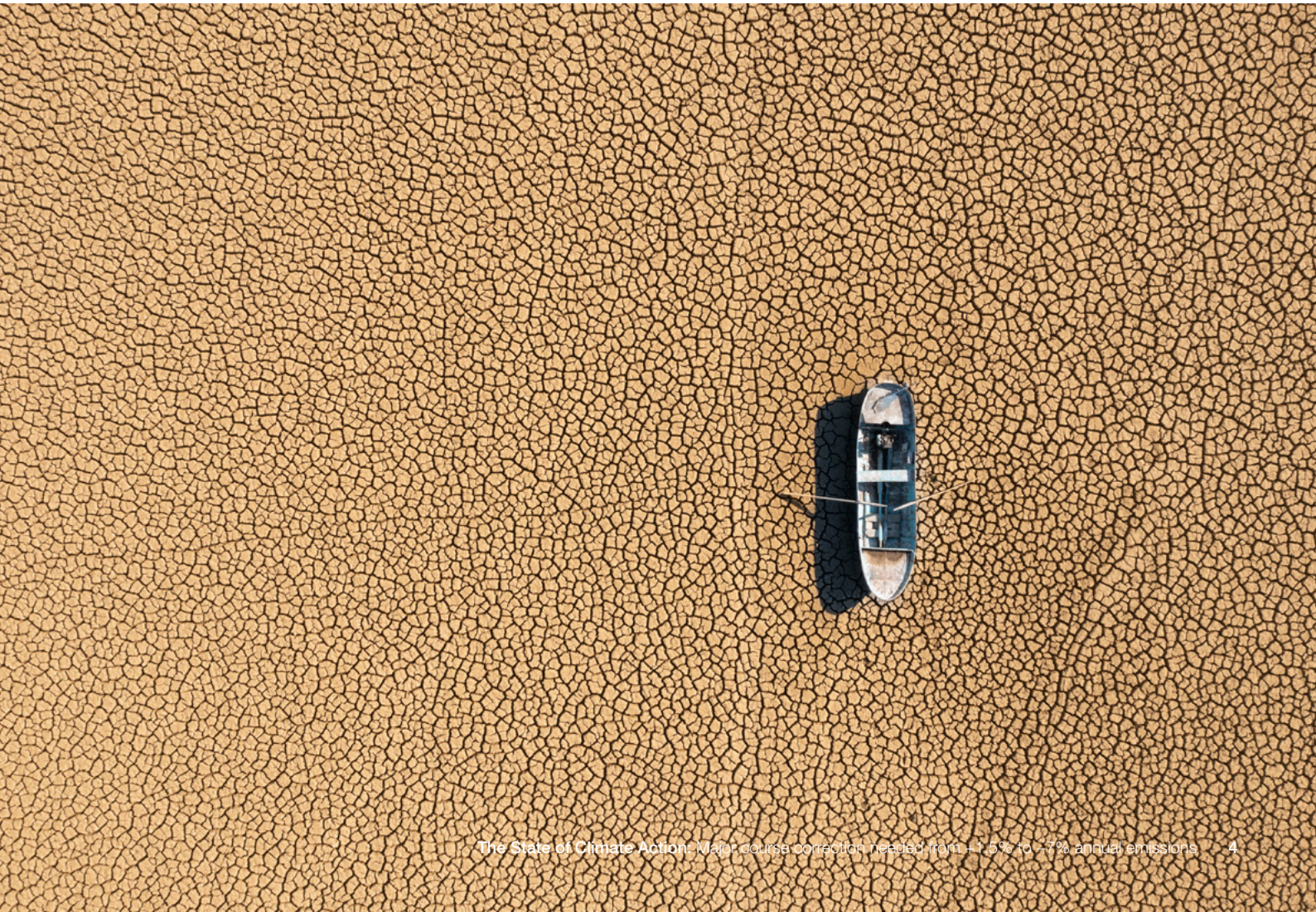
- Only 35% of emissions are covered by a national net-zero commitment by 2050, and only 7% by countries that complement bold targets with ambitious policies.
- Fewer than 20% of the world's top 1,000 companies have set 1.5°C science-based targets, and, based on the Net Zero Tracker, fewer than 10% also have comprehensive public transition plans.²
- Technologies that are economically attractive now or will be in the near future can only achieve just over half of the emissions reductions needed to reach 1.5°C. The rest are still in the early stages of development, requiring greater investment and policy support to become economically competitive.

- More than half of climate funding needs are still unmet, with critical gaps in early technologies and infrastructure particularly acute, and the climate funding gap twice as large in developing economies as in developed ones.

If the decarbonization trajectory does not change, adaptation efforts will not be enough to cope with the future issues the world is steering towards for large parts of humanity and nature. Whether 1.5°C remains achievable or not, every tenth of a degree matters greatly, as the impacts of climate scale exponentially. There is therefore no choice but to redouble mitigation efforts dramatically.

The task ahead is daunting, but this paper's stark findings must be used as a catalyst to strengthen global resolve and immediately correct the current course, shifting from incremental actions to those that deliver outsized impact.

Note: This analysis is based on 1.5°C scenarios such as by the International Energy Agency and Intergovernmental Panel on Climate Change to provide examples of the gap and the actions required.



1

Without much more dramatic action, 1.5°C will slip out of reach

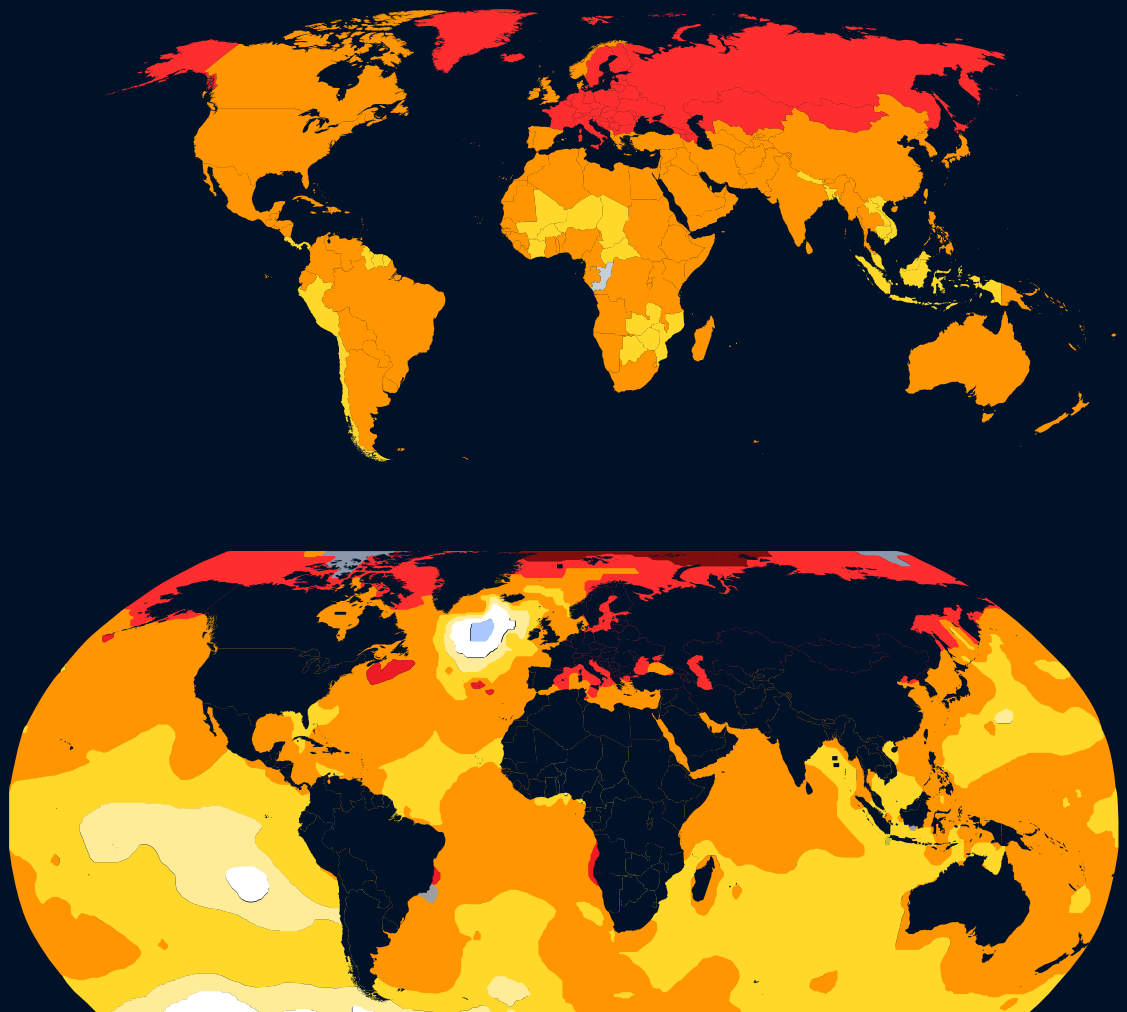
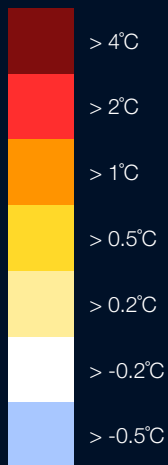
Already challenging a decade ago, the goal of limiting global warming to 1.5°C is now practically unreachable.

Large parts of Europe and Russia have already warmed by more than 2°C, and the Arctic by more than 4°C. Record ocean temperatures are accelerating in a vicious cycle. At this point, limiting warming to 1.5°C would require an annual decline

of 7% in global emissions – more than the impact from COVID-19 – every single year until 2030. But emissions this year are still expected to increase (see Figures 1 and 2).

FIGURE 1: Many countries and ocean areas are already more than 2°C warmer than they were 100 years ago

2012–2022 average temperature anomaly vs. 1900–1920:



Note: Limited precision data for China, Mongolia, Saudi Arabia, Iran, Africa and South America; insufficient data to derive an estimate for the Republic of the Congo and Antarctica.

Source: NASA Goddard Institute for Space Studies surface temperature analysis; BCG analysis

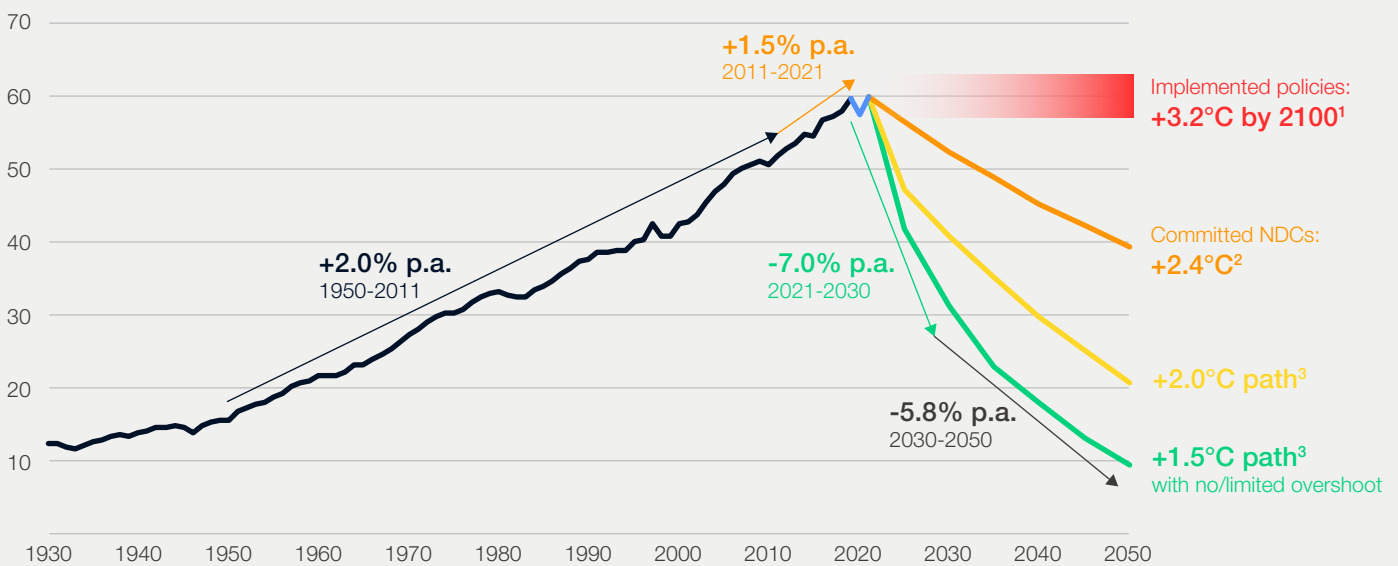


Climate change is here, it is terrifying, and it is just the beginning. The era of global warming has ended; the era of global boiling has arrived. ... It is still possible to limit global temperature rise to 1.5°C and avoid the very worst of climate change, but only with dramatic, immediate climate action. We have seen some progress – a robust rollout of renewables and some positive steps from sectors such as shipping – but none of this is going far enough or fast enough. Accelerating temperatures demand accelerated action.

António Guterres, Secretary-General, United Nations, 27 July 2023

FIGURE 2: To stay below 1.5°C, emissions need to come down by 7% per year – but they are currently increasing by 1.5%

Global net anthropogenic greenhouse gas emissions and pathways (Gt CO₂e per year)



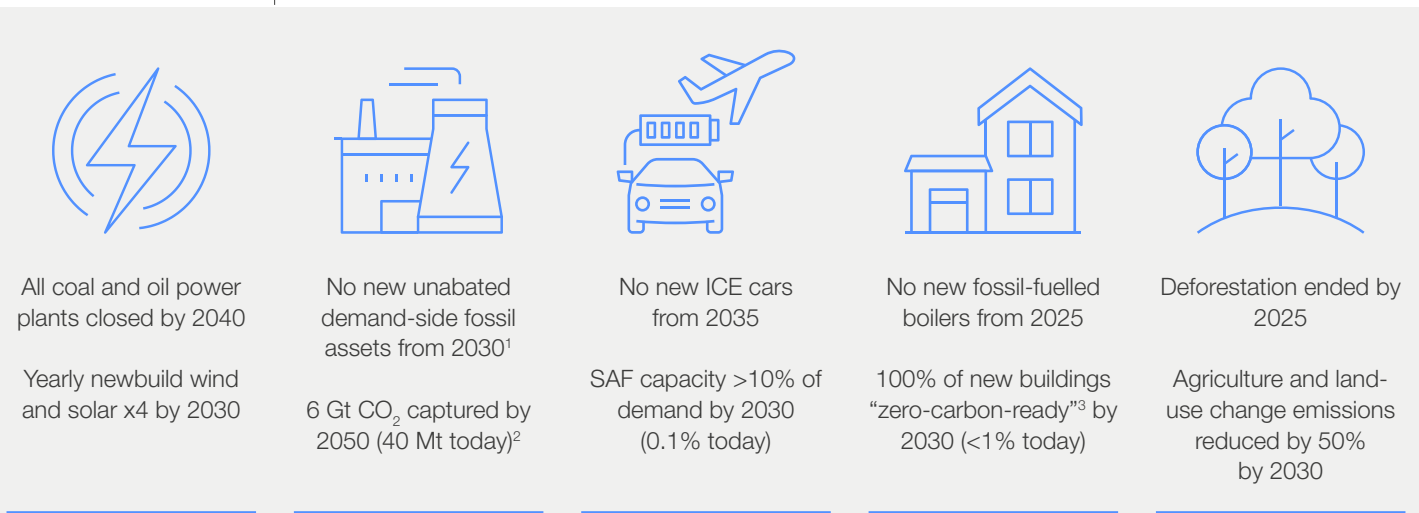
Notes: The light blue line plot segment represents estimates for 2020–2021, extrapolated from IPCC's 2019 data; NDCs = nationally determined contributions; p.a. = per year; 1. IPCC median projection, 5th to 95th percentile range: 2.2°C to 3.5°C, at medium confidence; 2. Climate Action Tracker's median projection; 3. IPCC median projection.

Source: Intergovernmental Panel on Climate Change; Potsdam Institute for Climate Impact Research; Climate Action Tracker; BCG analysis

The measures needed to counter this trend are dramatic, and they must happen on a global scale (see Figure 3). But the 1.5°C ambition is set by science, not politics. Every tenth of a degree above 1.5°C will move humanity out of safe operating space and will come at an increasing cost to ecosystems, economies and human well-being. And although adaptation and resilience efforts are

inevitable to counter these risks, they will become more expensive and less effective with every incremental increase in temperature. A 2023 study of ten developing countries found that by 2030 each country's adaptation costs would rise by around 60% to 260% at 3.5°C compared to 1.5°C,³ and residual climate-related losses would also escalate significantly.

FIGURE 3: Reaching 1.5°C would require swift, significant action: selected examples



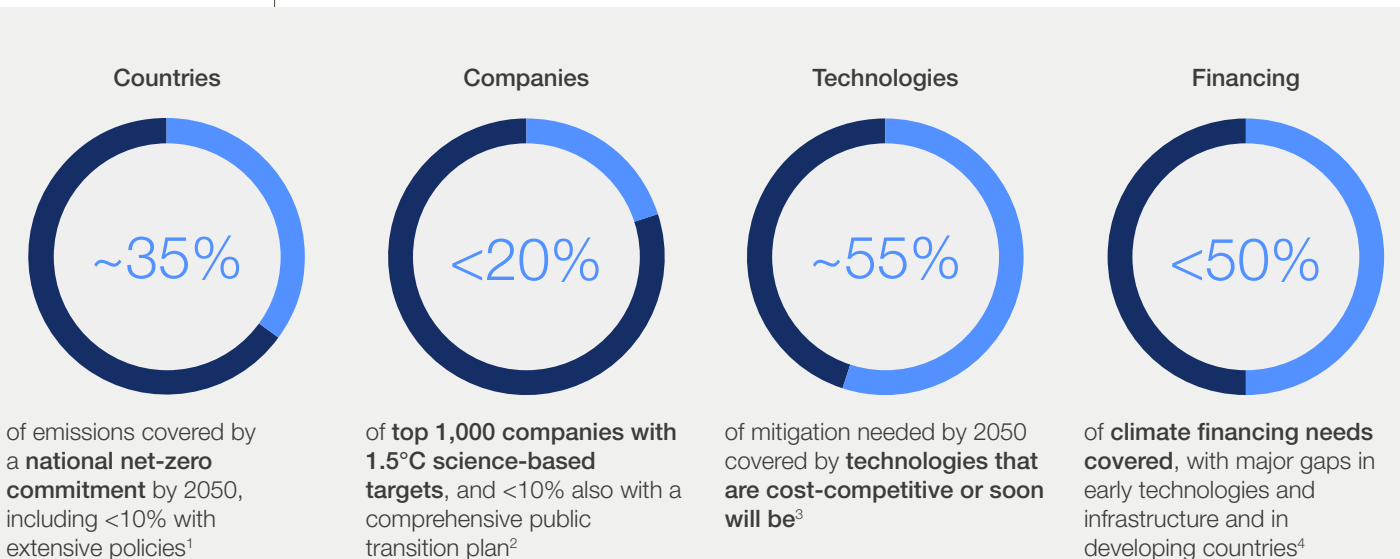
Notes: 1. Refers to industrial assets only; 2. Includes carbon capture, utilization and storage and direct air capture; 3. Zero-carbon-ready buildings are highly energy efficient and use either direct renewable energy or an energy supply that can be fully decarbonized by 2050 (e.g. electricity, district heat).

Source: Illustration based on International Energy Agency Net Zero by 2050 Scenario; United Nations High-Level Expert Group; Intergovernmental Panel on Climate Change

Therefore mitigation *must* accelerate. Green technologies must scale much faster. Countries, corporations and investors collectively need to do much more, much more quickly. This means

a sharp course correction from the current level of action, which is insufficient in all respects (see Figure 4).

FIGURE 4: Across all major dimensions, progress is insufficient



Source: 1. Net Zero Tracker; Climate Watch; Climate Action Tracker; 1.5°C national pathway explorer; Intergovernmental Panel on Climate Change; International Energy Agency; Powering Past Coal Alliance; Glasgow Declaration; World Bank; European Heat Pump Association; Climate policy database. 2. CDP data (2018–2021); Glasgow Financial Alliance for Net Zero (2023); Net Zero Tracker (2023); Refinitiv (2023); Science Based Targets initiative (2023). 3. International Energy Agency; Intergovernmental Panel on Climate Change; Lena Höglund-Isaksson et al., “The Role of Anthropogenic Methane Emissions in Bridging the Emissions Gap”, in Emissions Gap Report 2021: The Heat Is On, pp. 47–55; desk research. 4. International Energy Agency; UN Environment Programme; Climate Policy Initiative; World Bank; OECD; SAF Investor

2

National commitments and policies are still widely insufficient

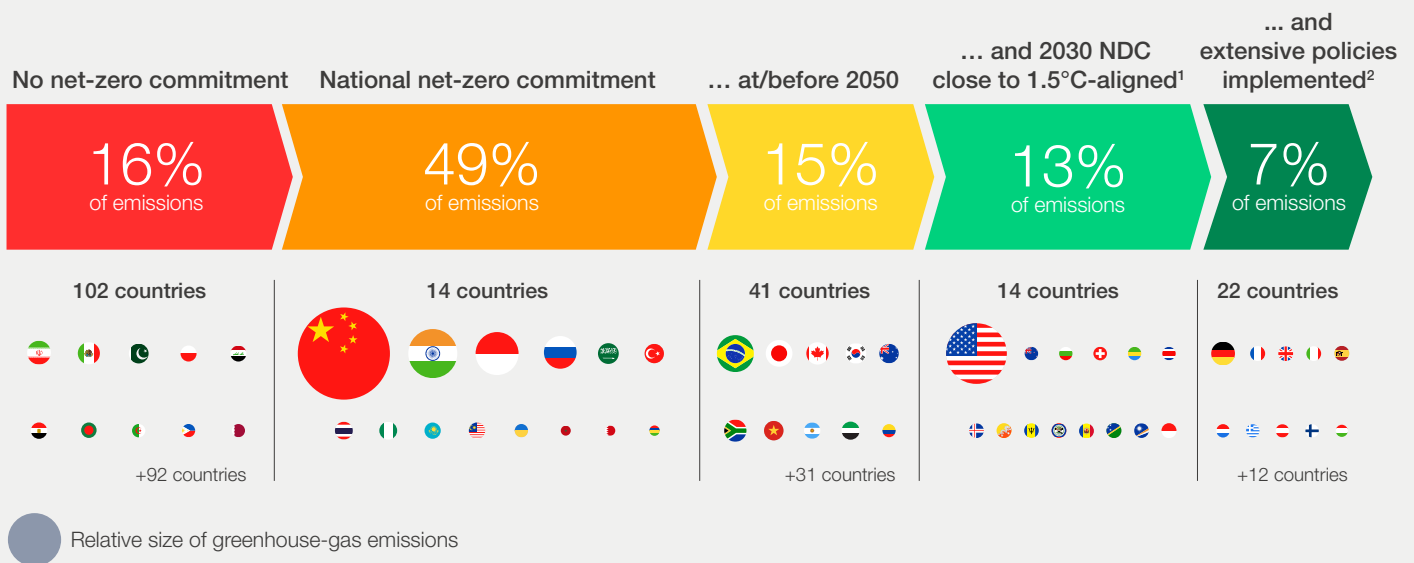
As of mid-2023, the share of total global emissions covered by national net-zero targets exceeded 80% – up from virtually zero only a few years ago – but very few countries are currently on track to achieve 1.5°C.

Although great strides have been made, key countries still stretch their ambitions for far too long, commit to far too little progress this decade or struggle to create strong implementation plans to achieve the targets they have set.

Despite the substantial increase in national net-zero commitments, only a third of global emissions are covered by a net-zero target for 2050 – the rough date required for a 1.5°C pathway. The gap is even more significant this decade, as only 20% are also

committing to short-term action close to what is required. The share with relatively ambitious policies to implement this action stands at below 10% (see Figure 5). Even some of these are at risk of being dialled back, as exemplified by the UK’s plan to grant more than 100 new oil and gas extraction licences, France’s inability to achieve its 2023 renewables target, the temporary resurgence of coal power in Europe following Russia’s invasion of Ukraine, and the USA reaching an all-time-high oil output in 2023 and allowing drilling in the Arctic.⁴

FIGURE 5: Very few countries are currently on track to achieve 1.5°C



Notes: Based on 193 UN member countries, excluding emissions from land use, land-use change and forestry and international aviation and shipping; NDC = nationally determined contribution; **1.** Country’s unconditional 2030 nationally determined contribution delivers at least 75% of 1.5°C-compatible reduction; **2.** Country has implemented at least a coal ban, internal combustion engine ban, emissions-trading schemes/tax and one key policy per emission sector (energy systems, transport, industry, buildings and agriculture, forestry and land use).

Source: Net Zero Tracker; Climate Watch; Climate Action Tracker; 1.5°C national pathway explorer; Intergovernmental Panel on Climate Change; International Energy Agency; Powering Past Coal Alliance; Glasgow Declaration; World Bank; European Heat Pump Association; Climate Policy database; BCG analysis

Climate change is a global problem, and addressing it is a shared responsibility, but a few individual countries carry a higher responsibility than others. Of the ten largest emitters (responsible for around 65% of current global emissions), five are jointly

on track to overshoot the 1.5°C path by 300 gigatonnes (Gt) until 2050: China, India, Russia, Indonesia and Iran.⁵ This represents almost half the global overshoot based on all national commitments (see Figure 6).⁶

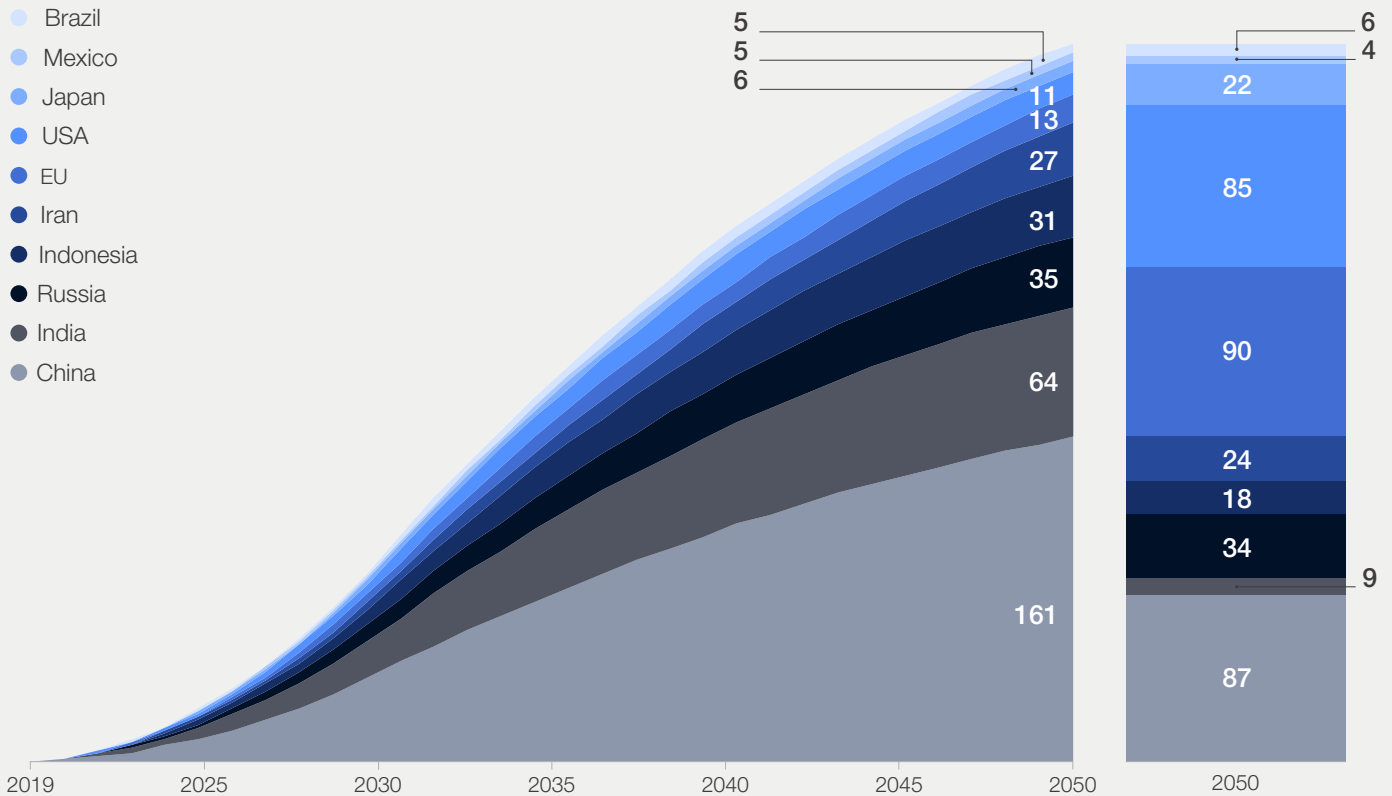
FIGURE 6: Despite national commitments, the “carbon debt” is rising

Cumulative gap between national commitments¹ and 1.5°C “technical” paths¹

Net Gt CO₂e per year, top 10 largest emitters, excluding land use, land-use change and forestry

Gap vs. “fair share” 1.5°C path²

Climate Action Tracker’s fair share lens shows higher-income countries have a greater role to play



Notes: 1. 2030 national commitments data is based on unconditional nationally determined contributions only; technical paths reflect technical mitigation potential, regardless of responsibility, capability or equality; 2. Based on Climate Action Tracker’s fair share rating system, splitting mitigation efforts based on countries’ capabilities, historical responsibility and equality (per capita or GDP).

Source: Net Zero Tracker; Climate Watch; Climate Action Tracker; 1.5°C national pathway explorer; Intergovernmental Panel on Climate Change; BCG analysis

But it is essential to also consider past contributions to the accumulation of greenhouse gases in the atmosphere, which have fuelled a larger debate about climate justice. The Climate Action Tracker has attempted to address these considerations with a “fair share” perspective. By factoring in the weight of historical responsibility and economic capability, it provides a metric similar to “financial responsibility” for emissions reductions. This

substantially changes the picture, making the EU and the USA, alongside China, roughly equally responsible for reducing the overshoot. This highlights the need for developed nations (especially the USA and EU countries), which are responsible for the largest share of historical emissions, to significantly increase their financial and technical support to developing countries for the global transition.

3

Corporate climate action is progressing far too slowly

On the corporate side, progress in recent years has been positive, but much more is needed.

The total number of companies with commitments to science-based targets more than sextupled from the end of 2020 to August 2023.⁷ But here, too, the current trajectory is entirely inadequate. A significant share of large corporations – especially outside Western countries – have not yet set targets. Where they have done so, the targets are often insufficient in scope, magnitude or follow-through. Many companies also lack a credible, coherent and transparent transition plan for achieving their targets. In this context, management teams and board members have a responsibility to ensure sufficient focus on climate impacts and action.

As of August 2023, fewer than 20% of the world's top 1,000 companies had science-based targets aligned with a 1.5°C pathway – and almost 40% had no net-zero commitment at all. A mere 2% among these also had both comprehensive, publicly disclosed transition plans to reach the

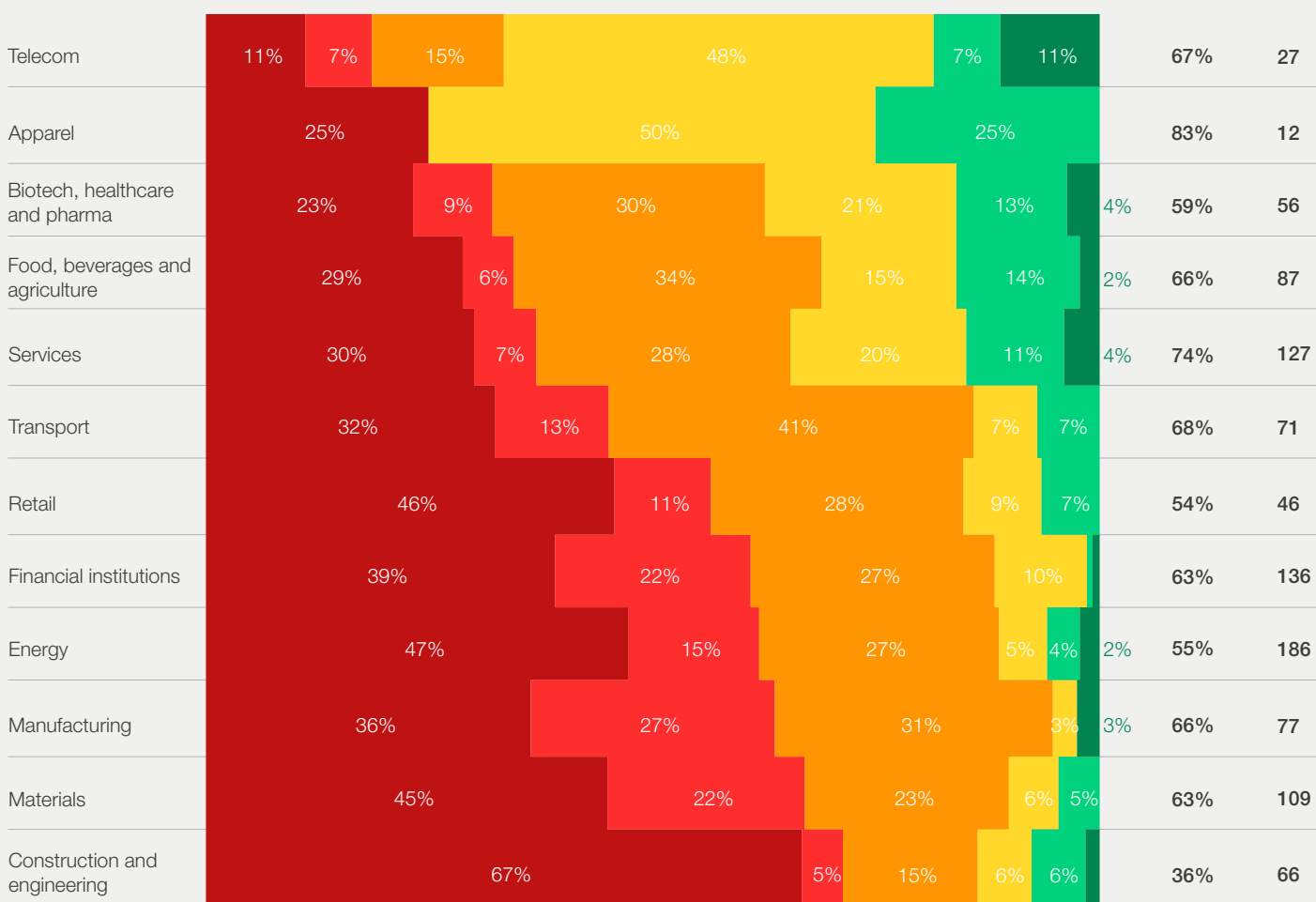
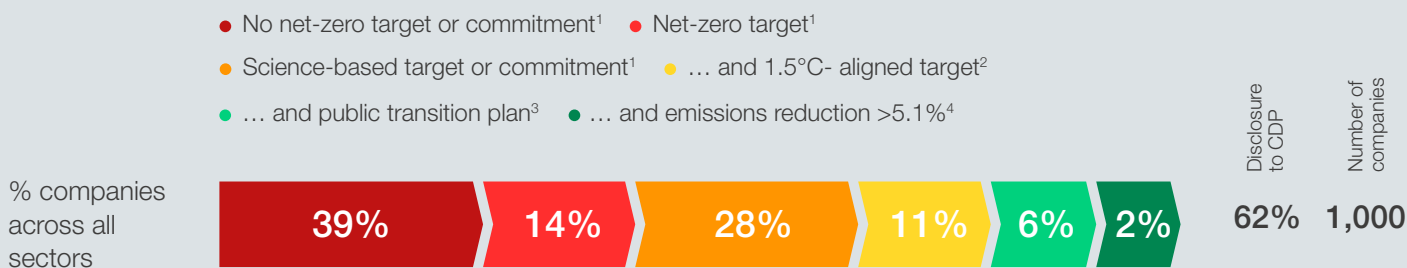
targets and actual emissions reductions in line with 1.5°C over 2018–2021.⁸ Despite some discrepancies, this picture holds true for all sectors, calling for much more ambitious action across the board (see Figure 7).

Even many top performers are only taking the first steps. Among the respondents to the 2022 Carbon Disclosure Project survey that decreased their emissions in 2021, most limited their efforts to “no-regret” levers⁹ such as energy efficiency (with 35% citing it among their reasons for reduced emissions) and using renewable power (71%).¹⁰ Levers such as electrifying vehicles, buildings and factories (2%) and using less mature technologies (below 0.5%) still contributed very little. If progress is to be accelerated, more companies need to invest in harder solutions, as described in the next section – and that entails more financial trade-offs and investments.



FIGURE 7: Fewer than 20% of the top 1,000 companies have set 1.5°C science-based targets

Data as reported by CDP, SBTi and Net Zero Tracker (July 2023)



Notes: 1. Science Based Targets initiative and/or Net Zero Tracker; Glasgow Financial Alliance for Net Zero; 2. Target covering Scopes 1 and 2, and Scope 3 if it accounts for more than 40% of total emissions; 3. Publicly disclosed plans covering all relevant scopes and/or measuring the expected impact of actions to meet the target as assessed by the Net Zero Tracker; 4. Compound annual reduction of more than 5.1% over 2018–2021 (Intergovernmental Panel on Climate Change 2018–2030 1.5°C path), based on CDP, or Refinitiv if no public disclosure on CDP.

Source: CDP data, 2018–2021; Glasgow Financial Alliance for Net Zero, 2023; Net Zero Tracker, 2023; Refinitiv, 2023; Science Based Targets initiative, 2023; BCG analysis

4

Green technologies and infrastructure are not scaling fast enough

Achieving net-zero emissions will require a fundamental transition in the ways that energy, materials and food are consumed and produced – and crucially, it must happen fast.

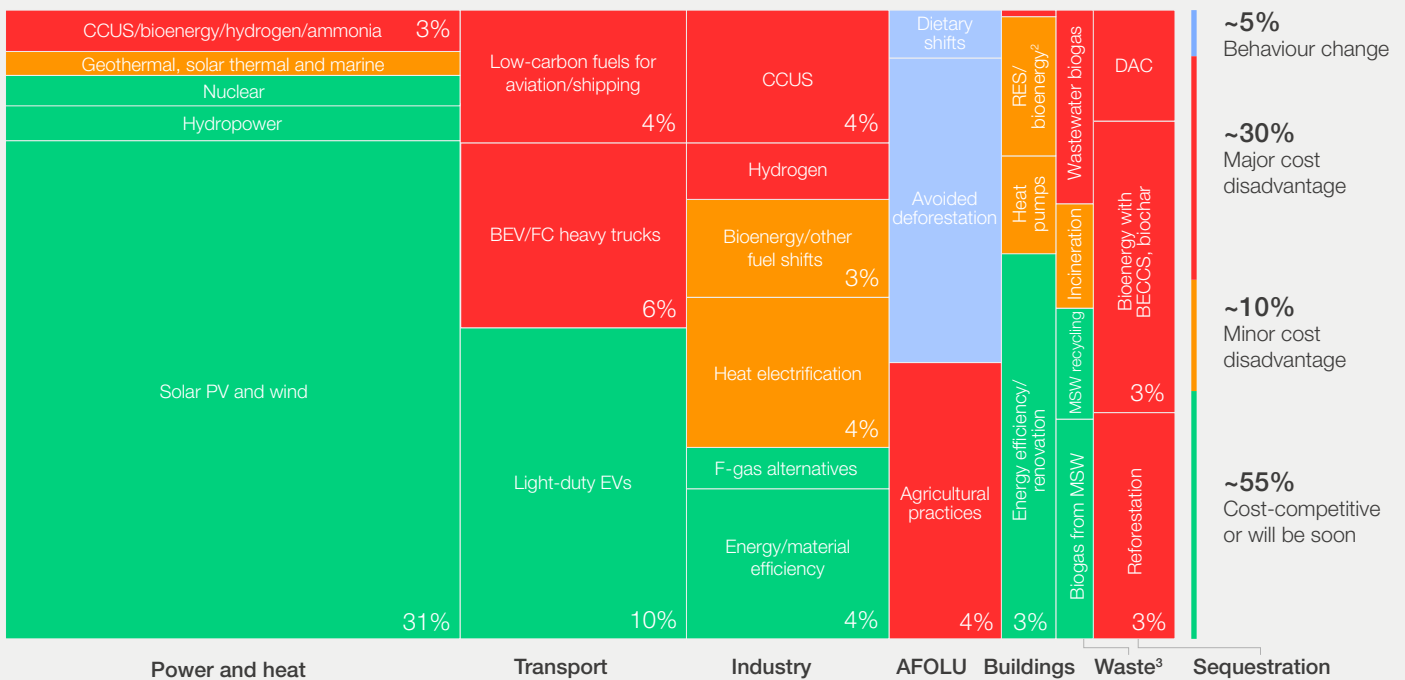
The path to achieving net-zero emissions is now well described, but key green technologies are not scaling fast enough.

Human ingenuity has already achieved impressive progress in critical technologies such as wind, solar

and batteries that would have seemed a pipe dream at the start of the century. Virtually all technologies needed to achieve net-zero emissions already exist, but they are at very different levels of maturity. As a result, technologies that are already, or will soon be, economically viable – especially efficiency

FIGURE 8: Most required green technologies exist, but only around 55% are or will soon be cost-competitive

Global greenhouse-gas mitigation required by 2050 to reach 1.5°C, split by sector and technology¹
 % of net Gt CO₂e p.a.



Notes: Cost-competitiveness is gauged in comparison to today's high greenhouse-gas reference, including capex and opex, and measured for the direct owner of the asset (as opposed to end-user price, for example); AFOLU = agriculture, forestry and land use; BECCS = bioenergy with carbon capture and storage; BEV/FC = battery electric vehicle/fuel cell; CCUS = carbon capture, utilization and storage; DAC = direct air capture; EVs = electric vehicles; MSW = municipal solid waste (including industrial); PV = photovoltaic; RES = renewable energy sources; 1. Annual emissions at projected 2050 level, current cost-competitiveness; 2. For heating only; 3. Excluding agricultural waste.

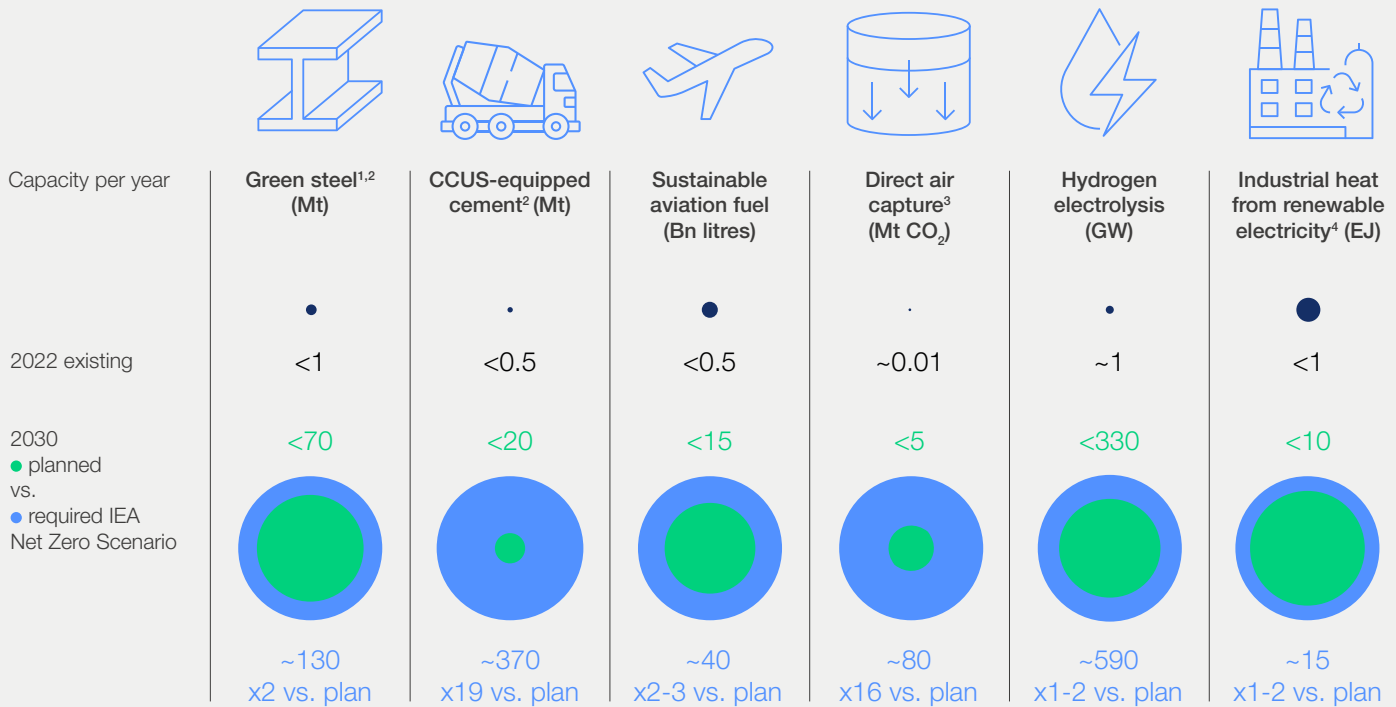
Source: International Energy Agency; Intergovernmental Panel on Climate Change; Lena Höglund-Isaksson et al., "The Role of Anthropogenic Methane Emissions in Bridging the Emissions Gap", in Emissions Gap Report 2021: The Heat Is On, pp. 47–55; desk research; BCG analysis

technologies, renewable power and EVs – can deliver just over half of the decarbonization required. Critically, however, nearly half of the technologies needed are not yet cost-competitive or are too expensive for most emitters to use (see Figure 8).

To reach or get close to net zero by 2050, the shift to lower greenhouse-gas-emitting solutions has to

happen within one asset generation. This means all technologies must start scaling immediately on a global level, regardless of economics or maturity. Right now, the early-stage technologies required for deep decarbonization – such as hydrogen; carbon capture, utilization and storage (CCUS); and direct air capture (DAC) – in particular still fall well short of the costs and scale needed (see Figure 9).

FIGURE 9: Early-stage technologies are expected to remain small in scale until 2030



Notes: CCUS = carbon capture, utilization and storage; EJ = exajoules; GW = gigawatts; Mt = megatonnes; 1. H2-DRI/CCUS-equipped, excluding scrap; 2. Includes plans to transition over time; 3. Only projects in advanced development; 4. Planned = IEA's stated policies scenario.

Source: Illustration based on International Energy Agency; company websites; SAF Investor; BCG analysis

To catch up, innovation and industrial scaling need to accelerate at nearly unprecedented levels. It took around 30 years from developing the first prototype of solar PV and EV Li-ion batteries to reach at-scale market deployment. For new technologies such as cement CCUS, DAC and solid-state batteries, this figure needs to halve.¹¹ This is not impossible – COVID-19 vaccines were developed and introduced in less than a tenth of the usual time frame – but it will require the world to treat climate change more like the life-threatening crisis that it is and incentivize, invest and scale accordingly.

A good illustration of the technology-scaling challenge is the fact that not all economically viable

technologies are so far scaling as fast as is needed. The annual additions of EVs and zero-carbon-ready building surface areas especially are not on track with the International Energy Agency's net-zero scenario – requiring, respectively, a sevenfold and ninefold increase by 2030.¹² Substantial skills gaps are a significant factor slowing them down. For instance, out of the 480,000-plus workers needed globally from 2021 to 2025 to implement planned wind capacity additions, only 150,000 had been trained by the end of 2021.¹³ More than 600,000 new jobs are also needed by 2030 to achieve the EU's solar strategy.¹⁴

5

The climate funding gap remains enormous

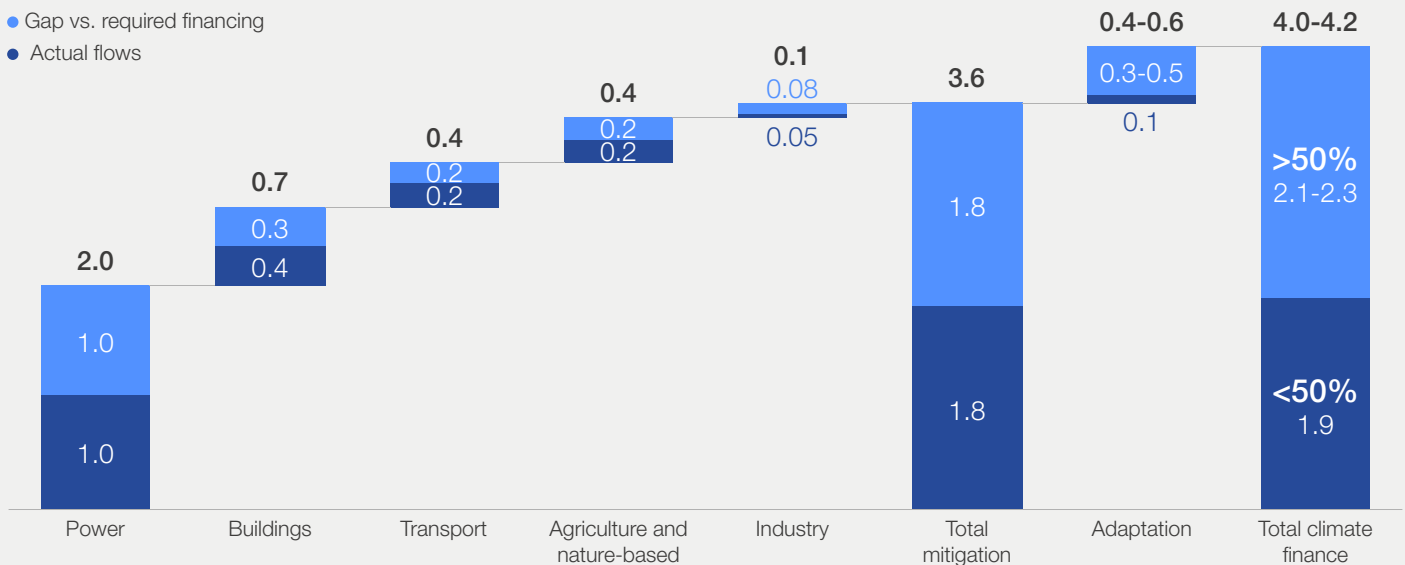
In part because of all of the factors noted in this report, the climate funding gap is huge.

In 2022 more than half of the roughly \$4 trillion in annual climate financing needs were unmet, with gaps across all sectors (see Figure 10). Investors seem particularly reluctant to fund climate technologies that carry high uncertainty, including unclear business cases, time to market or future

policy support. This results especially in critical underfunding of early-stage technologies such as bioenergy, hydrogen, sustainable aviation fuel (SAF), CCUS and battery storage, which collectively received only around 2% of last year's global mitigation funds.

FIGURE 10: More than half of annual climate financing needs were unmet in 2022

2020–2025 average yearly financing needs vs. 2022 actual flows
\$ trillions per year



Notes: Some figures have been rounded and totals may not match exactly.

Source: Illustration based on International Energy Agency; UN Environment Programme; Climate Policy Initiative; SAF Investor; BCG analysis

So far, public finance has been insufficient to fill the gap. Even in the USA, where the Inflation Reduction Act (IRA) is highlighted as a step change in clean-energy funding, the roughly \$400 billion in investments planned across the next ten years are dwarfed by the roughly \$5 trillion in pandemic stimulus that the country unlocked in a much shorter time frame during COVID-19.¹⁵

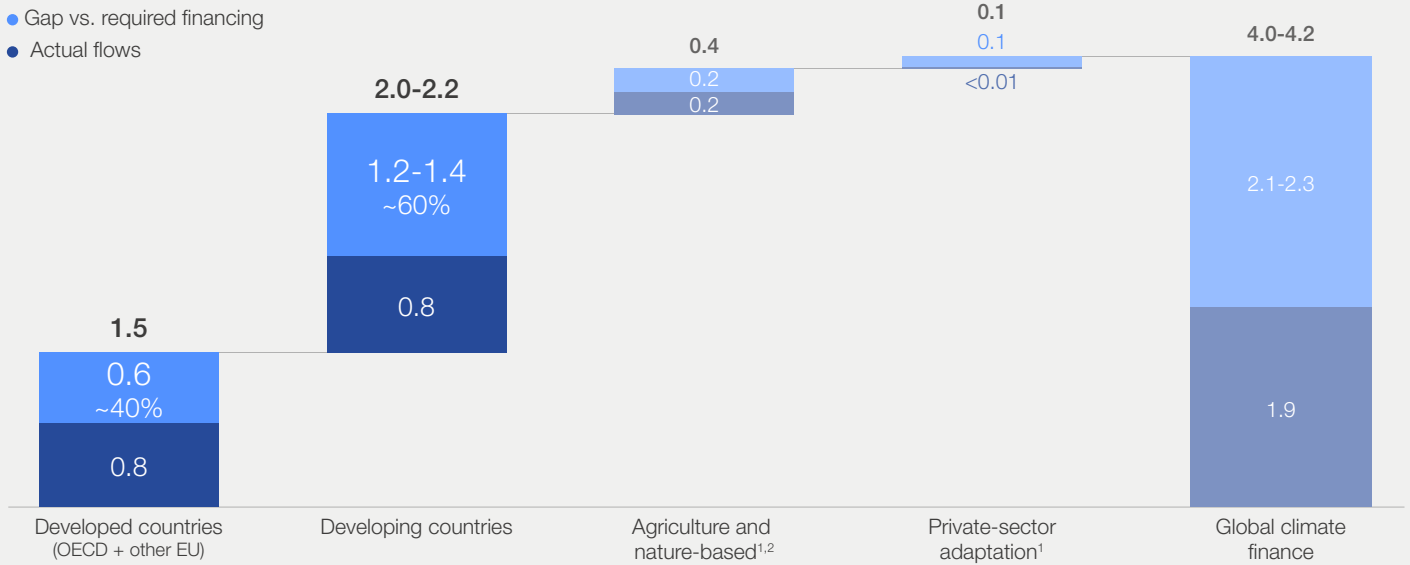
The need is even greater in lower-income countries. These must decarbonize while

growing their energy infrastructure and simultaneously invest more in adaptation and resilience, since many of them face disproportionate threats from rising temperatures, all while facing a financing gap twice as large as that of developed countries (see Figure 11). And this disparity is growing: from 2019 to the end of 2023, around 55% of the growth in clean-energy investments will likely have been concentrated in the EU, the USA and Japan, and around 35% in China.¹⁶

FIGURE 11: | The funding gap is more than twice as large in developing countries as it is in developed nations

2020–2025 average yearly financing needs vs. 2022 actual flows

\$ trillions per year, including mitigation and adaptation in developing countries



Notes: Some figures have been rounded and totals may not match exactly; **1.** Not allocated at country level; **2.** Mitigation only.

Source: Illustration based on International Energy Agency; UN Environment Programme; Climate Policy Initiative; SAF Investor; World Bank; OECD; BCG analysis

Developing countries are subject to lower levels of available capital and higher perceived risks – including from currency volatility, unclear regulations and permitting, illiquid assets, inferior grid quality and limited financial information. Investors thus tend to expect returns that are too high for many clean-energy projects, which are often capex-

intensive. For example, the financing costs of a utility solar PV plant in Brazil, India or Indonesia amount to 50–60% of their levelized cost of energy (LCOE), vs. slightly more than 20% in the EU and USA.¹⁷ The gap is even wider for adaptation, which often relies mostly on public funding and international aid.

Mitigation action needs to drastically step up

Even if 1.5°C soon slips out of reach, avoiding the worst consequences of climate change requires a dramatic rise in mitigation action.

This urgency would only increase if the 2.0°C or 2.5°C thresholds were crossed. Much has been written about potential solutions, a topic that will be covered in the next report. Here, a set of clear near-term priorities are highlighted – these are areas where, given the challenges, it will likely be necessary to go even further.

Near-term priorities include:

- **Unlock bolder, more rapid national commitments and actions**, in particular to rebuild the energy infrastructure, engage high-emitting sectors, reduce methane in light of its large short-term impact and implement ambitious government green-procurement practices.
- **Level the playing field for decarbonization through** mechanisms such as carbon pricing, emissions-trading systems and carbon border adjustment mechanisms (CBAM). Similarly, support bold efforts in nature, food and agriculture related to deforestation, reforestation and regenerative agriculture in a coordinated effort with climate action.
- **Strengthen government actions to remove obstacles** to the transition. Fast-track permitting, build the necessary infrastructure and supply chains, support investments to de-risk access to raw materials, and upskill the workforce, especially by reskilling workers from fossil-based industries.
- **Shift corporates' focus to bolder targets for themselves and their supply chains, and align actions to achieve these targets.** This should include greater transparency in material investments, risks and progress aligned with the new ISSB reporting framework,¹⁸ adopting clear intermediate goals for 2030 and sooner. Carbon removal should be included where possible and counted towards companies' goals, particularly where reduction pathways are unlikely to meet net zero.

- **Massively scale high-impact technologies and necessary infrastructure**, leveraging IRA or similar approaches to accelerate investment in both economically viable technologies that have the potential for outsized impact (solar PV, wind and EVs) and early-stage options that need to get to market more quickly (green hydrogen, SAF and CCUS).
- **Raise climate financing for the Global South, conditional on ambitious mitigation action**
 - strengthen funding from bilateral (such as JETPs¹⁹) and multilateral development banks, draw more private capital (for example, through concessional finance and legitimized crediting of investments, by governments and entities such as the SBTi²⁰) and channel more philanthropic funding into climate. This must go hand in hand with wider international agreements that are beneficial to all parties.

Each of these elements offers a substantial opportunity for improvement with gigatonne-level impact, but none will be easy to implement at a global scale, owing to the inherent complexity of the issues, combined with local and global politics, entrenched interests, funding challenges and disconnects between who pays, who benefits and how to measure the benefits.

However, the cost of inaction is an even larger threat. As temperatures continue to rise and affect communities around the world, the impact of delay will become increasingly apparent across the globe – and not just in climate-vulnerable countries – and so will the costs and challenges of acting later to make up for any time lost.

In this context, much more drastic measures – such as incentivizing companies with 1.5°C-compliant emissions-reduction targets and plans (for example, through tax benefits), or even making 1.5°C-compliance compulsory for companies doing business in a given country or region – may soon become necessary. The regulatory, tax and compliance burdens of actions taken later are likely to be even greater if the emissions curve isn't bent soon – and substantially.

Conclusion

The progress accomplished in recent years is historic in many regards, but it is still insufficient, and the risk of backtracking remains very real.

Humankind is getting dangerously close to setting off cascading tipping points, threatening the future of the planet. The world needs more Paris moments and actions that can move the needle in the near term. This will require much more collaboration across countries, companies and sectors to accelerate action *today*. If not, the necessary measures will

only continue to become more drastic as long as decision-makers keep underdelivering. A collective shift in mindset, spurring people into action at a level that truly matches the urgency of the climate crisis, is among the most important changes needed to navigate the route towards a climate-safe and nature-positive future.



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Endnotes

- 1 United Nations, *Technical Dialogue of the First Global Stocktake*, 8 September 2023: https://unfccc.int/sites/default/files/resource/sb2023_09_adv.pdf.
- 2 “Comprehensive public transition plans” are defined as publicly disclosed plans covering all relevant scopes and/or measuring the expected impact of actions to meet the target, as assessed by the Net Zero Tracker: <https://zerotracker.net/>.
- 3 Standard Chartered, *The Adaptation Economy*, 2023: <https://standardcharteredbank.turtl.co/story/the-adaptation-economy/page/1>. The ten countries covered are Bangladesh, China, Egypt, India, Indonesia, Kenya, Nigeria, Pakistan, the United Arab Emirates and Viet Nam.
- 4 “La France ne devrait pas atteindre ses objectifs de développement des énergies renouvelables à la fin de 2023”, *Le Monde*, 24 January 2023: https://www.lemonde.fr/planete/article/2023/01/24/la-france-ne-devrait-pas-atteindre-ses-objectifs-de-developpement-des-energies-renouvelables-a-la-fin-de-2023_6159100_3244.html ; Matt Egan, “Under Biden, US Oil Production Is Poised to Break Trump-Era Records”, *CNN Business*, 9 August 2023: <https://edition.cnn.com/2023/08/09/business/oil-production-biden-trump/index.html>; Eric McDaniel, “Biden Frames His Clean Energy Plan as a Jobs Plan, Obscuring His Record on Climate”, *NPR*, 13 July 2023: <https://www.npr.org/2023/07/13/1186854511/biden-climate-jobs-voters>.
- 5 This calculation is based on 2030 nationally determined contributions (NDCs) and net-zero targets; it excludes land use, land-use change and forestry.
- 6 This calculation is based on the Climate Action Tracker’s estimated global path from committed NDCs and long-term pledges, including land use, land-use change and forestry; Climate Action Tracker: <https://climateactiontracker.org/>.
- 7 Science Based Targets initiative, “Target Dashboard (Beta)”, August 2023: <https://sciencebasedtargets.org/target-dashboard>.
- 8 These numbers reflect publicly disclosed plans covering all relevant scopes and/or measuring the expected impact of actions to meet the target, as assessed by the Net Zero Tracker: <https://zerotracker.net/>.
- 9 That is, changes that are relatively easy to implement quickly as they are more widely available and are usually cheaper or on a par with fossil-based alternatives.
- 10 These figures apply only to companies that made their responses public; they exclude reductions due to methodology changes, mergers and acquisitions (M&A), unknown cause or no rationale.
- 11 International Energy Agency, *Energy Technology Perspectives 2023*, 2023: <https://www.iea.org/reports/energy-technology-perspectives-2023>.
- 12 Zero-carbon-ready buildings are highly energy efficient and use either direct renewable energy or an energy supply that can be fully decarbonized by 2050, such as electricity or district heat.
- 13 Global Wind Organisation and Global Wind Energy Council, *Global Wind Workforce Outlook 2021–2025*, 2021: <https://gwec.net/wp-content/uploads/2021/06/Global-Wind-Workforce-Outlook-2021-2025.pdf>.
- 14 SolarPower Europe, *EU Market Outlook for Solar Power 2022–2026*, 2022: <https://www.solarpowereurope.org/insights/market-outlooks/eu-market-outlook-for-solar-power-2022-2026-2%23downloadForm#downloadForm>.
- 15 Alicia Parlapiano, Deborah B. Solomon, Madeleine Ngo and Stacy Cowley, “Where \$5 Trillion in Pandemic Stimulus Money Went”, *New York Times*, 11 March 2022: <https://www.nytimes.com/interactive/2022/03/11/us/how-covid-stimulus-money-was-spent.html>.
- 16 International Energy Agency, *Scaling Up Private Finance for Clean Energy in Emerging and Developing Economies*, 2023: <https://www.iea.org/reports/scaling-up-private-finance-for-clean-energy-in-emerging-and-developing-economies>. These figures include mitigation funding for power, buildings, transport and industry; they exclude agriculture and nature-based mitigation, and adaptation and resilience.
- 17 Ibid. “Levelized cost of energy” is defined as the average net present cost of energy generation over the lifetime of the asset, per unit of energy production.
- 18 International Sustainability Standards Board: <https://www.ifrs.org/groups/international-sustainability-standards-board/>.
- 19 JETP stands for “just energy transition partnership”, a bilateral agreement between a developing country and a set of developed countries to finance the decarbonization of the country as a whole, involving public and private funds.
- 20 Science Based Targets initiative: <https://sciencebasedtargets.org/>.



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