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G20 Zero-Carbon Policy Scoreboard

Issue 2021



BloombergNEF

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Executive summary

Governments around the world are considering how best to drive companies and consumers to reduce greenhouse-gas emissions with a view to avoiding catastrophic climate change. Many have begun to implement policies to achieve their goals, including setting a growing number of 'net-zero' targets. But which policies have been effective at spurring change so far, and what are the common pitfalls? Where could the next policy-driven opportunities lie? This report seeks to answer these questions by evaluating the G20 countries' policies to spur decarbonization to determine which governments have implemented the support needed to realize the goals of the Paris Agreement. It highlights examples of what works and could be replicated elsewhere, and flags where more progress is needed.

This is an extended excerpt from the full *Zero-Carbon Policy Scoreboard* report. Clients can access this more detailed assessment of the policies driving decarbonization in the G20 economies, as well as the underlying datasets, at the following links: [web](#) | [terminal](#).

Scoreboard methodology

- The 19 countries covered in this report have been scored out of 100% based on 122 qualitative and quantitative metrics that encompassed the number and types of policies implemented, including by state or provincial governments for the U.S. and Canada, and by the EU for the bloc's member states.
- We then assessed the 'robustness' of each country's policies as applied to six sectors – power, low-carbon fuels and carbon capture & storage, transport, buildings, industry and the circular economy. The evaluation took account of the transparency and predictability of the process, completeness of the policy mix, ambition and achievability, impact and contribution toward the country's targets.
- Other, entirely quantitative metrics were used to evaluate the effectiveness of a country's policy regime, such as sales of electric vehicles (EVs) or heat pumps, and share of renewables in a country's total electricity generation.

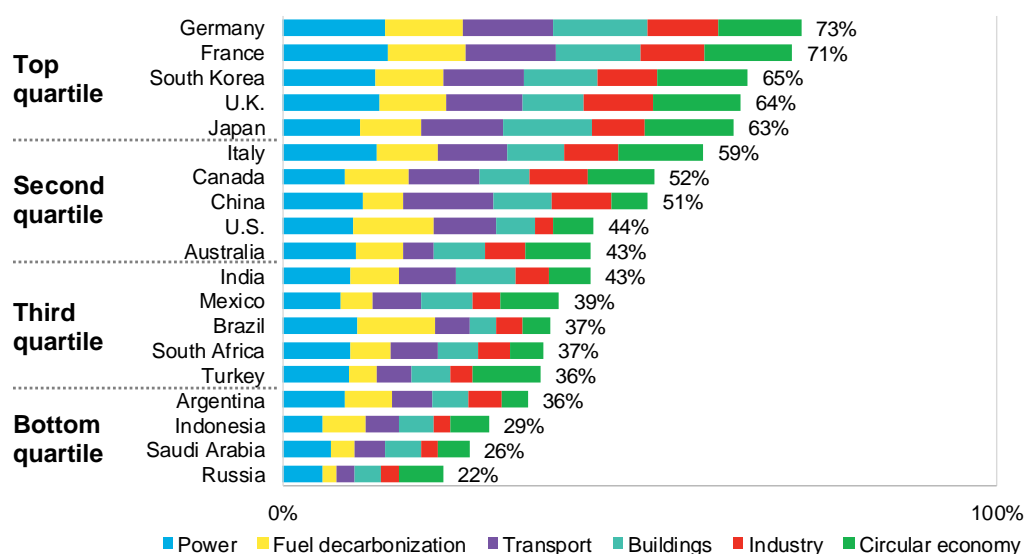
Scoreboard results

- Germany, France, South Korea, the U.K. and Japan are in the top quartile because they have implemented a higher number of robust, concrete measures to achieve ambitious-but-achievable targets. Their policy-making processes are relatively transparent and predictable, and their initiatives are starting to have a measurable impact increasing renewables build or electric vehicle (EV) sales, for example.
- With an average score of 67%, these countries have strong incentives for renewable power and flexible resources such as battery storage. In addition, their governments have begun to introduce measures to reduce emissions outside the electricity sector – notably transport

and/or circular economy. This is important because all five nations have net-zero emission targets for 2050, legislated or due to be passed into law in the next year.

- More often than not, policy makers in these nations have introduced both supply- and demand-side policies – making use of carrots and sticks – as well as for related infrastructure. They all price greenhouse-gas emissions or tax fossil fuel consumption, although none of their policies in these regards is perfect.
- No country has a perfect score for all areas, with those for the industry and buildings sectors most commonly the lowest. Governments will therefore need to consider how to best address these weaknesses if they wish to achieve their climate targets and deliver their share of emission reductions.

Figure 1: Policy Scoreboard – Issue 2021 results by sector

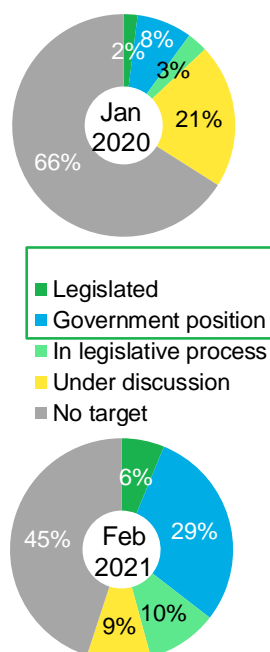


Source: BloombergNEF. Note: Fuel decarbonization = efforts to promote the production of green gas and biofuels, and CCUS.

- Coming close behind are those in the second quartile: Italy, Canada, China, the U.S. and Australia all have strong decarbonization policies in at least one sector. Most commonly, this is for power but two have secured the top spot for other areas of the economy: the U.S. ranks first for fossil-fuel decarbonization, and China for transport (with France and Germany).
- However, with an average score of 50% among them, these governments' policy mixes are generally incomplete, meaning they have yet to promote decarbonization in some areas. Alternatively, they may have gaps in the policy support they offer to certain sectors.
- With an average score of 38%, India, Mexico, Brazil, South Africa and Turkey are in the third quartile because they offer notably less support for decarbonization, both in terms of number and quality of policies. This is especially the case outside the power sector – eg, industry and circular economy.
- Those in the bottom quartile – Argentina, Indonesia, Saudi Arabia and Russia – have significant room for improvement. Their average score of just 28% reflects a dearth of measures in place. They have done most in power, but even those policies are often hampered by delays or overly stringent rules on participation. These countries have done little to nothing to decarbonize their transport, industry, and buildings sectors.

Section 1. Introduction

Figure 2: Greenhouse-gas emissions from countries and states with net-zero emission targets



Source: WRI CAIT, governments, BloombergNEF. Note: Includes 2016 greenhouse-gas emissions including land-use change and forestry. Includes EU, national and state-level net-zero and carbon-neutrality goals.

Just over five years ago in Paris, governments agreed to keep the global average temperature increase this century to below 2 degrees Celsius, and make efforts to limit warming to 1.5 degrees. The last two years have seen a surge in governments pledging to reach net-zero emissions. As a result, such targets are now in force in countries and states that accounted for 35% of greenhouse-gas emissions in 2016 – up from just 10% a year ago. Now, many governments have begun to implement concrete policy measures to realize these goals – some with success, some less so. With that in mind, this report outlines the main findings of the *Zero-Carbon Policy Scoreboard* – BloombergNEF’s evaluation of the G20 countries’ policies to spur climate action, highlights successes and points to where improvement is needed.

Section 2 presents some of the broad conclusions or ‘lessons learned’ regarding the ways in which governments can support the shift to a cleaner economy. Section 3 considers the cross-sector and -regional issues affecting decarbonization policy, such as international climate negotiations and fossil-fuel subsidies.

Section 4 provides a snapshot of the results for individual sectors – power, fossil-fuel decarbonization (low-carbon fuels and CCUS), transport, buildings, industry and the circular economy. This marks the inaugural edition of the Scoreboard and BloombergNEF will release the survey annually going forward. Each year, we intend to cast the spotlight in particular on an individual sector or issue. For this first edition, agriculture is featured in Section 4.7, the ‘focus’ section.

BloombergNEF clients have access to the detailed results behind the Scoreboard as well as deep-dive examinations of the policies driving decarbonization in the G20 nations across six segments of their economies. This report and the underlying datasets can be accessed at the following links ([web](#) | [terminal](#)).

Context

A total of 58 countries and states have announced net-zero emission targets (Figure 2). Of these, most have been stated as official government pledges, but 18 have been formally passed into law. A further 26 goals are currently being legislated. ‘Net-zero’ is more a cover-all label as these goals vary in which gases they cover, deadlines as well as if governments intend to rely on carbon offsets or not.

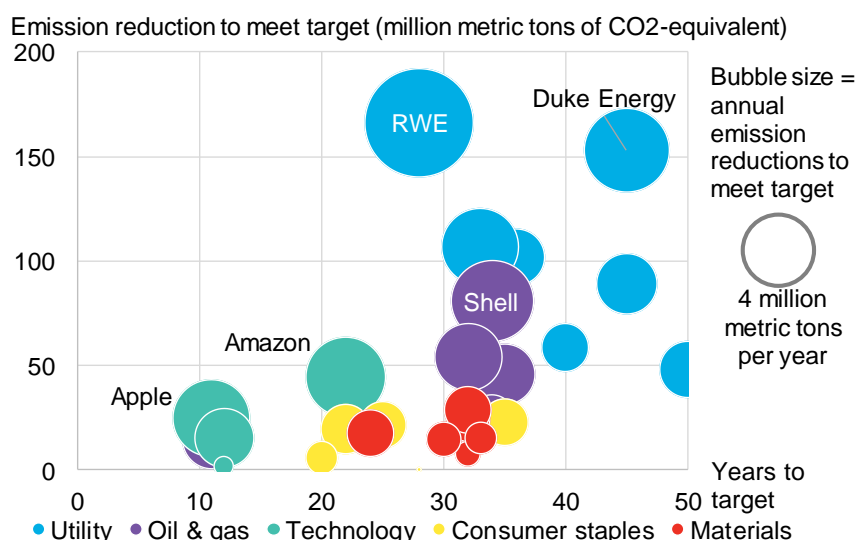
The same is also true of the flurry of corporate net-zero targets pledged in recent years, as companies seek to outdo their competitors. The corporations in Figure 3 must eliminate emissions totaling 1.3 billion metric tons of CO₂-equivalent to reach net zero – equivalent to the greenhouse-gas output of Brazil in 2016, including land-use change and forestry. Other

companies – totaling nearly a thousand as of October 2020¹ – have pledged a ‘science-based target’ – ie, to cut emissions in line with the Paris Agreement goals (Section 3.1),

Governments are therefore under pressure to devise a set of policies to achieve a significant reduction in emissions. This report focuses on the efforts of the G20 countries, as the biggest economies and emitters. There are in fact 19 individual country members of the G20 markets, with the EU being the 20th participant. We therefore take account of bloc-level policy when evaluating the three member states (France, Germany and Italy). And because the policy landscape for other countries is heavily swayed by subnational-level initiatives, these were also integrated into the assessment, especially for Canada and the U.S.

The Covid-19 pandemic continues to wreak economic havoc across the world. Yet governments and companies still need to take action to mitigate and adapt to the effects of climate change, even if greenhouse-gas emissions see a temporary reduction. With that in mind, some economic-recovery packages have included funding with an explicit aim to cut emission or aid climate adaptation, with approved green stimulus totaling \$921 billion by January 21, 2021.² However, this sum is still below \$1,041 billion – the total allocated to carbon-intensive sectors and companies, with no green component.

Figure 3: Corporate net-zero targets by years to deadline, absolute emission reduction required and remaining annual reductions



Source: Company filings, BloombergNEF, *Corporate Net-Zero Targets Primer: Jump on the Bandwagon* ([web](#) | [terminal](#)). Note: Scope 1 and 2 emissions, except for technology companies and Danone and Unilever (includes Scope 3).

The evaluation approach (described in Section 1.2) has sought to reflect the fact that there is no ‘silver bullet’ policy mix – governments have different resources and priorities, and face different hurdles in spurring the shift to a cleaner economy. Figure 4 highlights the varying emission pictures facing the G20 countries – in terms of both the scale and form of the decarbonization challenge.

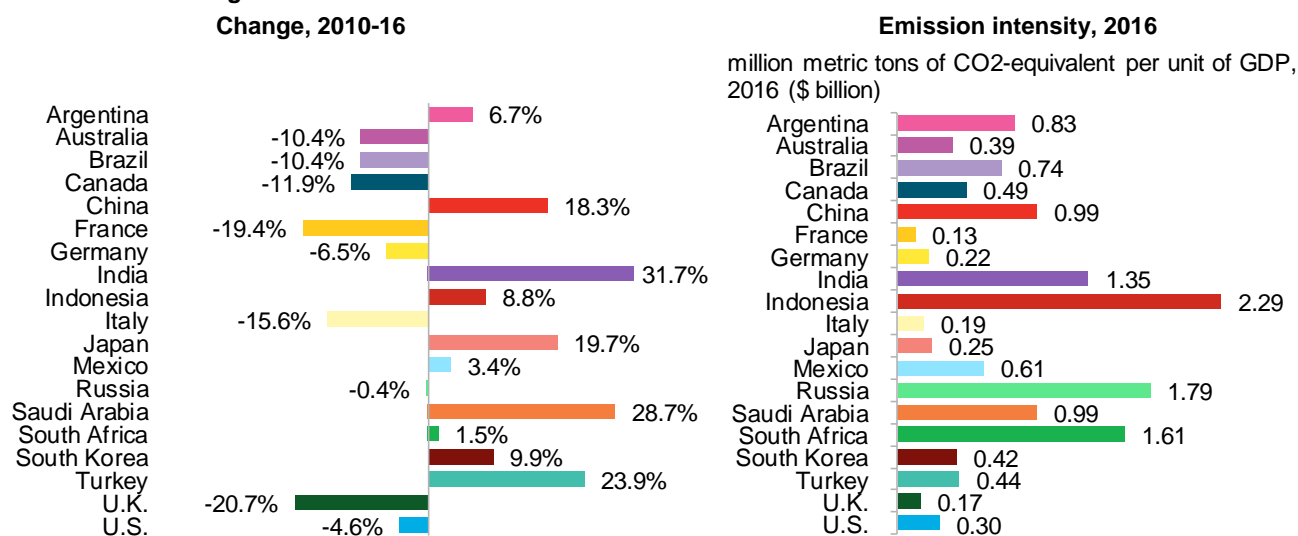
China achieved the biggest decrease in emission intensity over 2010-16, putting it at the lower end of other developing economies. Yet it increased absolute greenhouse-gas output over the

1 BloombergNEF clients: *Science-Based Targets Data Tool* ([web](#) | [terminal](#)).

2 BloombergNEF clients: *Covid-19 Green Policy Tracker 9: First U.S. Green Stimulus* ([web](#) | [terminal](#)).

period. Economic and population growth also caused India to realize the biggest increase in emissions between 2010 and 2016, with Saudi Arabia not far behind. The Middle Eastern country also has the second-highest emissions per capita, after Australia, where each person accounted for 20 million metric tons of CO₂-equivalent in 2016. In contrast, China stood at 0.05 million metric tons and India 0.02 million.

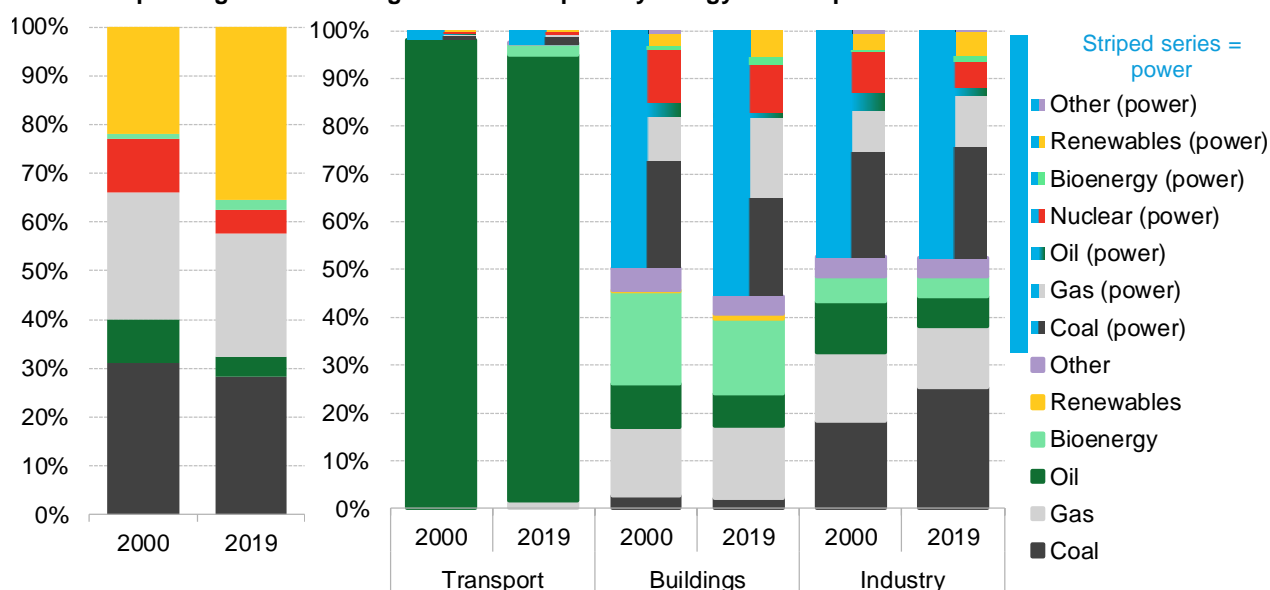
Figure 4: Greenhouse-gas emissions in G20 countries



Source: WRI CAIT database, International Monetary Fund, BloombergNEF. Note: Emissions include land-use change and forestry.

There is also no economy-wide 'silver bullet' for decarbonization with different sectors at different stages of progress. In terms of just the fuel mix, the electricity sector has seen the most change, with the fossil-fuel share of global power generation shrinking 9 percentage points to 66% over 2000-19 (Figure 5). Transport and buildings have both decreased the share of primary energy directly from fossil fuels, in favor of bioenergy (for the former) and electricity (for both) (Figure 6).

Figure 5: Global power generation Figure 6: Global primary energy consumption for selected sectors



Source: IEA, BloombergNEF. Note: The areas with a blue stripe indicate fuels used to generate power.

But taking account of the fuels used to generate that power used by those sectors, transport has only reduced its reliance on coal, gas and oil by 3 percentage points to 97% over 2000-18, while buildings increased that share by 2 percentage points to 62%. Industry remains dependent on fossil fuels, with a growing share for coal (both for direct combustion and as a power source).

The climate transition is not only a story of governments, sectors and companies – it will also need the participation of the general public. Policy makers will therefore need to take this into account, for example, by introducing incentives targeted at rooftop PV systems or electric vehicles (EVs), or by implementing programs to local residents support a nearby wind farm or power transmission line.³

1.2. Scoreboard methodology

The Policy Scoreboard assesses the decarbonization policies implemented by the 19 individual countries belonging to the G20, to provide a measure of progress so far and areas for improvement. A country's final score is based on over 10,000 data points spread across 122 metrics, which can be broken into the three categories in Figure 7.

Figure 7: Policy Scoreboard data-point categories

Presence	Robustness	Effectiveness
Measures which policy types are in place or in legislative process	Qualitative assessment of policies	Quantitative metrics to measure policy success

Source: BloombergNEF

The presence category of metrics, which accounts for around half a country's score and measures the number of policy types in place in a given country, taking account of those in force and those being legislated.⁴ Germany has the highest total score for policy presence, closely followed by South Korea and France.

The types of policy needed to spur climate action change as markets matures. To reflect this, different policy types were weighted differently depending on their sophistication and level of ambition or stringency. Broadly speaking, mandates or carbon-pricing schemes were weighted higher than targets or grant and loan programs.

Our analysis of the EU's current and former member states (notably France, Germany, Italy and the U.K.) incorporates policies implemented at the national and regional level. For some countries – notably the U.S. and Canada – climate action is driven by subnational governments. As such, their scores are a weighted average of the scores for their states and provinces, as well as any relevant federal-level policies. The weighted average was calculated based on emissions for the latest year available.

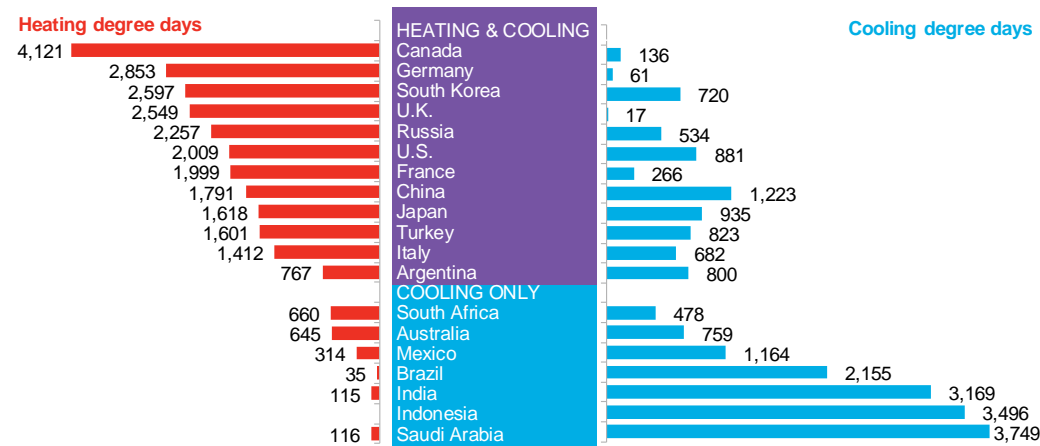
Local climate conditions mean that eliminating CO2 emissions associated with buildings, primarily by decarbonizing the production of heat, is a far bigger priority for some governments than others. To take this into account, if a country had significantly more 'cooling degree days' than 'heating degree days', it was deemed 'cooling only' (Figure 8) for scoring purposes. In such cases, their presence score for the buildings sector was based only on policies to promote energy efficiency

³ For more on this issue, BloombergNEF clients: *New Energy Outlook 2020* ([web](#) | [terminal](#))

⁴ Some governments' Covid-19 stimulus packages have included funding toward clean energy technologies such as EVs and hydrogen. Such initiatives were only included in the scoring for this report if they comprised long-term policy measures – rather than one-off increases in funding.

(including for air conditioning). All other countries were deemed 'heating and cooling' and scored on a wider number of metrics.

Figure 8: Heating & cooling, and cooling-only countries



Source: Bloomberg. Note: Heating and cooling degree days are the cumulative number of degrees that a day's average temperature is below or above 18 degrees Celsius.

Implementing a large number of decarbonization policies does not automatically result in emission reductions. The robustness metrics, which contributed around a quarter of countries' scores, seeks to take this into account by evaluating the quality of its policy mix, based on BloombergNEF's significant experience in the sectors, technologies and geographies. In our assessments, we took account of the following criteria:

- **Transparency:** The policy-making process should be clear and open, with details well communicated to industry and potentially with changes subject to consultation.
- **Predictability:** Market participants should have long-term visibility on future support, be confident that potential changes are announced well before implementation, and know that changes will not retroactively cut support.
- **Completeness:** The overall policy mix should be sufficiently comprehensive to be effective, meaning few exemptions or gaps in coverage.
- **Ambition:** Targets should be sufficiently high to spur changes but not so high that they are unrealistic and ineffective.
- **Impact:** Policies should make a noticeable impact on the market and help the country progress toward its climate goals.

To assist our qualitative evaluation of these policies, we also collected data relating to 33 quantitative metrics to measure their effectiveness. The G20 countries are at different stages of economic development and decarbonization. We therefore levelized these metrics as much as possible – for example by focusing on rates of change over given periods of time (eg share of renewable power generation), or the share in a given year (change in annual EV sales).

Section 2. Lessons learned

The G20 countries in this report face different challenges regarding decarbonization and have implemented different policies in response. There is obviously no one-size-fits-all policy solution for deep decarbonization. That said, in the process of this evaluation we did observe some broader trends that have the potential to be applied across multiple nations and sectors.

Overarching targets should be ambitious but realistic

- Governments often kick off their decarbonization policy-making processes by setting long-term goals for emission reductions. This is the case for the countries in this report, all of which have long-term targets of varying levels of ambition.
- Some have also produced roadmaps or strategies for specific technologies to, for instance, build certain volumes of renewable energy capacity, add certain numbers of electric vehicles (EVs) to roads, or produce a certain number of tons of 'green' hydrogen. These can signal a government's intentions to the market and highlight potential investment opportunities.
- However, targets are generally only effective if they are both ambitious enough to require significant change and realistic enough not to be meaningless. Examples of the latter include Saudi Arabia's target for 27.3GW of renewables capacity by 2024 and 58.7GW by 2030. As of year-end 2019, the country had just 0.4GW installed.⁵

Targets must be paired with concrete follow-through policies

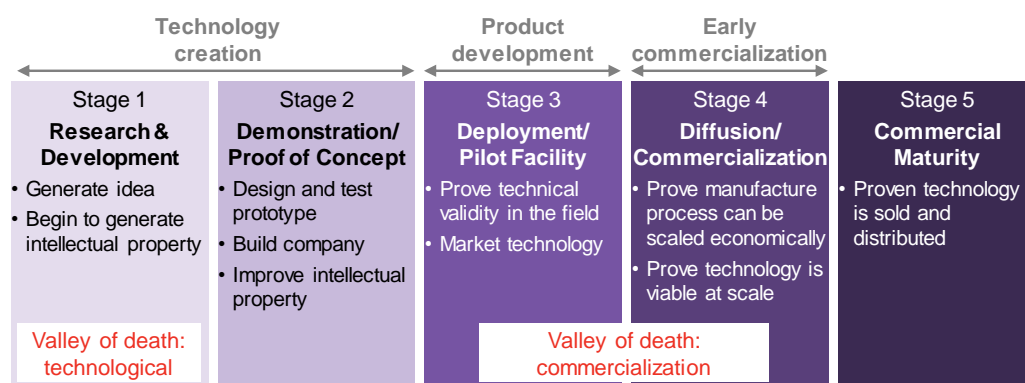
- On their own, targets can have relatively little impact – they need to be followed up by concrete measures offering longer-term financial or fiscal support. Some countries in the survey were marked down for failing to implement follow-up policies. For example, India's cooling plan – one of the first in the world – is ambitious but lacks sufficient financial incentives to implement it.
- Similarly, in 2017 the U.K. government released seven action plans for energy-intensive industries, including emission-reduction targets of 60-97% by 2050 below 2012 levels. However, it implemented little support to achieve those plans, other than a few one-off funding competitions with limited budgets.

Policies must be tailored to the maturity of the technologies they seek to support

- Policy makers should implement support for existing technologies as well as mechanisms to promote the development of new technologies required to achieve deep decarbonization. Technologies at different stages of maturity (Figure 9) require different types of support.
- Moving a technology from the research phase to commercialization typically involves crossing at least one 'valley of death' when developers face high cash demands but lack capital. Historically, there have been two critical locations where capital shortfalls have come into play: at the first, earliest stage when a technology is ready to exit the lab, and during deployment and diffusion, when the challenges of commercialization come to the fore.

5 BloombergNEF clients: *Saudi Energy Transition Outlook 2020* ([web](#) | [terminal](#)).

Figure 9: Stages of technology maturity



Source: BloombergNEF, *Crossing the Valley of Death*, 2010.

- In general, higher-scoring countries have introduced support for overcoming the first-stage valley, in particular R&D funding programs.
- The countries in this report have a range of such programs in place to support newer energy-transition technologies and approaches such as low-carbon hydrogen (eg, Germany's 'Reallabore der Energiewende'), carbon capture, use and storage (CCUS – eg, the U.S. R&D program), and process-emission savings (eg, EU Research Fund for Coal and Steel).
- The second valley, between product development and early commercialization, is a crucial point for policy support. At this stage, governments should go beyond one-off programs to provide ongoing support to help technologies achieve this transition – eg, such as EV purchase subsidies, renewable power feed-in tariffs or grants for heat pumps. These should enable the technology to ramp up deployment, in order to prove viability at scale and bring down costs.
- These incentives may be allocated via administrative procedure (in the same way as in the early days of renewable feed-in tariffs in Europe). Alternatively, they may be based on competition-based mechanisms, as in Brazil and India for renewable power and are being considered for low-carbon hydrogen production in Europe. The former approach may strengthen investor certainty of future support, while the latter tends to, but does not always, bring down costs for government.

Decarbonizing entire sectors requires policy cocktails

- There is no silver bullet for decarbonizing entire sectors of an economy; governments must pursue multiple pathways to achieve substantial emissions cuts. In the power sector, for instance, renewables can reduce emissions but systems with large wind/solar shares will also need access to flexible resources like storage.
- Countries that score highest in our survey tend to have the most complete policy frameworks per sector. For example, some of those in the bottom quartile may only have implemented policy support targeted at the 'easier' and cheaper decarbonization pathways, or they may have failed to promote infrastructure build-out.
- Even those in the top quartile fell into this trap: Germany's building renovation program introduced in 2016 helped improve energy efficiency. However, the country lags on metrics such as low-carbon heating, with 75% provided by oil and natural gas in 2018.⁶

6 BloombergNEF clients: 2020 Germany Energy Transition Outlook ([web](#) | [terminal](#)).

True decarbonization means abandoning fossil-fuel subsidies now

- Decarbonization is fundamentally inconsistent with subsidizing the production or consumption of fossil fuels. G20 countries provided \$584 billion⁷ of such support annually 2017-19. This undermines their zero-carbon promises and policies by distorting markets while increasing the risk of locking in emission-intensive assets for decades to come.
- Removing fossil-fuel subsidies is often politically challenging. But a minority of support goes directly to consumers: nearly half of the G20 total was allocated to oil and gas production and another fifth to fossil-fuel-fired power generation. Even consumer-specific subsidies as currently structured often fail to benefit the most vulnerable citizens.

When carrots aren't tasty enough, sticks may be required

- Generous fiscal and financial incentives have in a number of cases proven effective at spurring decarbonization efforts. This has included feed-in tariffs or tax benefits that kick-started wind and solar deployment (but are less needed today since those technologies have come down in cost).
- However, if governments are unwilling to offer sufficiently generous 'carrots' to sectors to decarbonize, they must instead consider 'sticks'. This can mean mandates or bans to force system change and can include abolishing coal-fired power, requiring biofuel blending, dictating buildings-energy intensity levels, or mandating recycled-content use.
- It helps if these mandates are binding and imposed on specific players (eg, electricity suppliers), rather than a whole sector or country where there is no clear penalty for non-compliance. Mandates can also be gradually increased over time (with future changes announced well in advance to give industry time to respond).

The broader policy-making context is critical

- Several countries in the survey scored lower because their policy-making processes lack transparency and fail to invite sufficient stakeholder input, or because their governments make irregular, unexpected changes to policies. Mexico is a prime example of such unpredictability and this has hurt its renewable power market.
- Other examples from this report are unexpected delays to renewables auction programs (eg, Turkey and South Africa) and to policy delivery (eg, Australia's National Electric Vehicle Strategy and the U.K.'s Energy White Paper, which was finally published in December 2020).

No sector is an island – joined-up approaches are best

- Substantial interdependencies exist between sectors, especially when deployment of one technology is at least somewhat contingent on the deployment of others. Most notably, to ensure electrification of end-use sectors such as heating is accompanied by decarbonization, a power system must become greener. It will likely also mean other changes for the electricity sector such as the need for more flexible resources.
- Countries that scored highest in the survey have begun to look beyond their power sectors for decarbonization opportunities. Most often, they have sought to promote transport electrification and a more circular economy. Most have also introduced incentives for industry and buildings.

7 International Institute for Sustainable Development (IISD), *Doubling Back and Doubling Down*, 2020.

Decarbonization requires infrastructure proliferation

- The world will need some 290 million charging points by 2040 to serve the growing EV fleet, BNEF estimates. This amounts to \$111 billion of investment in public charging for passenger and commercial vehicles alone over the next 20 years. Other sectors will require similar, or much larger, levels of infrastructure build-out to decarbonize sufficiently.
- Countries such as Germany, the U.K. and China have incentives in place to spur such infrastructure deployment. But governments will have to grow their support in coming years, particularly those seeking to facilitate use of hydrogen or CCUS. A complete conversion of the world's power sector to zero-carbon will mean trillions in investment in transmission.
- Covid-19 recovery packages offer a good opportunity for governments to invest in green infrastructure. South Korea, China and Germany have allocated stimulus support to EV chargers, and Canada and France have announced electricity-grid funding to help renewables deployment. However, governments have also approved hundreds of billions of dollars for infrastructure build-out with no effort to reduce greenhouse-gas emissions.

...and well trained people

- Deep decarbonization will require a virtual army of millions of skilled workers to build out the required infrastructure. A key obstacle both to growth and to emissions reduction today in some sectors is the lack of qualified personnel. This is particularly true in the buildings and agriculture sectors currently but stands to become a bigger challenge in other areas in coming years.
- The U.K.'s Green Homes Grant scheme, introduced in September 2020 as part of the government's Covid-19 recovery measures, provides funding for energy-efficiency upgrades. However, activity has been delayed due to a lack of contractors with required certifications.
- Achieving a major efficiency scale-up, for example, requires a large, skilled workforce, meaning governments should offer funding for training and certification. Information campaigns targeting homeowners are also required and can be tied to financial support. Governments should establish and expand organizations to provide this information.

Section 3. Global issues

This section discusses cross-sectoral policy efforts to further decarbonization. While there are positive signs that the Paris Agreement has spurred healthy competition between nations to cut CO₂, just 15% of global emissions are subject to some form of a carbon price or tax today and in 2019 the G20 provided over \$147 billion in 2019 in fossil-fuel subsidies. Given that nations are moving at substantially different speeds to address climate change, border-adjustment mechanisms may offer the best – if controversial – means to enable sufficient ambitious climate policy.

3.1. International climate diplomacy

Figure 10: Structure of the Paris Agreement process



Source: BloombergNEF

Coordinated action by multiple countries could accelerate efforts to address emissions and take steps to adapt to a warmer planet. The United Nations Framework Convention on Climate Change (UNFCCC), established in 1992, is the main forum for international action on climate change. Its overall aim is to stabilize greenhouse-gas concentrations in the atmosphere at a level that will prevent dangerous human interference with the climate system. The 197 signatory parties to the UNFCCC meet on an annual basis at the Conference of Parties (COP) to assess progress and make further decisions. However, this progress has been slow, in part due to the requirement for unanimity on all agreements and some parties' seeming unwillingness to compromise.

Relevance of the Paris Agreement

One of the UNFCCC's biggest achievements to date was the Paris Agreement, adopted in 2015, which aims to keep global average temperature increases this century to below 2 degrees Celsius. As the first truly global agreement on climate change, its inception was a diplomatic achievement in itself. Its design is deemed an improvement over the Kyoto Protocol as it enables signatories to agree on the broad direction of travel but to choose different strategies and protect their own interests. In contrast, the Kyoto Protocol took a top-down approach, with only certain parties taking on an emission-reduction target.

Each party that has signed and ratified the Paris Agreement was meant to submit in 2020 a new nationally determined contribution (NDC) – non-binding plans detailing how it intends to cut emissions and adapt to climate change. NDCs are reviewed every five years, through a 'pledge, review and ratchet' cycle (Figure 10). The first cycle started when parties' first plans were pledged in 2015, at COP21 in Paris.⁸ Now, five years on, countries are due to unveil more ambitious plans. However, 71 had submitted a new or updated NDC by year-end 2020, representing some 28% of global emissions. Governments may well cite the effects of the Covid-19 pandemic, which also delayed the 2020 UN climate summit (COP26) by a year. The first and second NDCs submitted to date are insufficient to keep warming to within 2 degrees.⁹

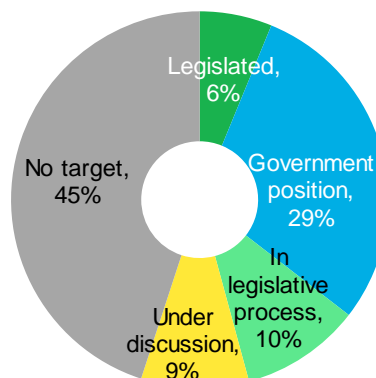
8 Parties submitted their first 'intended nationally determined contributions' (INDCs) in 2015, nine months before COP21. INDCs become NDCs when countries confirm the Paris Agreement into their national legislation (or 'ratify' the Agreement). Countries that have not 'ratified' the deal still only have INDCs.

9 Climate Action Tracker, November 2020.

Paris has proved effective as a framework to spur countries to increase their climate ambition, in a move to 'keep up with the Joneses'

Critics of Paris say that it fails to deliver concrete emission reductions. However, that was arguably not its goal – rather it is a mechanism to track governments' climate commitments and spur them to ratchet up ambition every five years. It relies on a system of intangible peer pressure to be a 'climate leader' or 'race to the top' – or at least keep pace with competing markets. Concrete examples of this effect are difficult to pinpoint but a growing number of nations have made zero-carbon pledges in recent years, particularly in 2020.

Figure 11: Global greenhouse-gas emissions covered by national net-zero targets



Source: BloombergNEF. Note: 2016 greenhouse-gas emissions with land-use change and forestry. 'Government stated position' = government has officially stated a net-zero target but have not enshrined it in legislation.

Indeed, it could be argued that Paris and the next round of talks have made 'net-zero' by 2050 or some other day very much in vogue, as this is the minimum level of ambition needed to limit warming to 1.5 degrees Celsius, according to the Intergovernmental Panel on Climate Change. While declared net-zero targets grab substantial media attention, actual legislated net-zero targets cover just 4% of global greenhouse-gas emissions in 2016 (Figure 11). A further 28% relates to markets where a government has an official net-zero goal in place but have not sought to legislate it, while 11% is undergoing a legislative process.

Offsets in Paris (Article 6)

In addition to the NDC process, parties to Paris were to establish a global carbon market-based mechanism (under Article 6). But negotiators have twice failed to reach a deal on the rules for this market (first at COP24 in Poland, then at COP25 in Madrid). The postponement of the 2020 talks now means the earliest the rules can now be agreed is 4Q 2021. The future of the Kyoto Protocol's Clean Development Mechanism (CDM) hinges on the decisions made about transitioning Kyoto credits into the new market.

There are two components of Article 6:

- **Trading target achievements (Article 6.2):** this enables parties to cooperate in order to achieve their NDCs, using Internationally Transferred Mitigation Outcomes (ITMOs). Parties can 'buy' ITMOs generated by the emission reductions of another party, and count the reductions toward their own NDC. This allows buyer countries to finance emission cuts in another country, to meet their own commitments. Rigorous accounting should ensure that there is no double counting of mitigation.
- **Global offset market (Article 6.4):** this aims to establish a new global carbon offset market to encourage mitigation while raising funds for climate change adaptation. It is similar to the

Governments were also meant to agree on a new global carbon market-based mechanism

But such an agreement has yet to materialize, with the biggest areas of contention being how to deal with remaining Kyoto credits and share of proceeds

Kyoto Protocol's CDM but requires parties to reduce global emissions, rather than to offset growth such that overall emissions remain flat. This is referred to as overall mitigation in global emissions (OMGE).

The Article 6 design was due to be finalized by 2018. But the most contentious issues yet to be decided concern whether Kyoto units will be valid for the new global offset market, and whether a 'share of proceeds' and OMGE will apply to Article 6.2

Kyoto units

Global accounting of Kyoto units, or Certified Emissions Reductions (CERs) is poor, and estimates of how many historic credits are in existence vary. Allowing credits into the Paris Agreement framework could significantly reduce its ambition, if the amount of units transferred in is high. Further, these credits were very cheap and would not be enough to drive the level of emission reductions needed globally. They would be worth even less if they cannot be used to fulfil NDCs. Yet projects have been verified by the UNFCCC and attracted investment in good faith, leading host countries to fight for their inclusion.

Share of proceeds and OMGE

The Paris Agreement specified that a "share of proceeds" from the global offset market established in Article 6.4 would be channelled into the UNFCCC's Adaptation Fund, which helps finance climate adaptation projects and programs in developing country parties. The Alliance of Small Island States and The African Group – countries that have teamed up to be stronger at COP negotiations – are keen for a share of proceeds to enter the fund, while some parties call for OMGE principles to apply to Article 6.2, to ensure that the mechanism reduces global emissions. Resistant parties, namely the U.S., argue that both the share of proceeds and OMGE essentially constitute a transaction tax that would deter trading and undermine Article 6.2.

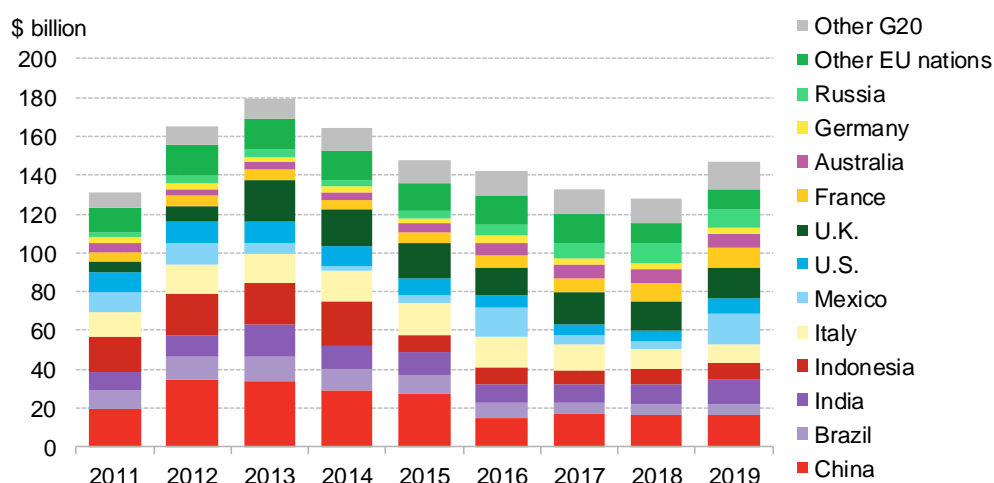
3.2. Fossil fuel subsidies

Policy makers at the G20 summit in 2009 agreed to phase out "inefficient" fossil fuel subsidies

Another important global issue affecting countries' policy efforts to reduce emissions is fossil fuel subsidies, which can be broadly defined as any government measure that makes fossil-fuel production or consumption more economically viable than other energy sources. In essence, they act as a negative carbon price. Subsidies can take a number of forms, from lowering the price paid by an electricity consumer, to providing grants to oil companies for drilling.

The need to reduce greenhouse-gas emissions and the growing number of lower-carbon technologies have spurred some policy makers to agree to reduce fossil fuel subsidies. Indeed, at the G20 Pittsburgh Summit in 2009, governments committed to "phase out and rationalize over the medium term inefficient fossil fuel subsidies". They did not define "inefficient" other than to say that such subsidies "encourage wasteful consumption, distort markets, impede investment in clean energy sources and undermine efforts to deal with climate change". They also did not specify a deadline year to achieve this goal. However, EU member states pledged to phase out subsidies by 2020, and G7 countries (Canada, France, Germany, Italy, the U.K. and the U.S.) agreed a deadline of 2025. The 12th Sustainable Development Goal aims to 'rationalize inefficient fossil-fuel subsidies' by 2030.

Figure 12: Annual fossil-fuel subsidies provided by G20 countries



Source: OECD, BloombergNEF. Note: Data includes consumption and production subsidies but does not include Saudi Arabia which does not disclose such data. 'Other EU nations' data excludes, Croatia or Cyprus.

None of these targets is close to achievement: 10 years on from the Pittsburgh Summit G20 countries except Saudi Arabia provided in 2019 over \$147 billion¹⁰ in direct budget transfers (eg, and tax breaks to foster coal, oil and gas production and consumption (Figure 12). This marked compound annual growth of 1.3% over the last decade. Saudi Arabia, which has historically been less transparent on such funding, continues to provide considerable aid for fossil fuels.¹¹

On top of direct budget transfers and tax concessions, the G20 governments also support the sector through reduced retail energy prices and investment by state-owned enterprises. In total, the G20 provided an average of \$584 billion over 2017-19 in fossil-fuel support, of which nearly half was spent on oil and gas production and another fifth on fossil-fuel-fired power generation.

Fossil fuel subsidies still totalled nearly \$150 billion in 2019

Some governments are undertaking fossil fuel reforms and are often find the process both slow and difficult politically. However, such support mechanisms distort markets and risk carbon 'lock-in' – whereby assets funded today will be around for decades, locking in high levels of future emissions. Fossil fuel subsidies may be designed to ensure security of domestic energy supply, to protect vulnerable consumers or to support jobs. However, other mechanisms – eg, renewables incentives and 'just transition' policies¹² – can meet these needs as well, without the same lock-in risk. There is also evidence that fossil fuel subsidies tend to benefit wealthier consumers rather than the targeted vulnerable groups.

In an attempt to speed up the phase-out process, G20 Finance Ministers developed a framework for voluntary peer reviews of fossil-fuel subsidies in 2013. The idea was to facilitate sharing of experiences and learnings in phasing out fossil-fuel subsidies between countries. China and the U.S. were the first to undertake such reviews of each other's fossil-fuel support, published in 2016. Germany and Mexico followed in 2017, then Indonesia and Italy in 2019. Argentina and Canada, and France and India, are in the process of undertaking peer reviews. The reviews are

10 This figure includes all EU member states except Cyprus and Croatia and excludes Saudi Arabia.

11 International Institute for Sustainable Development (IISD), *Doubling Back and Doubling Down*, 2020.

12 Just transition policies aim to support companies, workers and local communities affected by the shift from fossil fuels to cleaner technologies.

likely to have varying degrees of success. Unless there is a strict timeline set out for the phase-out of subsidies, countries may feel little pressure to act upon the reviews.

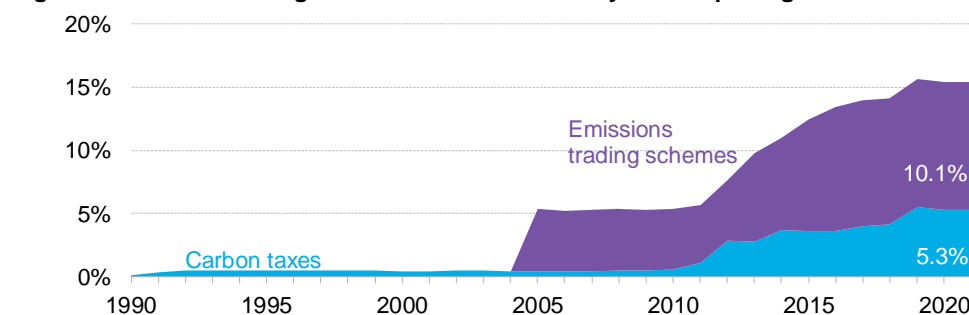
3.3. Carbon pricing

Over 22% of global emissions will be covered by a carbon price once China's national scheme begins

More governments than ever are pricing greenhouse-gas emissions with the aim of having polluters cut output. Absent a carbon price, polluters nothing for the costs their emissions impose on the environment, although in some schemes, they can pass on the carbon costs down supply chains. There are two main ways for governments to price carbon: market-based mechanisms such as emission-trading systems (ETS) or taxes. In a market, prices tend to start low and rise over time, allowing companies to adapt to their changes in cost, without a sudden shock to consumers. However, if the price remains too low (or concessions are too generous), the carbon price will have little effect on participants.

Just over 15% of emissions, across more than 80 countries or regions, are currently subject to a carbon price. This is set to grow to over 22%, upon the implementation of scheduled schemes in China, Germany, Virginia and the Mexican state of Tamaulipas. Of the emissions covered, 5.3% are subject to taxes, and 10.1% to market-based mechanisms (Figure 13).

Figure 13: Share of total global emissions covered by carbon pricing



Source: World Bank, BloombergNEF

Carbon pricing is perhaps an obvious weapon in a policy maker's toolkit to deter the use of carbon-intensive fuels and incentivize cleaner technology, though it is best used as part of a policy suite. This is because carbon pricing alone may not be enough to drive the types of innovation required to reach a net-zero world¹³. The design features of an emission trading scheme or tax can differ significantly, as can the realized carbon price. Existing measures vary greatly in terms of the price and scope in a region it covers (Figure 14 and Figure 15).

In a carbon market, participants have greater flexibility over how to meet compliance at lowest cost – whether by submitting allowances or offsets¹⁴ or by reducing their emissions. A carbon tax has less flexibility but has the benefit of being administratively simpler than an emission-trading scheme. Governments set the price of a tax, often many years into the future, giving all stakeholders price certainty. In a market-based mechanism, the price fluctuates to reflect the

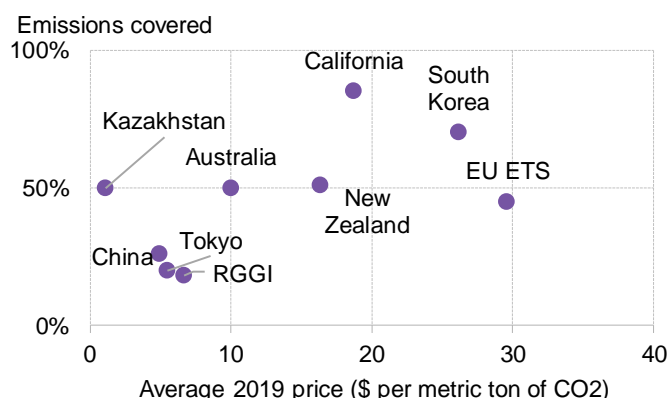
¹³ A fluctuating carbon price may not provide the certainty required for companies to make long-term investments. Further, the technologies needed for deep decarbonization are far from commercialization – these projects are unlikely to be scaled up unless there is further financial support available.

¹⁴ Carbon offsets can be used as compliance instruments in some carbon markets, such as the California cap-and-trade system. A carbon offset represents the reduction, avoidance or sequestration of one metric ton of CO₂. They are separate from carbon allowances, which are instruments that represent the legal right to emit one metric ton of CO₂.

supply and demand balance in the market. However, the price is also subject to other factors, such as market sentiment, meaning it may not align with true abatement costs.

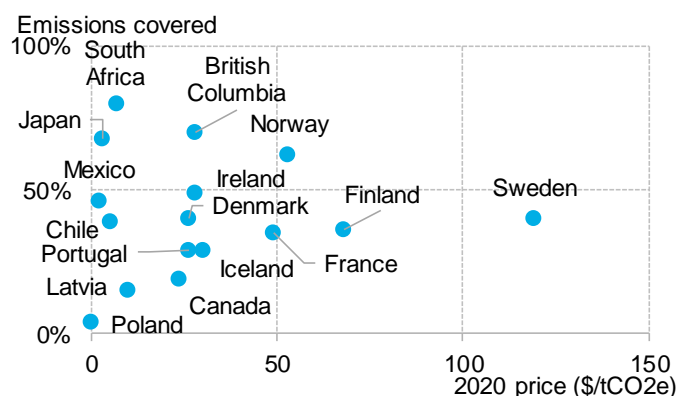
Historically, cap-and-trade schemes have been more politically palatable than carbon taxes. Some governments have taken steps to increase the acceptability of taxes by making them revenue-neutral, whereby funds raised from the carbon tax are used to reduce other taxes. This is the case in British Columbia, for example. Other carbon policies may choose to spend revenues on helping the region decarbonize, for example the EU ETS' Innovation Fund.

Figure 14: Carbon price and emission coverage in jurisdictions with market-based mechanisms



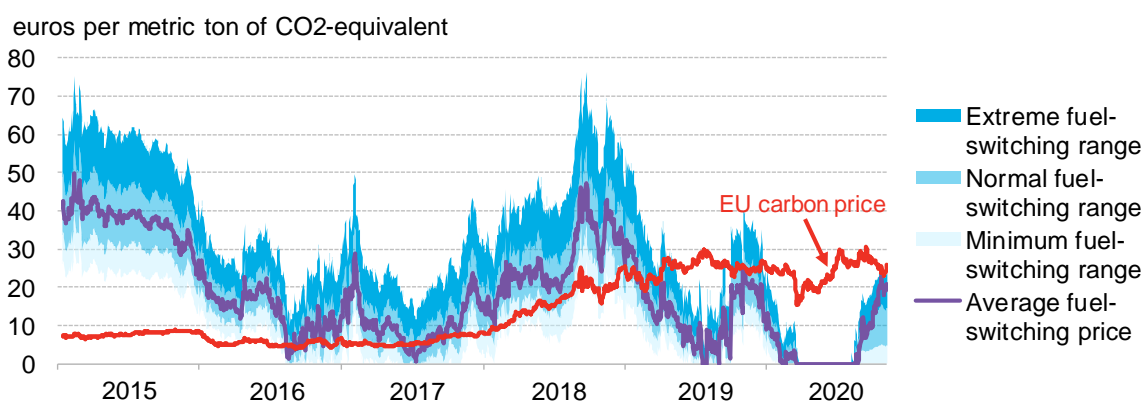
Source: World Bank, BloombergNEF. Note: Prices have not been adjusted to reflect any free allocation or exemptions. RGGI = the U.S. Regional Greenhouse Gas Initiative. Figure 15 shows the highest price where a region has multiple carbon prices.

Figure 15: Carbon price and emission coverage in jurisdictions with a carbon tax in place



The world's highest price is the tax in Sweden, at \$119 per metric ton. However, many schemes have a price below \$10 a metric ton, which is not enough to drive meaningful emission reductions. Over the last decade, the EU ETS – the largest carbon market in the world – has seen prices range from \$5.02 (2016) to \$41.14 (2011).

Figure 16: European carbon allowance price and northwest Europe carbon fuel-switching price



Source: BloombergNEF. Note: Minimum range = carbon price that would make the most efficient gas plants more profitable than the least efficient coal plants. Extreme range = least efficient gas plants would be more profitable than the most efficient coal plants.

As an example of how carbon-pricing mechanism can spur emission reduction, in 1H 2020, a mix of low gas and high carbon prices in Europe raised the price of emission allowances well above the 'fuel switching range' (Figure 16). This is the range in which gas plants become more profitable than coal, helping to reduce lignite output in Germany by 27% and coal by 32% in the

first nine months of 2020 relative to the same period in 2019. Meanwhile, gas generation rose by 35%. This fuel switching equated to some 27 million tons of emission savings, equivalent to 12% of German power sector emissions in 2019.

3.4. Carbon leakage

Governments wishing to scale up climate action in sectors exposed to global competition may implement a carbon border adjustment mechanism

Governments with ambitious climate goals will need to look across their economies for emissions-reduction potential, including sectors exposed to international competition. However, this raises concerns of ‘carbon leakage’ whereby a company moves operations to markets with lower environmental compliance costs (eg, no carbon price). If this occurs, then a carbon price or other policy has failed to reduce global net emissions – it has simply shifted them to another location.

As a result, governments implementing a carbon price have often granted concessions to companies deemed to be at risk of carbon leakage. These may take the form of lower tax rates, or a share of ‘free allocation’ in the case of emissions trading schemes such as the EU and South Korea markets.

Companies granted such concessions have less incentive to decarbonize, even though they may need to reduce emissions for a country or state to realize its climate goals. As such, some governments are exploring whether to implement a carbon border adjustment mechanism (CBAM). These policy measures seek to ensure that domestic and overseas companies face similar environmental costs, hence removing carbon leakage risk. California’s cap-and-trade scheme, implemented in 2013, is the world’s only example of a CBAM in the power sector. The state relies on imports from other states to meet around a third of its electricity consumption. Importers must buy allowances to cover emissions from out-of-state generation not covered by California’s emission-trading scheme. Adapting regulation to minimize ‘resource shuffling’ has been challenging. This refers to a form of carbon leakage whereby ‘dirtier’ power initially scheduled for California is diverted to another region, resulting in no change to overall emissions.

The European Commission is due to publish a proposal for a CBAM in 2021, and will likely target emission-intensive goods that are easy to trade, such as aluminum, steel, cement and electricity. The proposal is likely to be contentious, as designing a CBAM requires trade-offs between environmental impact and political feasibility. Imposing high penalties from the start could result in backlash and punitive counter-measures. A less onerous and controversial measure is unlikely to prevent carbon leakage. Economic models gauging the risk of carbon leakage vary in their conclusions, with no clarity on the level of carbon pricing that would lead industrial manufacturers to relocate. Regardless, the European Commission perceives the risk as real enough to warrant implementing a CBAM. For more, see *New Dawn for Carbon Pricing as EU Targets Imports* ([web | terminal](#)).

An EU proposal is due to be released in 2021, while the new U.S. president and Canadian government have shown their interest in such a policy

The EU proposal could carry more political weight if U.S. President Joe Biden imposes “carbon adjustment fees or quotas on carbon-intensive goods from countries that are failing to meet their climate and environmental obligations”, as per his [climate plan](#) published before the election. As Biden may struggle to pass a CBAM through Congress, he may opt to strengthen existing tariffs using carbon leakage as the justification. Canada’s federal government also intends to work with EU member states and its North American partners on a potential border carbon adjustment, according to its [Fall Economic Statement](#).

Other nations, including China, will have less room to retaliate if multiple markets implement similar measures. Those with their own ambitious climate policy regimes will likely argue against

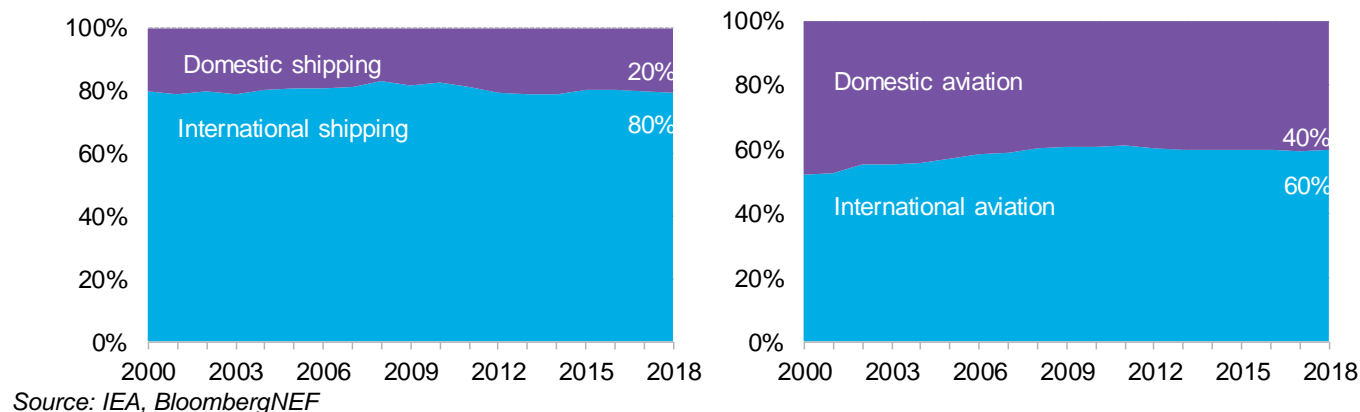
stringent CBAMs. Heightened global trade tensions could also highlight the need for regions to be more self-sufficient.

3.5. International travel emissions

Governments are working to agree on policies to tackle international aviation and shipping emissions through ICAO and IMO

The Paris Agreement and NDCs do not cover emissions from international aviation and shipping – ie, journeys that depart from one jurisdiction and arrive in another. Instead, parties have opted to work through the International Civil Aviation Organization (ICAO) and International Maritime Organization (IMO) to reduce these international emissions. This is important because such journeys can comprise a sizable share of the aviation or shipping sector's total emissions and final energy consumption (Figure 17). For example, in the EU, greenhouse-gas output from 'domestic' journeys – those that both depart and arrive within the EU – only accounted for 38% of total shipping emissions for the bloc in 2018. As a result, the remainder were classed as 'international' and hence not included in the EU's NDC.

Figure 17: Final energy consumption for shipping and aviation



In 2018, shipping was responsible for 11% of total global transport emissions, and aviation 12%. Without additional mitigation measures, this share could expand: global aviation and shipping may account for almost 40% of economy-wide carbon by 2050, up from around 4.5% in 2019, according to the [European Environment Agency](#).¹⁵ Indeed, the Asia Pacific region sees the highest levels of growth, accounting for 47% of all aviation carbon emissions by 2050, based on BloombergNEF analysis. Emissions in North America and Europe increase by 50%, together reaching around 0.8GtCO₂ in 2050 (Figure 18).

The new aviation offset scheme began in January 2021, and a shipping program is in the works

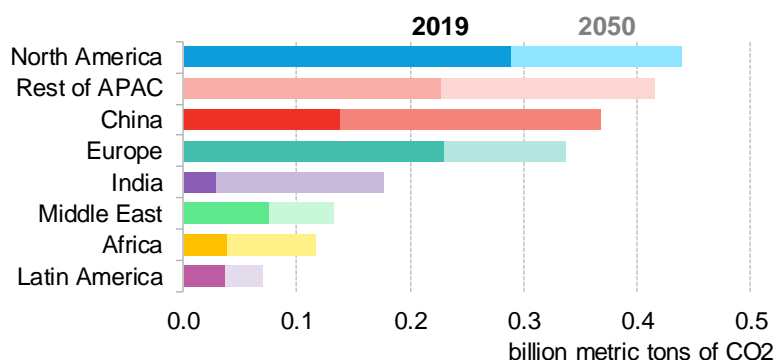
The aviation sector has made slightly more progress in devising mechanisms, having adopted the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) in 2016. This program, which began on January 1, 2021, will require airlines to offset any growth in emissions above 2019 levels.¹⁶ They can comply using either CORSIA eligible offsets, or claim emissions reductions from certain fuels. The pilot (2021-23) and first phase (2024-26) will be voluntary, followed by a second phase in 2027-35. A total of 88 [volunteer countries](#) had signed up as of October 2020, including the U.S. and all EU member states. [China and Russia](#) have denounced the program, saying it would unfairly penalize emerging economies. The U.S. remains on board,

¹⁵ Despite Covid-19's impact on air travel in 2020, passenger air travel demand almost triples over 2019-50 and air freight demand more than double, according to BloombergNEF analysis. BloombergNEF clients: [2020 Aviation Fuel Outlook \(web | terminal\)](#).

¹⁶ The original baseline was 2019 but it was changed after aviation emissions in 2020 dropped due to the Covid-19 pandemic.

on the condition that Corsia “is applied by other major aviation states”. While the second phase is ‘mandatory’ for ICAO members, little can actually be done to enforce this.

Figure 18: Projected aviation-related CO2 emissions by region



Source: BloombergNEF

Shipping’s [IMO GHG Strategy](#), adopted in 2018, aims to halve emissions from ships by 2050 and reduce the carbon intensity of the sector by 40% by 2030, compared with 2008 baselines. Under the IMO, ships must report their emissions under a mandatory measurement, reporting and verification scheme. The organization has also established legally binding energy efficiency measures. Industry has submitted a proposal to establish a research and development fund, financed through a fuel levy still under consideration by the IMO. It proposes a mandatory levy of \$2 per metric ton on marine fuel, which may raise \$5 billion over 10 years. Funds would be invested in accelerating the development of zero-emission technology for the sector.

Some parties, namely the EU, may opt to take unilateral action as they consider that ICAO and IMO negotiations are not fast or ambitious enough. The European Commission has been ramping efforts to bring emissions from international aviation and the maritime sector under the EU ETS. It launched in July 2020 a [consultation](#) including the option to bring back international carriers into the EU ETS – a proposal that caused an uproar in 2013.¹⁷

3.6. Sustainable finance

Private-sector investment will play a crucial role in achieving decarbonization, although sustainable finance is hindered by the lack of a regulatory definition of ‘green’

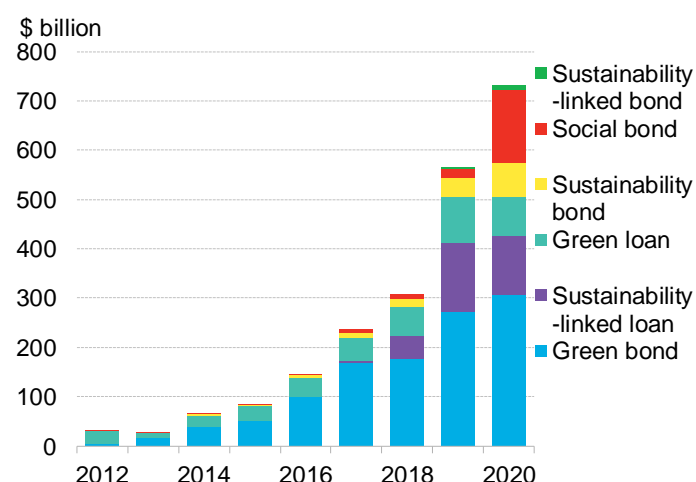
The deployment of capital in support of projects or companies with carbon-reducing attributes – sustainable finance – has the potential to make climate contributions for years or even decades to come. The private sector can play a crucial role in a transition to a low-carbon economy, by ensuring that financial instruments stack up environmentally and are aligned with international climate targets.

Sustainable debt describes borrowing activity via loans and bonds that are used to promote environmental or social improvement. Some instruments raise money to finance or refinance green or social projects or activities. Others are used to promote institutional sustainability targets and goals. The amount of global activity in sustainable debt continues to increase. Green bonds are the most popular type of sustainable debt (Figure 19). EMEA leads the charge, accounting for over half of sustainable debt by region (Figure 20). The increase is fueled by investors’ concerns

¹⁷ Fierce opposition from foreign carriers led to an exemption known as ‘stop the clock’, whereby only intra-EU flights were included in the EU ETS. The exemption has been extended multiple times.

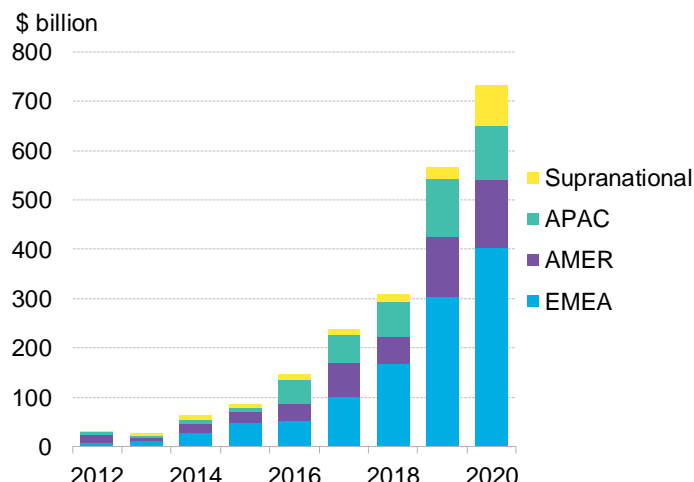
over climate change, and the desires of companies, banks and governments to be seen 'doing the right thing' as well as to manage climate change-related risks.

Figure 19: Sustainable debt issued by type



Source: BloombergNEF, Bloomberg LP.

Figure 20: Sustainable debt issued by region of risk



The uptick in sustainable finance over the last few years could signal that cash is flowing in the right direction for parties to achieve their various NDCs under the Paris Agreement. However, there remains a lack of clarity in the sector on the precise definition of 'green', even though transparency and credibility are key to the growth of the sustainable debt market.

In 1H 2020, the organizations behind a number of voluntary international frameworks enhanced their guidelines in response to investor concerns about lack of clarity. These guidelines – relating to sustainability-linked bonds and loans, green loans, social bonds and sustainable development goal bonds – help bring clarity, despite the continuing lack of a binding legal framework. The EU also made a step toward preventing greenwashing¹⁸ and boosting green investments with the adoption of the EU Taxonomy for Sustainable Activities and further details on the Green Bond Standard. China also revised its criteria for green bond activities.¹⁹

If the definition of green finance is expanded to include any type of fund that uses a strategy associated with "sustainability," the totals are considerably higher. Over \$30 trillion was held in sustainable or green investments in 2018, up 34% from 2016, according to the [Global Sustainable Investment Alliance](#).

¹⁸ 'Greenwashing' refers to unsubstantiated or false claims of being environmentally sound.

¹⁹ For more, BloombergNEF clients: *2H 2020 Sustainable Finance Market Outlook* ([web](#) | [terminal](#)).

Section 4. Sector results

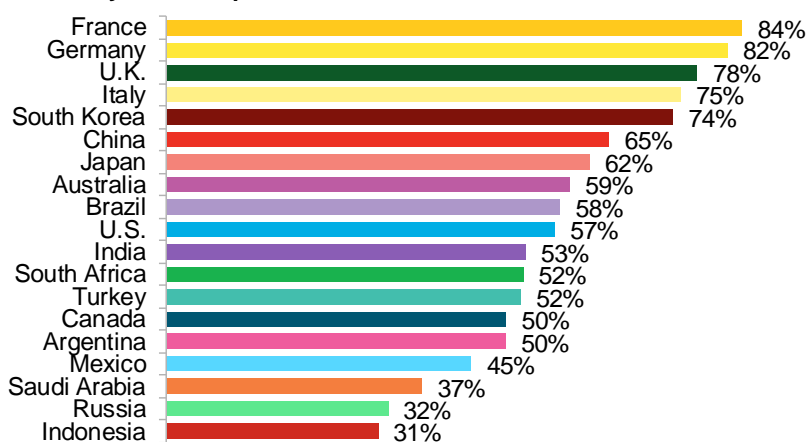
This section outlines the main findings of this year's *Zero-Carbon Policy Scoreboard* for each of the six sectors included in the assessment – power, fossil-fuel decarbonization, transport, buildings, industry and the circular economy. In addition, the focus section at the end casts the spotlight on a significant sector or issue that is not included in the ranking. In this inaugural edition, the topic is how to decarbonize agriculture.

The subsections below are an extended excerpt from the full *Zero-Carbon Policy Scoreboard* report. Clients can access detailed sector-by-sector report, as well as the underlying datasets, at the following links: [web](#) | [terminal](#).

4.1. Power

In our first *G20 Zero-Carbon Policy Scoreboard* ([web](#) | [terminal](#)), European nations top the table for policies to promote clean power, as ambitious targets, stable auction programs and the EU Emissions Trading System provide clear investment signals to the market.

Figure 21: Country scores – power



Source: BloombergNEF

The main findings regarding policies to decarbonize the power sector were as follows:

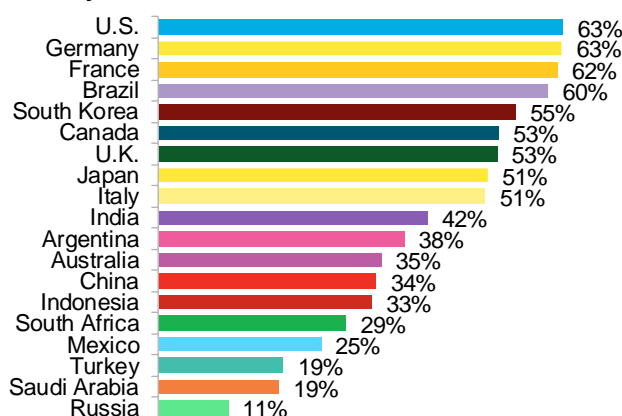
- G20 countries have implemented more policies to decarbonize their power systems than they have to clean up other segments of their economies. Power's sizeable share of emissions has made it a priority and affordably-priced renewables have eased policy making. Collectively, the G20 scored higher (58%) addressing power emissions than other sectors.
- The G20 have adopted varying approaches, which could be replicated elsewhere, with some local tailoring. Government-run reverse auctions for clean-power delivery contracts are among the most common. Best-scoring countries provide market participants transparency and certainty about how and when such tenders are held.

- Even countries with significant renewables deployment must adapt policies to evolving market conditions to ensure sustained progress. This could mean measures to ensure operating renewables projects are shielded from major power-price “cannibalization”, or schemes to incentivize flexible resources to balance the growing share of variable generation.
- While markets such as China, the U.S. and Europe have significantly reduced the carbon intensities of their power systems, the sector remains a major emitter overall. Moreover, power’s decarbonization stands to be even more important as governments promote electrification as a means to cut emissions from other sectors, such as transport or heat.
- Some countries have policies with conflicting goals as governments seek to appease different stakeholders. For example, Germany – a renewables leader – plans to keep coal online until 2038. We await to see whether China, South Korea and Japan will continue to support coal build in light of their recently announced net-zero targets.

4.2. Fossil-fuel decarbonization

The U.S. secures top spot for its effective and wide-reaching federal and state-level incentives for bioenergy and CCUS. Germany and France are runners-up, with well-developed hydrogen plans.

Figure 22: Country scores – fossil-fuel decarbonization



Source: BloombergNEF

The main findings regarding policies to spur a shift to low-carbon fuels and CCUS were as follows:

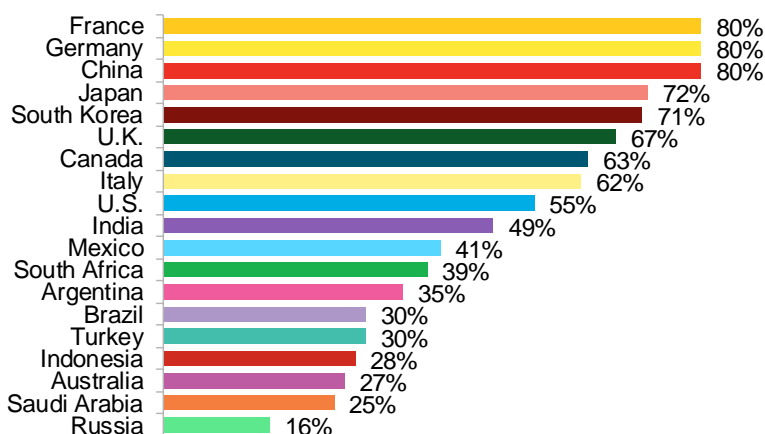
- Liquid biofuels have the most mature market of the technologies in this note, as is reflected in the level of policy support. The most common types of incentives are demand-side targets or regulations, which have proven effective in the U.S. and Brazil. Some countries have seen less growth due to lack of ambition or compliance.
- Similarly, biogas policies to date have mostly centered on demand. Several G20 countries also aim to support farmers and rural development. France has the most developed policy mix in this area, including targets and incentives to promote production and consumption of biogas and biomethane.
- Electricity and combined heat and power remain the dominant end-uses for biogas. But given competition from wind and solar power, governments should promote consumption by industry, buildings and heavy transport instead. They should also incentivize sustainable feedstock, as some governments (eg, the EU) have done, while others (eg, Brazil) have not.

- Over half of the G20 has plans to produce and/or consume hydrogen. But few have introduced explicit hydrogen policies, beyond some pledges for electrolyzer installations of varying levels of ambition. Governments should implement dedicated fiscal and financial incentives, to promote pilot and demonstration projects by cutting capital costs and risk.
- For CCUS to realize its full potential, financial incentives are needed to promote deployment and bring down costs. One reason why the U.S. is home to two-thirds of global carbon-capture capacity is the 45Q tax credit and additional policies at state level.

4.3. Transport

China, France and Germany rank the highest of the G20 countries for road transport. All three have implemented robust policies, which have driven electric vehicle (EV) sales.

Figure 23: Country scores – road transport



Source: BloombergNEF

The main findings regarding policies to decarbonize the transport sector were as follows:

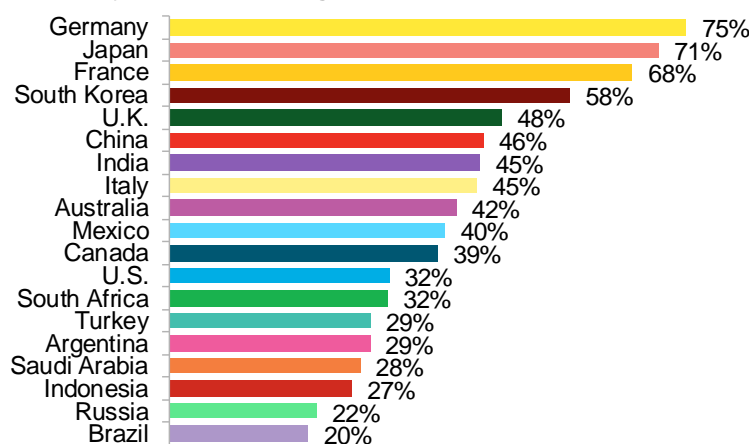
- Transport – as one of the fastest-growing sectors in terms of emissions – has been a focus of policy makers seeking to spur decarbonization. In particular, electrification, especially of road transport, has attracted the most attention in the past five years and will likely play a key role in achieving significant emission reduction in this sector.
- Policies lowering the upfront costs have been the most effective tool for driving early-stage adoption of passenger EVs and are offered in most G20 countries. These will likely remain necessary until EVs reach upfront price parity with internal combustion engine (ICE) vehicles.
- On top of such incentives, countries with high EV adoption have also implemented stringent fuel economy targets. China has one of the world's most aggressive fuel efficiency regulations as well as the New Energy Vehicle (NEV) credit program, which aims to stimulate EV supply by allocating annual production mandates to automakers.
- Some countries (eg, Japan, South Korea) have such goals but they are too weak or not binding, to drive change. The U.S. – previously a leader on EV sales – have seen deployment stall due to weakened fuel economy standards and limited model availability.
- The U.S. also lacks charging infrastructure – an area where governments play an important role. Most G20 countries offer some support, varying from home charging grants and public investment, to deployment targets or obligations on petrol station operators.

- Three of the G20 countries also plan to phase out sales of ICE vehicles. Yet few governments have followed up such announcements with concrete implementation measures, with no clear penalties for missing these targets.

4.4. Buildings

Germany ranks highest for buildings thanks to a large-scale renovation program and steady decline in the use of fossil fuels for heating. But decarbonizing buildings across the board has a long road ahead.

Figure 24: Country scores – buildings



Source: BloombergNEF

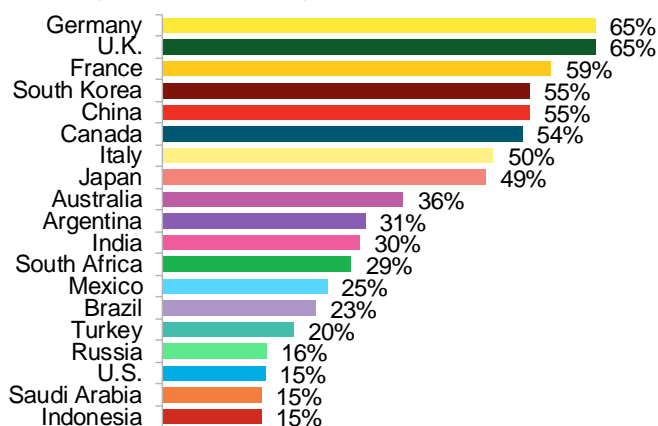
The main findings regarding policies to decarbonize the buildings sector were as follows:

- The top-scoring countries have implemented strong support for a particular decarbonization strategy – eg, renovations in Germany, heat pumps in Japan and electric heating in France. However, one-track approaches will be insufficient to achieve climate goals, especially for countries with net-zero targets.
- Energy-efficiency goals are relatively common in the G20 but are not enough to drive significant improvements in practice. One option is to introduce financial incentives, as seen in Europe and Japan, although these have a mixed track record. Regulation can be more effective, but is rare in practice, especially for existing buildings and rented properties.
- Low-carbon technologies like heat pumps could play a significant role in building decarbonization. Yet most G20 countries do not provide enough policy support to overcome their high upfront costs. Other barriers may also require policy attention – eg, feedstock constraints for bioenergy and infrastructure needs for hydrogen and district heat networks.
- Decarbonizing buildings will also require policies that increase technical knowledge across the value chain – from consumers to installers to energy suppliers and equipment manufacturers. In the near term, a lack of qualified installers could slow uptake (as seen in the U.K., for example) or even lead to insufficient demand.
- Not all G20 countries have significant space heating demand. India was at the top of the list among warmer nations. It was the first in the world to introduce a national cooling action plan, although the scheme lacks details on implementation and financing.

4.5. Industry

Germany and the U.K. have the highest scores for industry. But there is an overall dearth of policy to promote decarbonization in this area: industry had the lowest average score of the six sectors.

Figure 25: Country scores – industry



Source: BloombergNEF

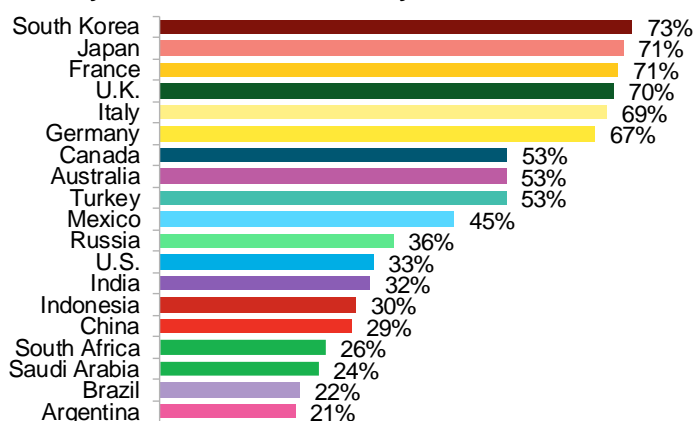
The main findings regarding policies to decarbonize the industry sector were as follows:

- There are good reasons why cutting industrial emissions will be difficult: many sectors face significant international competitive pressure and are important to the local economy, or have carbon emissions inherent to their production processes.
- Even so, governments with net-zero ambitions need to take action, as policy requires time to take effect. In addition, industrial equipment has especially long lifetimes and in some countries (eg, Germany) a sizeable share is approaching the end of its useful life. Clear decarbonization policies can set investment signals for new assets and replacements.
- Half of the countries in this report price carbon emissions from at least some industrial sectors. But these programs have yet to drive significant abatement as the levies may be too low (eg, Japan and Argentina), are only paid on a share of emissions (eg, in Canada) or because companies have benefitted from substantial free allowances (eg, South Korea).
- Nearly two-thirds of the G20 countries have implemented energy-efficiency incentives, although potential savings are quite limited. Some of the most effective schemes (eg, India and China) have comprised binding targets plus financial incentives.
- With sectors reliant on high-temperature heat, governments could increase funding to promote deployment of industrial-scale electrification options. More R&D funds would also accelerate commercialization of techniques to cut process emissions from industrial activities.
- There is also little support for lower-carbon fuels or CCUS, although a few G20 countries (eg, the U.K., Germany and South Korea) have begun to fund hydrogen and CCUS demonstration projects at industrial clusters. Governments could also introduce green product mandates, although few policy makers have taken this step so far.

4.6. Circular economy

South Korea secured pole position for circular economy policy, closely followed by Japan, the U.K. and France. Spurred by limited space for landfill, they were all early adopters of waste reduction measures.

Figure 26: Country scores – circular economy



Source: BloombergNEF

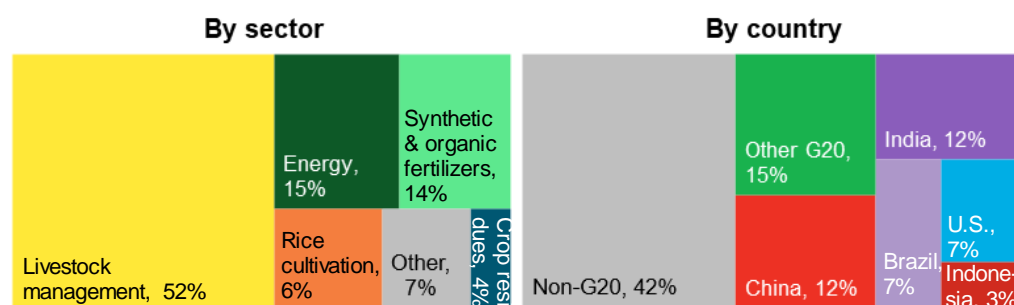
The main findings regarding policies to promote a shift to a more circular economy were as follows:

- The aim of a circular economy is to reduce waste and prevent materials at the end of their useful life from harming the environment. However, making the global economy more circular would also lower emissions, for example, by promoting re-use or recycling of materials.
- The G20 countries vary significantly in terms of the extent and stringency of their circular economy policy support. Spurred by limited space for landfills, Japan, South Korea and European nations were all early adopters of waste reduction measures such as high tipping fees and extended producer responsibility schemes to fund recycling.
- However, policies focused on waste prevention, re-use and recycling are more effective than those that merely dictate rules around recovery and landfilling. Enforceable measures like taxes and mandates also tend to drive more change than 'soft' targets.
- For example, programs that charge households based on the volume and type of waste have proved effective in South Korea and Japan, while the U.K. and EU are leading the world in terms of mandates requiring that certain products contain a certain share of recycled material.
- Some G20 countries like South Africa and Saudi Arabia have only the most basic policies, while others such as China and Argentina have yet to translate ambitious plans into law. Alternatively, rules may be poorly enforced, or there could be a lack of strong policy at the national level, leaving subnational governments to take the lead, as in the U.S.
- China's waste-import ban, which spurred other countries to follow suit, has accelerated the move to a circular economy. Governments could further these efforts with waste-export bans, to spur domestic recyclers to expand capacity, as seen in Australia.

4.7. Focus section – agriculture

Agriculture is not included in the final scoring of G20 countries' policies. Rather, agriculture is included as a 'focus' section highlighting a key sector or issue.

Figure 27: Global agriculture greenhouse-gas emissions, 2017



Source: UN Food & Agriculture Organization, WRI CAIT, BloombergNEF.

The main findings regarding policies to decarbonize the agriculture sector were as follows:

- Agriculture, which accounts for a 12th of global greenhouse-gas emissions, will be challenging to decarbonize: most farms are small and cash-constrained but employ a significant share of workers in certain areas. Assets like tractors have long lives.
- The EU's Common Agricultural Policy – one of the most comprehensive packages in the sector – has seen limited support for decarbonization. One reason is because funds are distributed based on land ownership rather than how it is used. However, ongoing reforms could boost the policy's contribution to climate action.
- Efforts to reduce livestock emissions could have the biggest impact on climate mitigation in the sector and a range of strategies – at varying levels of deployment – is available. Mandates and financial incentives are some of the most common policy types to tackle livestock emissions, such as those in Canada and Europe. But more are needed.
- Fossil fuels remain the dominant energy source on farms, especially in developing countries, and there is little dedicated support. However, some clean energy or efficiency programs are open to farmers, especially schemes focused on energy access/resilience.
- There is even less policy support for electrified transport as well as technical, practical and financial barriers. In some countries, some farming activity still relies on manual labor or animals, although governments are working to promote mechanization.
- Over-use of (subsidized) fertilizers has driven up emissions in developing countries. Subsidy programs are underway but can meet political resistance. Another approach would be to support agricultural strategies or new products that involve less (or no) synthetic fertilizers.
- A significant barrier to climate action is a lack of awareness and understanding in the sector. Governments should therefore implement training, certification and knowledge-sharing networks, as seen in China and New Zealand.

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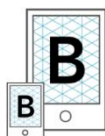
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