Inevitable Policy Response 2021
Policy Forecast
Detailed resource

Preparing financial markets for climate-related policy and regulatory risks

March 2021

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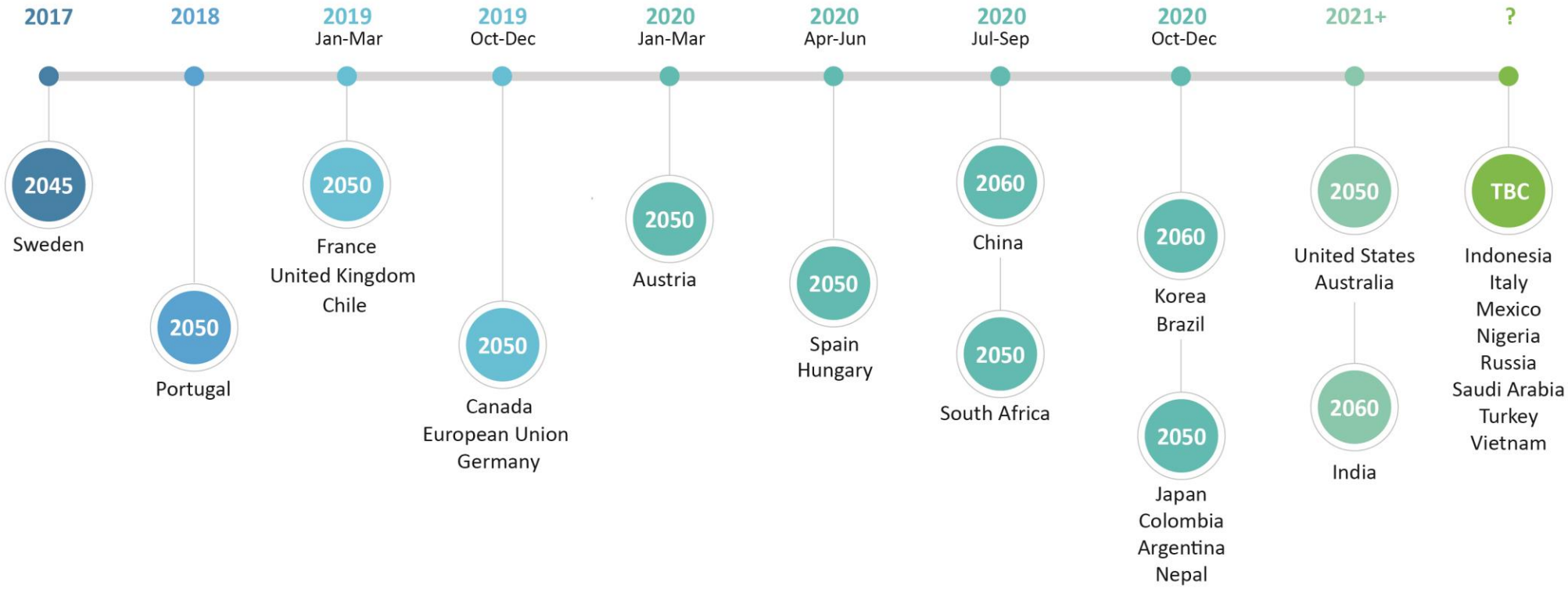
Net zero targets

Following a wave of announcements in 2020, we forecast the United States, India and Australia will announce their net zero emissions targets by 2023

Announcement timeline for net zero emissions targets



Net zero targets – new announcements by 2023

Country	Reasons for Forecast
USA	**Clear policy ambition of President Biden** • President Biden assumed office on 20 January 2021. • The 2020 Biden plan for a clean energy revolution and environmental justice, part of Mr. Biden's broader Vision for America proposals put forward for his 2020 presidential election campaign, pledged to set an objective for the U.S. to achieve a 100% clean energy economy and achieve net-zero emissions no later than 2050, with an enforcement mechanism to achieve this objective. • This target is in line with broader Democratic Party policy, as set out in the *Democratic Party statement on Combating the climate crisis and pursuing environmental justice* under the 2020 Democratic Party Platform, and the recommendations to Congress set out in *Solving the Climate Crisis*, the report prepared by the Democratic Party majority members of the bipartisan Select Committee on the Climate Crisis in June 2020.
India	**Natural culmination of multiple drivers** • Energy independence is a key strategic policy objective • Substantial groundwork laid by rapid push on renewables • Desire of Prime Minister Modi to show national and international leadership
Australia	**Substantial pressure to act on climate** • Prime Minister Scott Morrison stated on 1 February 2021 'Our goal is to reach net zero emissions as soon as possible, and preferably by 2050' • The international pressure for Australia to firm this up will be high in the lead up to COP26

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Detailed Policy Forecasts

Carbon pricing

Carbon pricing – Overview

Coverage trends

Widening coverage
64 carbon pricing initiatives are in place, covering over 22% of global GHG emissions.

Growing momentum
Coverage has increased fourfold in the last decade; in 2010, 20 initiatives covered around 5% of emissions.

Policy trends

Carbon pricing is a key component of net zero strategies…
All IPR countries with net zero ambition (11 in all) have some form of carbon pricing, including announcements of new carbon pricing mechanisms.

… and is under consideration more widely
8 out of 10 IPR countries without net zero ambition, do not have any form of carbon pricing, although some are investigating introduction of carbon pricing. 2 out of 10 IPR countries without net zero ambition have some form of carbon pricing.

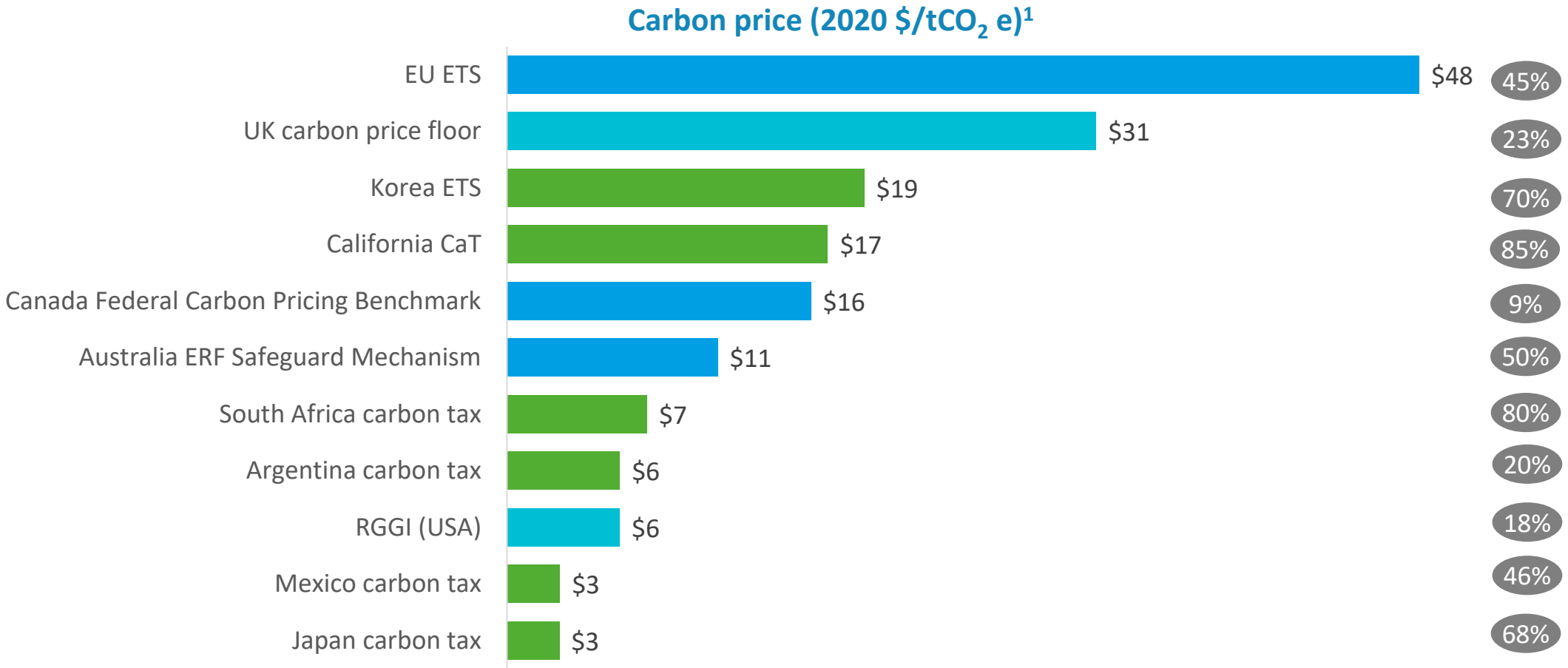
Policy forecast

Widespread coverage by 2030
All major economies will have carbon pricing schemes covering emissions in power and industry by 2030.

Policy ambition creates strong price signals
Policy ambition backstops prices of $60-85 by 2030 in leading countries, $35-50 elsewhere.

CBAMs driving price convergence
Beyond 2030, policy ambition continues to put upward pressure on prices, with carbon border adjustment mechanisms driving convergence with leading countries.

Current carbon prices for IPR countries range from $3-$48/tCO$_2$e across all sectors of the economy and cover 9-85% of all national emissions



Notes: 1) As of November 2020, the latest date for which data was compiled by the World Bank Carbon Pricing Dashboard, except for the EU ETS price, which is for March 2021 and the UK carbon price floor, for which the price is the reserve price for the UK ETS, set in February 2021

Source: World Bank Carbon Pricing Dashboard

Drivers and barriers of carbon pricing policy

Drivers[1]

Citizen pressure

Policymakers will implement carbon pricing when citizens are supportive of stringent climate action by government. 7 out of 21 IPR countries had a lower percentage of respondents supporting their country limiting its greenhouse gas emissions as part of an international climate agreement, than the average of 76% of respondents for G20 countries, according to a Pew survey carried out prior to the Paris Agreement.

Barriers[2]

Industrial competitiveness

Policymakers are more concerned that carbon pricing will put industrial competitiveness at risk in countries where iron and steel and chemicals - highly traded, energy intensive sectors - make up a large share of GDP. Chemicals made up greater than 2% share of GDP in 8 out of 21 IPR countries, whilst iron and steel made up greater than 2% share of GDP in only one country.

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Notes: 1) Factors which are likely to cause policymakers to accelerate ambition (or at least not hinder it); 2) Factors which are likely to cause policymakers to delay ambition (or at least hinder it)

Summary of major policies for carbon pricing

Net zero ambition countries[1]

USA does not have a carbon pricing scheme at the federal level. However, eleven states have carbon pricing regimes.

France has a national carbon tax for energy products, in addition to the EU emissions trading scheme.

Germany has a national emissions trading scheme (ETS), in additional to the EU emissions trading scheme.

Italy is subject to the EU ETS.

China's National ETS system launched in February 2021 and initially covers the power sector.

Canada's Federal Carbon Pricing Benchmark covers electricity and industry.

The UK's ETS was announced by government in February 2021 and will have similar coverage to the EU ETS.

The Korean ETS system covers 70% of all GHG emissions in the country.

Japan's carbon price covers the extraction and import of fossil fuels.

Argentina's 2019 Carbon Dioxide Tax covers coal and most liquid fossil fuels.

The South African Carbon Tax covers 80% of all emissions in the country.

Other countries[2]

Nigeria and Saudi Arabia do not have carbon pricing systems in place. Carbon pricing is on the political agenda in Saudi Arabia, but not Nigeria.

India and Russia do not have carbon pricing systems in place. Government is struggling to introduce carbon pricing due to political resistance.

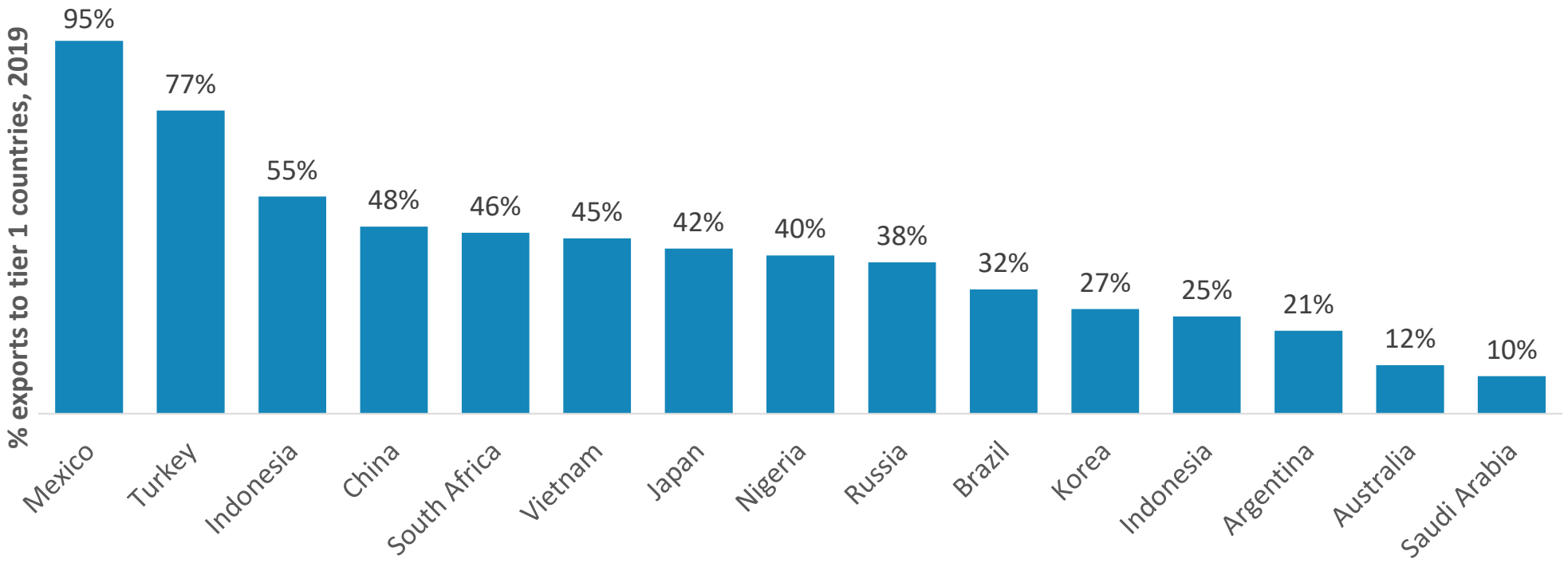
Turkey, Vietnam and Indonesia do not have mandatory carbon pricing in place, but are considering ways to introduce carbon pricing, including through pilot ETS schemes.

Australia and Mexico have some carbon pricing in place.

Notes: 1) Countries which have set a net zero target in law or in a policy document; 2) Countries which have not officially set zero targets in law or in a policy document

Carbon border adjustment mechanisms (CBAMs) from tier 1 countries will put pressure on other countries to implement more ambitious carbon pricing

Exports to IPR tier 1 countries for carbon pricing[1]	
Higher exports to tier 1 countries	**Lower exports to tier 1 countries**
CBAMs exert stronger pressure to implement ambitious carbon pricing	CBAMs exert weaker pressure to implement ambitious carbon pricing



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Notes: 1) Tier 1 countries are advanced economies, which typically have the highest ambition on carbon pricing.

IPR2021 carbon price policy forecast

Tier	Country	Forecast Policy Response	Change from IPR2019 Survey	Change from IPR2019 IPR2021
Tier 1	Canada	Signal or backstop of US$85 by 2030	▲	▲
	France Germany Italy UK	US$75 by 2030		
	USA	US$65 by 2030		
	China Australia Japan Korea	US$60 by 2030		
Tier 2	India Mexico South Africa Turkey	US$50 by 2030	▲ ▲	▲ ▲
Tier 3	Argentina Brazil Indonesia Vietnam	US$45 by 2030		
	Nigeria Russia Saudi Arabia	US$35 by 2030		

Legend ▲ higher ambition ▼ lower ambition ● no change

- Carbon pricing is forecast to apply to the power and industry sectors
- Relative to IPR2019, expected price signals in leading countries are $15 higher in 2030, with comparable increases elsewhere.
- Canada has signaled the intention to apply a >$100 carbon price by 2030.
- South Africa and Turkey prices upgraded to tier 2. South Africa's ambition driven by net zero target, while Turkey's driven by trading relationship with EU.
- Ambition for US and China in line with IPR2019 though are no longer among the most ambitious countries

Notes: carbon prices are in real 2020 US Dollars (US$)

Carbon pricing – tier 1 countries

$60-$85/tCO$_2$e by 2030

Country	Reasons for Forecast
Canada $85 by 2030	**Existing carbon price in place; proposal for further increases in the carbon price** • Canada's Federal Carbon Pricing Benchmark has a backstop to ensure a minimum carbon price in all provinces. The price was CAD 20/tCO$_2$e (US$16/tCO$_2$e) in 2019 and is set to rise to CAD $50/tCO$_2$e (US$39/tCO$_2$e) in 2022. • The government's 2020 'A Healthy Environment and Healthy Economy' plan proposes to increase this backstop by CAD $15/tCO$_2$e per year from 2022 to 2030, reaching a price of CAD $170/tCO$_2$e (US$130/tCO$_2$e) in 2030.[1]
France $75 by 2030	**EU ETS and national carbon tax in place; net zero target in the EU Climate Law** • France is already a participant in the EU emissions trading scheme (EU ETS). The EU ETS price was €40/tCO$_2$ ($48/tCO$_2$e) as of March 2021. • Additionally, France has a national carbon tax under the Finance Act 2014, which covers CO$_2$ emissions from energy products across industry, buildings and transport, with exemptions for those covered by the EU ETS. As of 2020, the price is set at €45/tCO$_2$ (US$52/tCO$_2$). • The EU Climate Law, expected to be enacted in 2021, sets a target of net zero emissions by 2050 and increases the 2030 emissions reduction target from 40% below 1990 levels to 55%. Realignment of the EU ETS to these stronger targets raises the prospect of higher prices.

Notes: 1) The proposal raises the price by $15/year – up from the currently legislated $10/year. Given that the current Liberal government is a minority government and will find it difficult to implement the $15/year price hike, we assume that the currently legislated $10/year price hike continues to apply. The resulting US$100 price in 2030 is then discounted back to $85 in real 2020 US$ to reflect an average annual inflation rate of 1.5%

Carbon pricing – tier 1 countries

$60-$85/tCO$_2$e by 2030

Country	Reasons for Forecast
Germany $75 by 2030	**EU net zero ambition; the EU emissions trading scheme being in place** • Germany is already a participant in the EU emissions trading scheme (EU ETS). The EU ETS price was €40/tCO$_2$ ($48/tCO$_2$e) as of March 2021. • Additionally, the German government has implemented a national ETS for sectors not covered by the EU ETS, under the 2019 Fuel Emissions Trading Act. For 2021-25, emission allowances will have a fixed price of €25/tCO$_2$ (US$29/tCO$_2$), rising to €55-65/tCO$_2$ (US$64-76/tCO$_2$) in 2025. • The EU Climate Law, expected to be enacted in 2021, sets a target of net zero emissions by 2050 and increases the 2030 emissions reduction target from 40% below 1990 levels to 55%. Realignment of the EU ETS to these stronger targets raises the prospect of higher prices.
Italy $75 by 2030	**EU net zero ambition; the EU emissions trading scheme being in place** • Italy is already a participant in the EU emissions trading scheme (ETS). The EU ETS price was €40/tCO$_2$ ($48/tCO$_2$e) as of March 2021. • The EU Climate Law, expected to be enacted in 2021, sets a target of net zero emissions by 2050 and increases the 2030 emissions reduction target from 40% below 1990 levels to 55%. Realignment of the EU ETS to these stronger targets raises the prospect of higher prices.

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Carbon pricing – tier 1 countries

$60-$85/tCO$_2$e by 2030

Country	Reasons for Forecast
UK $75 by 2030	**Carbon pricing regime in place with a minimum price; net zero target** • The UK was a participant in the EU emissions trading scheme (EU ETS) until the end of 2020. • Additionally, the UK has a carbon price floor setting a minimum carbon price in electricity generation. The 2020 Budget announced a freeze on the rate of the carbon price floor at £18/tCO$_2$ (US$23/tCO$_2$) in 2021-22. • A new carbon pricing regime – the UK ETS - has been announced by government in February 2021, which will be similar in coverage to the EU ETS and have a minimum price of £22/tCO$_2$ (US$31/tCO$_2$). Trading of permits will commence in May 2021. • The UK also has a 2050 net-zero target in law under the 2019 amendment to the 2008 Climate Change Act.
USA $65 by 2030	**No federal carbon pricing system but some regional systems in place; net zero ambition** • At present, there is no federal-level carbon tax or emissions trading system in place. • However, eleven states have carbon pricing regimes. The California Cap and Trade (CaT) Programme has the largest sectoral coverage, covering 85% of all Californian emissions. As of November 2020, the California CaT price was US$16.9/tCO$_2$. The Regional Greenhouse Gas Initiative (RGGI) has the largest geographical coverage, covering power sector emissions in 10 states. As of November 2020, the RGGI price was US$5.9/tCO$_2$. • There is also ambition at the federal level. The Biden Administration has announced the objective to legislate for a 2050 net zero target and IPR2021 forecasts a 2050 net zero target in place in 2023. As part of the legislative agenda, Democrats on the House Ways and Means Committee have tabled the GREEN Act, which includes a provision to introduce a carbon price.

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Carbon pricing – tier 1 countries

$60-$85/tCO$_2$e by 2030

Country	Reasons for Forecast
Australia $60 by 2030	**Carbon pricing regime in place despite challenging politics; forecast of net zero target** • Ambitious carbon pricing faces political challenges in Australia. The centre-left government legislated a carbon price of AUD $23/tCO$_2$ under the 2011 Clean Energy Act, but this was repealed in 2014 by the centre-right government – which ran in the election on a platform to repeal it - and replaced by the voluntary Emissions Reduction Fund. • Australia's Emissions Reduction Fund (ERF) is a national carbon crediting mechanism that issues credits to organisations and individuals that abate emissions, covering agriculture, energy efficiency, industrial emissions, transport, waste, and land use. As of November 2020, the price of an ERF unit was US$11.10/tCO$_2$. • IPR2021 forecasts that Australia will set a 2050 net zero emissions target. All major countries with net zero emissions targets have implemented some form of carbon pricing. The net zero forecast for Australia raises the prospect of more ambitious carbon pricing.
China $60 by 2030	**Nascent carbon pricing regime and a net zero target** • China's national ETS system launched in February 2021, based on experience from seven regional pilot ETS schemes. Whilst the system initially only covers power sector emissions, it will expand to cover seven additional sectors - petrochemical, chemical, building materials, steel, non-ferrous metals, paper, and domestic aviation – at a later date. • China's 2060 net zero ambition, announced by President Xi Jinping in September 2020, raises the prospect of more ambitious carbon pricing in China.

Carbon pricing – tier 1 countries

$60-$85/tCO$_2$e by 2030

Country	Reasons for Forecast
Japan $60 by 2030	**Limited carbon pricing regime; net zero target; high share of exports to tier 1 carbon pricing countries** • At present, there is limited carbon pricing policy in place: the 2012 Tax for Climate Change Mitigation covers the import and extraction of fossil fuels. As of November 2020, this tax was set at US$2.80/tCO$_2$, with no plans for further rises. • A national emissions trading system has been under consideration since 2008, but with no announcements on implementation dates by successive government administrations. • However, Japan's 2050 net zero target, submitted to the UNFCCC in the update to the First NDC in December 2020, raises stronger prospects for a new carbon pricing scheme. • Additionally, 42% of Japan's manufacturing exports are to countries which have tier 1 carbon pricing. Carbon border adjustment mechanisms (CBAMs) from tier 1 countries would create strong incentives for Japan to increase ambition in its carbon pricing.
Korea $60 by 2030	**Carbon pricing regime in place; net zero target** • The 2015 Korea Emissions Trading Scheme (KETS) covers 610 of the country's largest emitters in the industry, power, buildings, domestic aviation, public and waste sectors, accounting for 70% of total GHG emissions. As of November 2020, the KETS price was US$18.8/tonne. • Phase 3 of the KETS is scheduled to end in 2030 with no plans for a Phase 4 announced yet. • However, Korea's 2050 net zero target, submitted to the UNFCCC in the update to the First NDC in December 2020, raises stronger prospects for carbon prices.

Carbon pricing – tier 2 countries

$50/tCO$_2$e by 2030

Country	Reasons for Forecast
Mexico $50 by 2030	**Recent progress on carbon pricing; high share of exports to tier 1 carbon pricing countries** • A carbon tax on coal and oil has been in place since 2014 under the 2013 Tax Reform. The tax covers the additional CO_2 emissions of coal and oil relative to natural gas. As of November 2020, the price was US$2.80/tCO$_2$. • Additionally, the 2012 General Law on Climate Change commits to developing an emissions trading system by 2023. • The Mexico ETS - a pilot emissions trading system for the electricity, oil and gas and industry sectors, covering around 37% of national emissions - has been in place since 2020, under the July 2018 reform to the General Law of Climate Change. • 95% of Mexico's manufacturing exports are to countries which have tier 1 carbon pricing. Carbon border adjustment mechanisms (CBAMs) from tier 1 countries would create strong incentives for Mexico to increase ambition in its carbon pricing.
South Africa $50 by 2030	**Nascent carbon tax in place; net zero target** • The 2019 South African Carbon Tax applies to the power, industry, buildings, and transport sectors, covering 80% of GHG emissions. As of November 2020, the tax was US$7.40/tCO$_2$, and is set to increase by price inflation plus 2% per year to 2022. • The government's September 2020 announcement of a 2050 net zero target as part of the Low Emissions Development Strategy, raises prospects for increased ambition in carbon pricing.

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Carbon pricing – tier 2 countries

$50/tCO$_2$e by 2030

Country	Reasons for Forecast
Turkey $50 in 2030	**Limited action on carbon pricing; pilot ETS under consideration; high share of exports to tier 1 carbon pricing countries** • Turkey does not have a mandatory carbon pricing regime in place. The Voluntary Carbon Market, a voluntary emissions trading scheme, has been in place since 2013. • However, Turkey is working with the World Bank's Partnership for Market Readiness Programme to prepare to pilot an emissions trading scheme. • 77% of Turkey's manufacturing exports are to countries which have tier 1 carbon pricing. Carbon border adjustment mechanisms (CBAMs) from tier 1 countries would create strong incentives for Turkey to increase ambition in its carbon pricing.
India $50 in 2030	**No carbon pricing regime in place; forecast of net zero target; high share of exports to tier 1 carbon pricing countries** • At present, there is no carbon tax or emissions trading system in place. • IPR2021 forecasts that India will set a 2060 net zero emissions target by 2023. All major countries with net zero emissions targets have implemented some form of carbon pricing. • 55% of India's manufacturing exports are to countries which have tier 1 carbon pricing. Carbon border adjustment mechanisms (CBAMs) from tier 1 countries would create strong incentives for India to increase ambition in its carbon pricing.

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Carbon pricing – tier 3 countries

$35-$45/tCO$_2$e by 2030

Country	Reasons for Forecast
Brazil $45 by 2030	**No carbon pricing regime in place; limited recent action on carbon pricing** • At present, there is no carbon tax or emissions trading system in place. • However, policymakers are currently working with the Partnership for Market Readiness Programme to consider the implementation of an ETS or carbon tax, with the Ministry of Economy developing design options for carbon pricing and conducting impact assessments.
Argentina $45 by 2030	**Nascent carbon tax in place; limited trade with tier 1 carbon pricing countries** • The 2019 Carbon Dioxide Tax is an upstream carbon tax on the producers, distributors and importers of coal, coke and almost all liquid fossil fuels based on their carbon content. As of November 2020, the price was US$5.94/tCO$_2$ e. • Only 12% of Argentina's manufacturing exports are to countries which have tier 1 carbon pricing. Carbon border adjustment mechanisms (CBAMs) from tier 1 countries would not create strong incentives for Argentina to increase ambition in its carbon pricing.

Carbon pricing – tier 3 countries

$35-$45/tCO$_2$e by 2030

Country	Reasons for Forecast
Vietnam $45 by 2030	**No carbon pricing regime in place; future system under consideration** • At present, there is no carbon tax or emissions trading system in place. • The 2020 draft Law on Environment Protection tasks the Ministry of Natural Resources and Environment of Vietnam with drafting the design for a domestic carbon credit market and to prepare Vietnam to enter an international carbon credit market in 2021.
Indonesia $45 by 2030	**No carbon pricing regime in place; future system under consideration** • A pilot emissions trading system has been under development since 2018. • The 2017 Government Regulation on Environmental Economic Instruments sets the basis for potential implementation of an emissions trading system by 2024.

Carbon pricing – tier 3 countries

$35-$45/tCO$_2$e by 2030

Country	Reasons for Forecast
Russia $35 by 2030	**No carbon pricing regime in place; political resistance to carbon pricing** • At present, there is no carbon tax or emissions trading system in place. • The politics of carbon pricing in Russia remain challenging. In January 2019, the Ministry for Economic Development issued a bill to introduce a carbon tax for the industry, energy and aviation sectors from 2025, but the government scrapped plans for its implementation in October 2019 due to industry opposition.
Saudi Arabia $35 by 2030	**No policy or ambition on carbon pricing but some limited movement** • At present, there is no carbon tax or emissions trading system in place. • However, Saudi Energy Minister Prince Abdulaziz stated in a press conference in September 2019, that the country plans to launch a carbon trading scheme to diversify its energy supplies and reduce carbon emissions[1]
Nigeria $35 by 2030	**No policy or ambition on carbon pricing** • At present, there is no carbon tax or emissions trading system in place. • Government has not indicated it is planning or considering implementation of a carbon pricing scheme.

Source: 1) Reuters (2019)

Detailed Policy Forecasts

Coal phase-outs

Coal phase-out – Overview

Coal trends

Declining coal generation
Coal generated 37% of global electricity in 2019, down from 40% in 2010.

The decline is concentrated in advanced economies
Coal generated 23% of electricity in advanced economies in 2019, down from 34% in 2010; for emerging market and developing economies, this share was 46% in 2019, the same as 2010.[1]

Policy trends

Some countries already target an end to coal generation
5 of the 21 countries in IPR have legislated or set the objective to phase-out coal generation; this includes the UK, France, Germany, Italy, and Japan.

Other countries are beginning to shift away from coal
Although 16 of the 21 countries in IPR do not have a target to end unabated coal generation, policy is beginning to shift against coal power in several countries including Japan, Korea and USA.

Policy forecast

Most construction of new coal ends by 2025
Policy signals and market reforms make new unabated coal uninvestable by 2021-2025 in almost all countries.

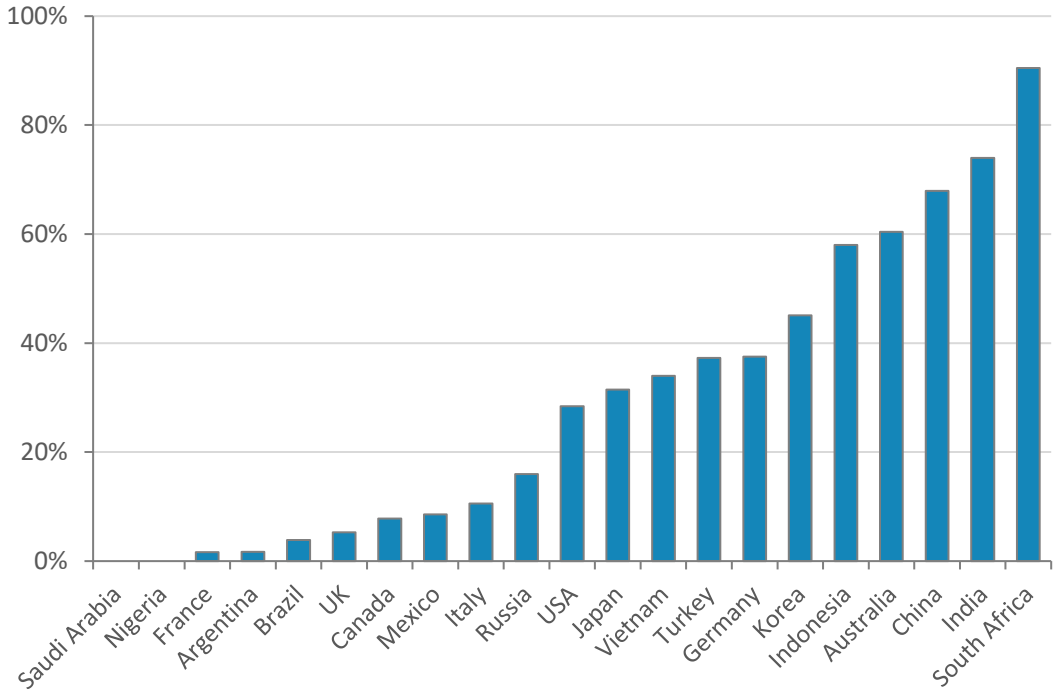
All countries end coal generation by 2040
Leading countries end all unabated coal generation by 2030. Other major countries follow by 2040.

Notes: 1) advanced economies, and emerging market and developing economies aligns to the country categories in the IEA's 2020 World Energy Outlook

Coal's share in the electricity mix remains high in some IPR countries but is falling in most

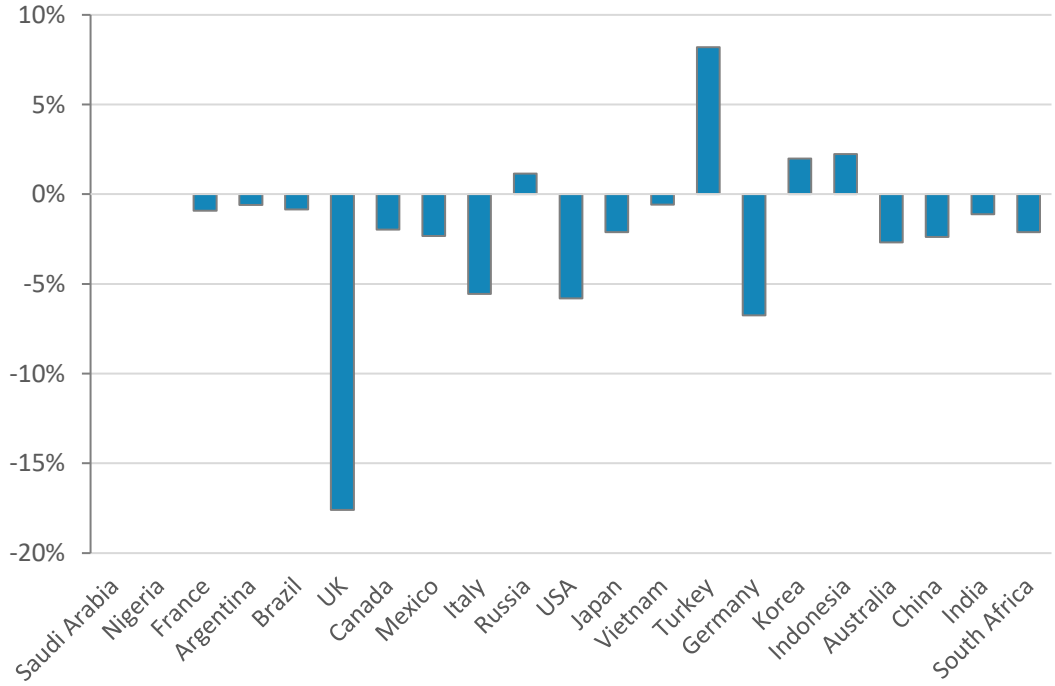
Coal's share in electricity generation remains substantial in some IPR countries…

Share of coal-fired generation in electricity mix[1]



…but coal is declining as a share of total generation in most IPR countries

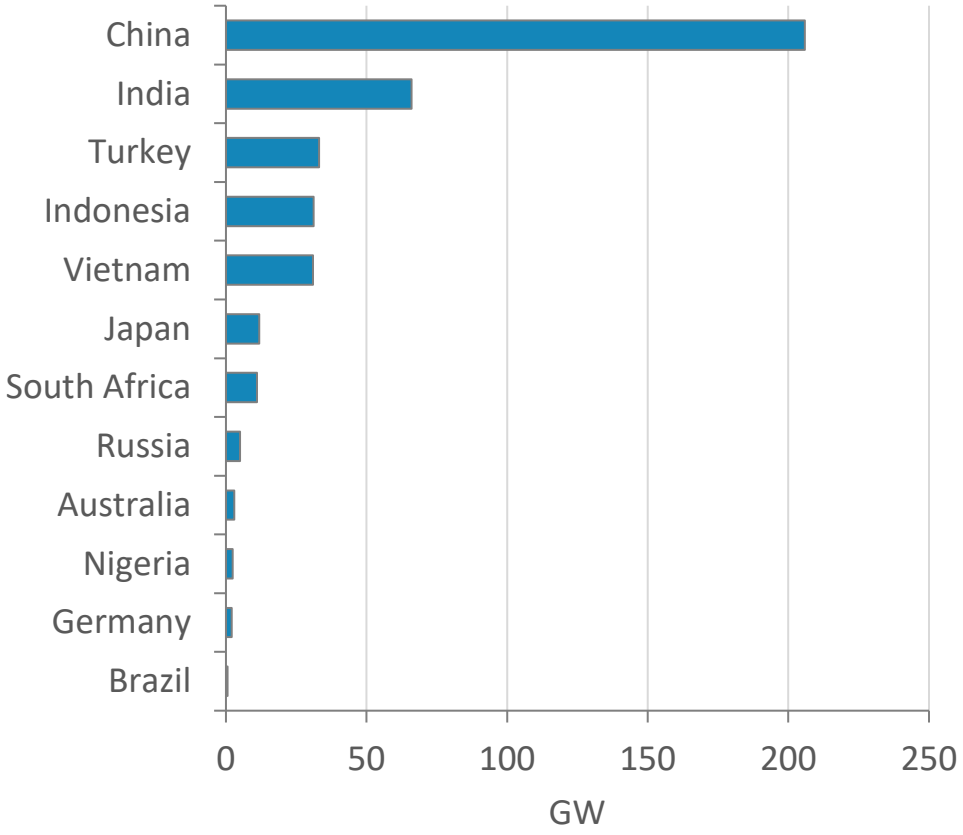
Change in coal as a share of total generation, 2015-18



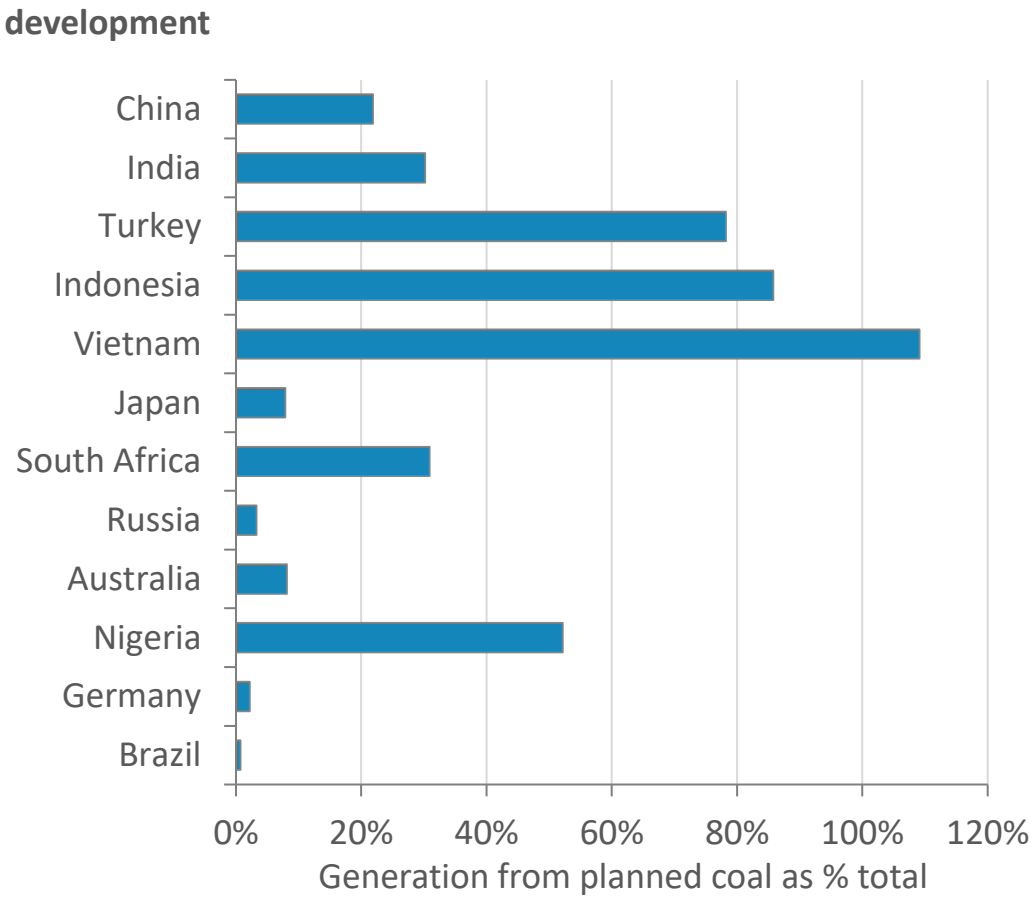
Notes: 1) Share of coal-fired generation in the electricity mix is for 2017 or 2018 depending on latest available data
Source: 1) IEA (2020) World Energy Balances

China and India have the most coal-fired generation under development

China and India have a combined 270 GW of coal under development…



…with generation from planned coal as % total >40% in Turkey, Indonesia, Vietnam and Nigeria

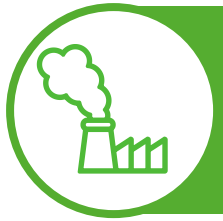


Notes: Vietnam has a large pipeline of coal-fired power relative to existing total generation, which is why generation from planned coal as % total is >100%

Sources: Global Energy Monitor; IEA (2020) World Energy Balances

Drivers and barriers of coal phase-out policy

Drivers[1]



Air pollution concerns

Policymakers face stronger incentives to end all coal generation in countries where the death rate from air pollution is high. 15 out of 21 IPR countries have over 30 deaths per 100,000 people from air pollution annually.

Techno-economics

Policymakers face stronger incentives to end unabated coal generation in countries where other sources of electricity have lower costs. Carbon Tracker estimates that in major economies, 96% of existing coal generation will cost more to run than building new renewables by 2030.[1]

Barriers[2]

Just Transition

Policymakers will be more concerned that ending unabated coal generation will put jobs at risk in countries where the coal mining sector is large and therefore a major source of employment. 7 out of 21 IPR countries have a share of coal production in GDP over 0.5%.

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Notes: 1) Factors which are likely to cause policymakers to accelerate ambition (or at least not hinder it); 2) Factors which are likely to cause policymakers to delay ambition (or at least hinder it)
Source: 1) Carbon Tracker (2018) Powering down coal

Summary of major policies for coal phase-out

Net zero ambition countries[1]

- France has legislated to phase-out all coal generation by 2022.
- Germany has legislated to prohibit construction of new coal generation and phase-out all coal generation by 2038.
- Italy has set the objective to phase-out all coal generation by 2025 but has not legislated this.
- Several US states have committed to phase-out coal generation: Oregon has legislated to end coal power by 2030; Washington has legislated to end coal generation by 2025.
- Canada has legislated to phase-out all coal generation by 2030.
- The UK has legislated to phase-out all coal generation by 2025, with an objective to do this by 2024.
- Japanese Prime Minister Suga announced in October 2019 'we will fundamentally shift our long-standing policy on coal-fired power generation'.
- Korea has set the objective to ban new coal generation plants beyond those already approved.
- China, the USA, Brazil, Argentina and South Africa have not set the objective to end all unabated coal generation.

Other countries[2]

- Several Indian states, including Gujarat and Chhattisgarh have set the objective to end new coal generation.
- India, Vietnam, Indonesia, Russia, Mexico, Turkey, Nigeria, Saudi Arabia and Australia have not set the objective to end all unabated coal generation

Notes: 1) Countries which have set a net zero target in law or in a policy document; 2) Countries which have not officially set zero targets in law or in a policy document

Developments in end of unabated coal generation policy since IPR2019

Net zero ambition countries[1]

Germany: the 2020 Coal Exit Law prohibits commissioning of new coal generation capacity and puts in place measures to phase-out all coal generation by 2038 at the latest.

Korea: the 2020 update of Korea's First NDC sets the objective to place a 'ban on construction of new coal-fired power plants'.

United Kingdom: in February 2020, the Prime Minister announced that the phase-out of all coal generation will be brought forward one year to 1 October 2024.

Other countries[2]

No major strategy or policy announcement to end the construction or phase-out of all unabated coal generation since IPR 2019.

INEVITABLE POLICY RESPONSE

Notes: 1) Countries which have set a net zero target in law or in a policy document; 2) Countries which have not officially set zero targets in law or in a policy document

IPR2021 coal phase-out forecast: ending construction of new unabated coal

Tier	Country	Forecast Policy Response	Change from IPR2019 Survey	Change from IPR2019 IPR2021
Tier 1	Australia	Actual and anticipated policy signals (bans, EPS, carbon pricing), and market reforms end new coal build from 2020		
	Canada			
	France			
	Germany			
	India		●	▲
	Italy			
	Korea		●	▲
	Mexico			
	Argentina		▲	▲
	Brazil		▲	▲
	UK			
	USA			
Tier 2	China	Policy signals and market reforms targeting 2025		
	Japan		▼	▼
	South Africa		▲	▲
	Turkey		▲	▲
	Vietnam		▼	●
Tier 3	Russia	Policy and reforms targeting 2030		
	Indonesia		▼	▼
	Nigeria			
	Saudi Arabia	No coal in use or expected		

Legend ▲ higher ambition ▼ lower ambition ● no change

- Relative to IPR2019, India and Korea upgraded to tier 1.
- A number of countries upgraded to tier 2 in line with expert expectation that policy will strengthen ambition in these countries.
- Japan downgraded from tier 1 to 2 due to challenges phasing out coal.
- Indonesia downgraded from tier 2 to 3 due to substantial coal in pipeline.

INEVITABLE POLICY RESPONSE

Coal phase-out (new coal capacity) – tier 1 countries

End construction of new unabated coal by 2020

Country	Reasons for Forecast
Australia	**Low economic competitiveness of new coal generation** • New renewables outcompete new coal generation already in Australia,[1] eroding the business case for new coal generation.
Canada	**Low economic competitiveness of new coal generation** • Government has legislated to phase-out all coal-fired generation by 2030 (2018 amendment to the Reduction of Carbon Dioxide Emissions from Coal-fired Generation of Electricity Regulations), eroding the business case for new coal generation, which would need to be retired within 10 years.
France	**Low economic competitiveness of new coal generation** • New renewables already outcompete new coal in the EU.[1] • Government has legislated to phase-out all coal-fired generation by 2022 (Energy and Climate Act of 2019), eroding the business case for new coal generation, which would need to be retired within 2 years.
Germany	**New coal generation prohibited** • 2020 Coal Exit Law prohibits new coal-fired generation in Germany.

Source: 1) Carbon Tracker (2018) Powering down coal

Coal phase-out (new coal capacity) – tier 1 countries

End construction of new unabated coal by 2020

Country	Reasons for Forecast
India	**Low economic competitiveness of new coal generation** • New renewables already outcompete new coal generation in India,[1] eroding the business case for new coal generation.
Italy	**Low economic competitiveness of new coal generation** • New renewables already outcompete new coal generation in the EU.[1] • Italy's 2019 National Energy and Climate Plan sets the objective 'to phase-out the use of coal for electricity production by 2025', eroding the business case for new coal generation, which would need to be retired within 5 years.
Korea	**New coal generation prohibited** • The 2020 update of Korea's First NDC states 'the Republic of Korea has increased its share of domestic reduction through its continued mitigation efforts such as the ban on construction of new coal-fired power plants'.
Mexico	**Low economic competitiveness of new coal generation; no project pipeline** • New renewables already outcompete new coal generation in Mexico,[2] eroding the business case for new coal generation. • Mexico has no coal-fired generation under development, last building a coal plant in 2010.

Sources: 1) Carbon Tracker (2018) Powering down coal; 2) BN Americas (2020) Mexican renewables costs starting to compete with fossil fuels

Coal phase-out (new coal capacity) – tier 1 countries

End construction of new unabated coal by 2020

Country	Reasons for Forecast
UK	**Low economic competitiveness of new coal generation** • New renewables already outcompete new coal generation in the EU[1]. • Government has legislated to phase-out all coal-fired generation by 2025 (2014 Emissions Performance Standard), eroding the business case for new coal generation, which would need to be retired within 5 years.
USA	**Low economic competitiveness of new coal generation** • New renewables already outcompete new coal generation in USA,[1] eroding the business case for new coal generation.
Argentina	**No planned construction of new coal generation** • Argentina has no coal-fired generation under development and no policy in place to build new plants beyond those already operating and approved.
Brazil	**Minimal planned construction of new coal generation** • Brazil has permitted 600 MW of new coal-fired generation, equivalent to only 1% of current total electricity generation.

Notes: the UK was a member of the EU at the time of the analysis.
Source: 1) Carbon Tracker (2018) Powering down coal

Coal phase-out (new coal capacity) – tier 2 countries

End construction of new unabated coal by 2025

Country	Reasons for Forecast
China	**No ambition to end new coal generation but low economic competitiveness compared to other energy sources** • Government policy continues to support the expansion of coal-fired generation: the 2020 National Energy Administration 2023 Risk Alert, which sets rules governing construction of new coal-fired power plants, allowed 25 Chinese provinces to build new coal generation capacity, four more provinces than in 2019. • China also has 210 GW of coal-fired generation under development, equivalent to 22% of current total electricity generation. • However, new renewables already outcompete new coal generation in China,[1] eroding the business case for investment in coal-fired generation.
Japan	**Large project pipeline but declining economic competitiveness of new coal generation** • 12 GW of new coal generation is under development in Japan, equivalent to 8% of current total electricity generation. • However, Carbon Tracker estimated that new renewables will outcompete new coal generation by 2025 in Japan, eroding the business case for new coal generation.[1] • In October 2020, the new Prime Minister Suga announced in his first address to parliament that 'we will fundamentally shift our long-standing policy on coal-fired power generation'.

Source: 1) Carbon Tracker (2018) Powering down coal

Coal phase-out (new coal capacity) – tier 2 countries

End construction of new unabated coal by 2025

Country	Reasons for Forecast
South Africa	**No ambition to end new coal generation but low economic competitiveness compared to other energy sources** • Government has not set the objective or put policies in place to phase-out new unabated coal-fired generation. • South Africa has 11 GW of new coal power capacity under development, equivalent to 31% of current total electricity generation. • However, new renewables already outcompete new coal generation in South Africa,[1] eroding the business case for new coal generation.
Turkey	**No ambition to end new coal generation but falling economic competitiveness compared to other energy sources** • Government has not set the objective or put policies in place to phase-out new unabated coal-fired generation. • Turkey has 33 GW of coal capacity under development, equivalent to 78% of current total electricity generation. • However, Carbon Tracker estimated that new renewables will outcompete new coal generation by 2022 in Turkey, eroding the business case for new coal generation.[1]

Source: 1) Carbon Tracker (2018) Powering down coal

Coal phase-out (new coal capacity) – tier 2 countries

End construction of new unabated coal by 2025

Country	Reasons for Forecast
Vietnam	**No ambition to end new coal generation but low economic competitiveness compared to other electricity sources** • Government has not set the objective or put policies in place to phase-out new unabated coal-fired generation. • On the contrary, the 2016 Power Development Plan VII sets the objective for 55 GW of coal-fired generation by 2030, an increase of 36 GW on 2020 capacity. • However, Carbon Tracker estimated that new renewables will outcompete new coal generation by 2020 in Vietnam, eroding the business case for new coal generation.[1]

Source: 1) Carbon Tracker (2018) Powering down coal

Coal phase-out (new coal capacity) – tier 3 countries

End construction of new unabated coal by 2030

Country	Reasons for Forecast
Indonesia	**Large project pipeline and strong government support for new coal generation** • Indonesia has 31 GW of new coal generation under development, equivalent to 86% of current total electricity generation. • Government has not set the objective or put policies in place to phase-out new unabated coal-fired generation. • On the contrary, government support for coal-fired generation remains strong: the 2019 Electricity Procurement Plan projects coal to account for a 54% share in the energy mix by 2025.
Nigeria	**Large project pipeline and strong government support for new coal generation** • There is currently no coal-fired generation in operation in Nigeria. • However, Nigeria has 2 GW of coal generation under development, equivalent to 52% of current total electricity generation. • The 2018 draft National Energy Policy sets the objective to 'increase in the contribution of coal by 30% of the national energy mix by 2030'.

Coal phase-out (new coal capacity) – tier 3 countries

End construction of new unabated coal by 2030

Country	Reasons for Forecast
Russia	**No government ambition to end new coal generation; additional new coal power planned** • Russia last built coal-fired generation in 2019. • There is 5 GW of coal-fired generation under development, equivalent to 5% of current total electricity generation. • No government ambition or policies in place to end construction of new unabated coal-fired generation.

IPR2021 coal phase-out forecast: ending unabated coal generation

Tier	Country	Forecast Policy Response	Change from IPR2019 Survey	Change from IPR2019 IPR2021
Tier 1	France	Strong policy signal that coal generation will be made unlawful or unprofitable before 2030	▲	▲
	UK		▲	▲
	Italy		▲	▲
	Canada	Coal to be made unlawful or unprofitable by 2030		
	USA			
Tier 2	Germany	Strong policy signal that coal generation will be made unlawful or unprofitable by 2038-2040	▼	▼
	Australia		▼	▼
	South Africa		▲	▲
	Mexico		▼	▼
	Argentina	Coal to be made unlawful or unprofitable by 2045	▲	▲
	Brazil		▲	▲
	Korea			
	China			
	India			
	Indonesia			
	Japan		▼	▼
	Nigeria		▲	▲
	Russia		▲	▲
	Turkey		▲	▲
	Vietnam			
	Saudi Arabia	No coal in use or expected	▲	▲

Legend ▲ higher ambition ▼ lower ambition ● no change

- France and UK upgraded to before 2030 in line with existing policies; Italy upgraded due to EU pressure, in line with expert expectations
- Germany downgraded to tier 2 in line with 2038 phase-out policy
- Australia and Mexico downgraded to tier 2 in line with survey evidence and limited stated ambition to phase-out coal
- Japan downgraded from 2030 due to challenges phasing out coal
- All tier 3 countries upgraded to tier 2 due to expert expectation that policy would aim for phase-out before 2045

INEVITABLE POLICY RESPONSE

Coal phase-out (all coal generation) – tier 1 countries

End unabated coal generation by 2030

Country	Reasons for Forecast
France 2022	**Commitment to end all unabated coal generation by 2022** • The Energy and Climate Act of 2019 commits to 'all coal power plants ceasing operating by 2022'. • The Act imposes an emissions performance standard on power plants of 550 gCO_2/KWh by 2022 which is too low to enable unabated coal-fired plants to generate electricity.
UK 2024	**Objective to end all unabated coal generation by 2024** • The UK's 2014 Emissions Performance Standard effectively ends coal generation from 2025 by setting emissions standards at a level too low to enable unabated coal-fired plants to generate electricity. • In February 2020, Prime Minister Johnson increased ambition, announcing in a speech that the end of coal generation will be brought forward one year to 1st October 2024.
Italy 2025	**Ambition to phase-out all unabated coal generation by 2025** • Coal-fired generation is decreasing as a share of electricity supply, contributing 11% of the total in 2018, down from 15% in 2010. • Italy's 2019 National Energy and Climate Plan sets the objective 'to phase-out the use of coal for electricity production by 2025'.

Coal phase-out (all coal generation) – tier 1 countries

End unabated coal generation by 2030

Country	Reasons for Forecast
Canada 2030	**Commitment to end all unabated coal generation by 2030** • The 2018 coal phase-out regulation (amendment to the Reduction of Carbon Dioxide Emissions from Coal-fired Generation of Electricity Regulations) sets an emissions performance standard of 420 tCO_2/GWh by 2030, which effectively prevents unabated coal generation from operating.
USA 2030	**Declining economic competitiveness for coal generation** • Coal-fired generation has decreased substantially over the last decade: it accounted for 29% of electricity generation in 2018, down from 46% in 2010. • Coal generation is no longer cost-competitive with renewables: Vibrant Clean Energy estimated that 86% of existing coal-fired plants in the United States are likely to be more expensive to run than new-build wind and solar by 2025.[1]

Source: 1) Vibrant Clean Energy (2019) The coal cost crossover

Coal phase-out (all coal generation) – tier 2 countries

End unabated coal generation by 2038-40

Country	Reasons for Forecast
Germany 2038	**High reliance but policy in place to end unabated coal generation by 2038** • Germany is reliant on coal-fired generation over the short-term, with coal accounting for 38% of electricity generation in 2018, down from 44% in 2010. • However, the 2020 Coal Exit Law legislates to phase-out all coal generation by 2038 at the latest.
Australia 2040	**High reliance but declining economic competitiveness of coal generation** • Australia has high reliance on coal-fired generation: coal accounted for 60% of electricity generation in 2018. • Government has not set the objective or put policies in place to end all unabated coal generation. • However, eventual phase-out is expected given poor cost-competitiveness: 72% of coal capacity in Australia is estimated be more expensive to operate than renewables by 2030.[1]

Source: 1) Carbon Tracker (2018) Powering down coal

Coal phase-out (all coal generation) – tier 2 countries

End unabated coal generation by 2038-40

Country	Reasons for Forecast
Mexico 2040	**No policy to end unabated coal generation but limited reliance in the electricity system** • Government has not set the objective or put policies in place to end all unabated coal generation. • However, Mexico has limited and falling reliance on coal-fired generation: coal accounted for 9% of electricity generation in 2018, down from 12% in 2010.
South Africa 2040	**High reliance but declining economic competitiveness of coal generation** • South Africa has high reliance on coal-fired generation: coal accounted for 90% of electricity generation in 2018. • Government has not set the objective or put policies in place to end all unabated coal generation. • However, eventual phase-out is expected given poor cost-competitiveness: 89% of coal capacity in South Africa is estimated be more expensive to operate than renewables by 2030.[1]

Source: 1) Carbon Tracker (2018) Powering down coal

Coal phase-out (all coal generation) – tier 2 countries

End unabated coal generation by 2045

Country	Reasons for Forecast
Argentina 2045	**No stated policy ambition but declining economic competitiveness of coal generation** • Government has not set the objective or put policies in place to end all unabated coal generation. • However, IPR2021 forecasts a carbon price of US$35/$tCO_2e$ by 2030 and beyond US$100/$tCO_2e$ by 2050 for Argentina, raising the prospects of coal-fired generation becoming unprofitable.
Brazil 2045	**No stated policy ambition but declining economic competitiveness of coal generation** • Government has not set the objective or put policies in place to end all unabated coal generation. • However, IPR2021 forecasts a carbon price of US$35/$tCO_2e$ by 2030 and beyond US$100/$tCO_2e$ by 2050 for Brazil, raising the prospects of coal-fired generation becoming unprofitable.
Korea 2045	**No policy to end unabated coal generation but declining economic competitiveness of coal generation** • Government has not set the objective or put policies in place to end all unabated coal generation. • The Basic Plan for Power Supply, 2020-34, announced in December 2020, sets the objective for 29 GW of coal-fired generation in 2034, down from 36 GW in 2020. • However, eventual phase-out is expected given poor cost-competitiveness: 99% of coal capacity in Korea is estimated be more expensive to operate than renewables by 2030.[1]

Source: 1) Carbon Tracker (2018) Powering down coal

Coal phase-out (all coal generation) – tier 2 countries

End unabated coal generation by 2045

Country	Reasons for Forecast
India 2045	**High reliance but declining economic competitiveness of coal generation** • Coal-fired plants account for a high and rising share of electricity generation in India, at 73% of generation in 2018, up from 67% in 2010. • Government has not set the objective or put policies in place to end all unabated coal generation. • However, eventual phase-out is expected given poor cost-competitiveness: 100% of coal capacity in India is estimated be more expensive to operate than renewables by 2030.[1]
Indonesia 2045	**High reliance but declining economic competitiveness of coal generation** • Indonesia has a high and growing reliance on coal-fired generation, with coal contributing 56% of electricity generation in 2018, up from 40% in 2010. • Government has not set the objective or put policies in place to end all unabated coal generation. • On the contrary, government support for coal-fired generation remains strong: the 2019 Electricity Procurement Plan projects coal to account for a 54% share in the energy mix by 2025. • However, eventual phase-out is expected given poor cost-competitiveness: 73% of coal capacity in Indonesia is estimated be more expensive to operate than renewables by 2030.[1]

Source: 1) Carbon Tracker (2018) Powering down coal

Coal phase-out (all coal generation) – tier 2 countries

End unabated coal generation by 2045

Country	Reasons for Forecast
Japan 2045	**High reliance but declining political support and economic competitiveness of coal generation** • Japan's reliance on coal generation has grown in recent years: it contributed 32% of electricity generation in 2018, up from 27% in 2010. • Coal generation plays an important role in ensuring security of supply given only 9 out of 33 operable nuclear reactors are currently in operation. • However, in October 2020, new Prime Minister Suga announced in his first address to parliament that 'we will fundamentally shift our long-standing policy on coal-fired power generation'. • Eventual phase-out is expected given poor cost-competitiveness: 100% of coal capacity in Japan is estimated be more expensive to operate than renewables by 2030.[1]
Nigeria 2045	**Government support but declining economic competitiveness of coal generation** • The 2018 draft National Energy Policy sets an objective to 'increase in the contribution of coal by 30% of the national energy mix by 2030' despite Nigeria not currently operating coal-fired generation. • Government has not set the objective or put policies in place to end all unabated coal generation. • However, IPR2021 forecasts a carbon price of US$35/tCO$_2$e by 2030 and beyond US$100/tCO$_2$e by 2050 for Nigeria, raising the prospects of coal-fired generation becoming unprofitable.

Source: 1) Carbon Tracker (2018) Powering down coal

Coal phase-out (all coal generation) – tier 2 countries

End unabated coal generation by 2045

Country	Reasons for Forecast
Russia 2045	**State-owned company support but declining economic competitiveness of coal generation** • State-owned companies provided US$750m of funding to new coal-fired generation assets per year between 2016-17. • Government has not set the objective or put policies in place to end all unabated coal generation. • However, IPR2021 forecasts a carbon price of US$35/$tCO_2e$ by 2030 and beyond US$100/$tCO_2e$ by 2050 for Russia, raising the prospects of coal-fired generation becoming unprofitable.
Turkey 2045	**High and growing reliance but declining economic competitiveness of coal generation** • Coal-fired generation has risen in recent years, with coal accounting for 37% of electricity generation in 2018, up from 26% in 2010. • Government has not set the objective or put policies in place to end all unabated coal generation. • However, IPR2021 forecasts a carbon price of US$45/tCO2 by 2030 and beyond US$100/$tCO_2e$ by 2050 for Turkey, raising the prospects of coal-fired generation becoming unprofitable.

Coal phase-out (all coal generation) – tier 2 countries

End unabated coal generation by 2045

Country	Reasons for Forecast
Vietnam 2045	**High and growing reliance but declining economic competitiveness of coal generation** • Vietnam has a high and growing reliance on coal-fired generation: coal accounted for 47% of electricity generation in 2018, up from 21% in 2010. • Government has not set the objective or put policies in place to end all unabated coal generation. • On the contrary, the 2016 Power Development Plan VII sets the objective for 55 GW of coal-fired generation by 2030, an increase of 36 GW on 2020 capacity. • However, eventual phase-out is expected given poor cost-competitiveness: 80% of coal capacity in Vietnam is estimated be more expensive to operate than renewables by 2030.[1]
China 2045	**High reliance but declining economic competitiveness of coal generation** • China has high reliance on coal generation: 66% of total electricity in 2018 was coal-fired. • Government has not set the objective or put policies in place to end all unabated coal generation. • Current 'fair dispatch' rules favour existing baseload power, particularly coal, rather than renewables; a shift towards an economic dispatch, which would favour renewables instead of coal generation, has been slow with no completion date set. • However, eventual phase-out is expected given poor cost-competitiveness: 100% of coal capacity in China is estimated be more expensive to operate than renewables by 2030.[1]

Source: 1) Carbon Tracker (2018) Powering down coal

Detailed Policy Forecasts

Clean power

Clean power – Overview

Clean power trends

Clean power trends
Rising share of generation
Low carbon sources of electricity accounted for 37% of global generation in 2019, up from 33% in 2010

Rapid variable renewable energy growth
Wind and solar PV generated 8% of global electricity in 2019, up from 2% in 2010

Policy trends

Global ambition to deploy low carbon power
3 of the 21 IPR countries have set the objective to achieve close to zero power sector emissions by 2050 (the US, the UK and France); while all 21 countries have set objectives to increase low carbon generation

Policy driving low carbon generation in most regions
17 of 21 IPR countries have either feed-in tariffs or renewable energy auctions in place

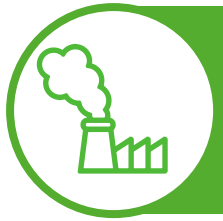
Policy forecast

100% clean power in early movers by 2040…
Strong policy framework to end all unabated fossil generation in leading countries by 2040

…and for all IPR countries by 2050
Other major countries follow by 2050 to end unabated fossil generation

Drivers and barriers of clean power policy

Drivers[1]



Techno-economics

Policymakers will face stronger incentives to deploy low-carbon generation at scale in countries where it is cost competitive with fossil generation. The IEA estimate that low carbon generation is increasingly below the costs of conventional fossil generation and that onshore wind will have the lowest cost of electricity generation on average globally by 2025.[1]

Industrial strategy

Policymakers will face stronger incentives to deploy renewables at scale in countries with capabilities in low-carbon technologies, where market growth could support national firms to achieve greater export success. 7 of the 21 IPR countries specialise in exporting equipment for either solar PV or wind power.[3]

Barriers[2]

Grid quality and enabling regime

Policymakers will be more likely to support renewables in countries with adequate electricity network infrastructure. 8 of the 21 IPR countries have losses in their electricity network equal to or greater than 10% of total electricity supply.

INEVITABLE POLICY RESPONSE

Notes: 1) Factors which are likely to cause policymakers to accelerate ambition (or at least not hinder it); 2) Factors which are likely to cause policymakers to delay ambition (or at least hinder it); 3) IPR defines specialising in exports as a country exporting more of this technology as a proportion of total exports compared to the world average

Summary of major policies for clean power

Net zero ambition countries[1]

- China has set the objective to achieve 1,200 GW of combined wind and solar generation by 2030.
- At the US state level, 12 states have set net zero electricity targets for 2040-50.
- France's 2019 National Energy and Climate Plan seeks 'to completely decarbonise energy production by 2050' which includes 'decarbonised electricity'.
- Germany has set the objective for renewables to contribute 80% of electricity generation by 2050.
- Canada's 2019 Clean Canada strategy states that 'by 2030, the goal is to generate 90% of Canada's electricity from clean sources'.
- The UK's 2018 Clean Growth Strategy states 'we anticipate that emissions from the power sector could need to be close to zero' by 2050.
- Japan has set the objective for renewables to supply 22-24% of electricity by 2030.
- South Africa has renewables contributing 33% of electricity demand in 2030 in its 2019 Integrated Resource Plan.

Other countries[2]

- India's 2015 NDC seeks 'to achieve about 40 percent cumulative electric power installed capacity from non-fossil-based energy resources by 2030'.
- Mexico has set the objective for low carbon sources to contribute 50% of total generation by 2050.
- Nigeria's 2016 Sustainable Energy for All Action Agenda states that 'by 2030, renewable energy is expected to contribute about 30% share in the available electricity mix'.
- Brazil has set the objective for renewables to contribute 84% of electricity generation by 2030

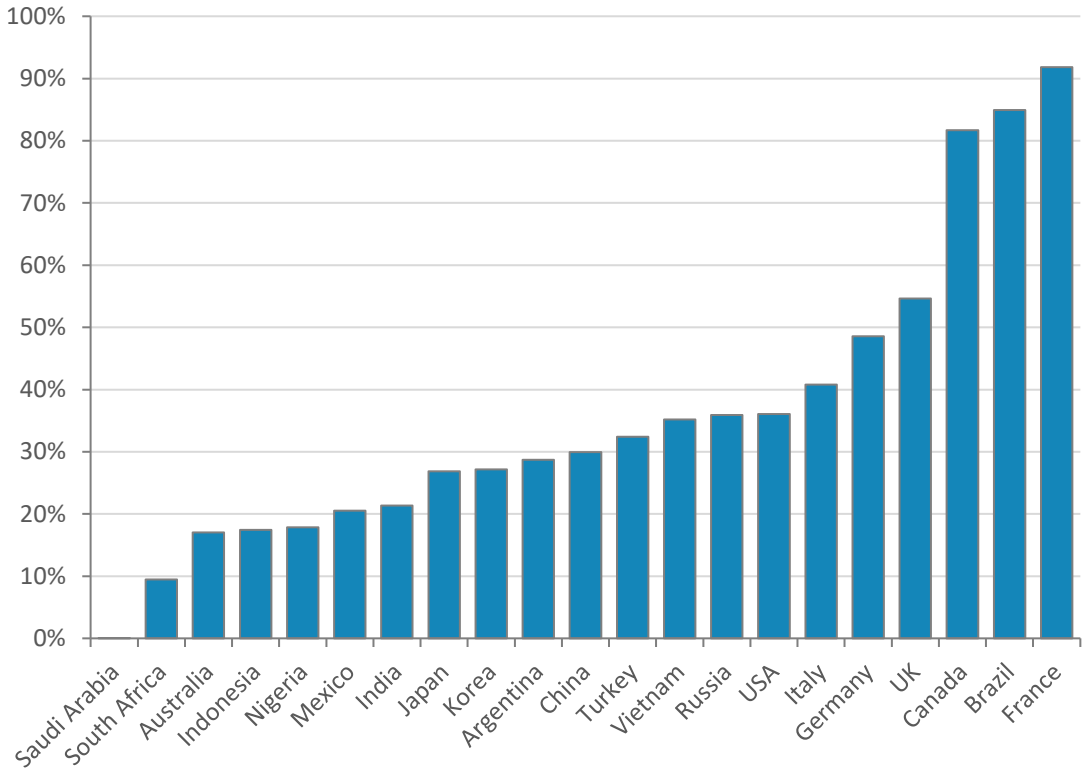
INEVITABLE POLICY RESPONSE

Notes: 1) Countries which have set a net zero target in law or in a policy document; 2) Countries which have not officially set zero targets in law or in a policy document

The low carbon share of generation is already high in some IPR countries with all regions deploying renewable power

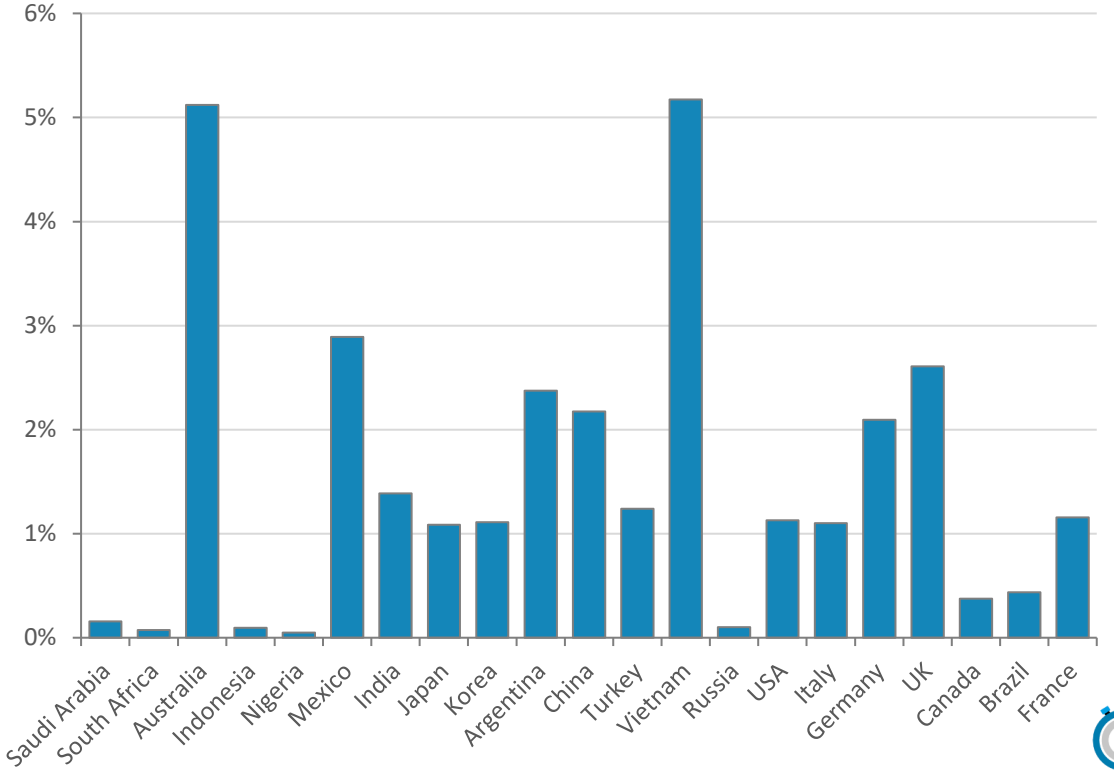
The low carbon share of total generation is already over 30% in 10 IPR countries…

Low carbon share of total generation, 2018



…while wind and solar generation are growing quickly in most IPR countries

New VRE % of existing generation, 2019*



INEVITABLE POLICY RESPONSE

Notes: 1) VRE is variable renewable generation, in this case wind and solar; % of existing generation data is from 2017 due to data gaps in 2019 across some countries

Sources: 1) IRENA (2020) Renewable Capacity Statistics 2020; 2) IRENA (2019) Renewable Energy Statistics 2019

IPR 2021 clean power forecast

Tier	Country	Forecast Policy Response
Tier 1	France Canada	Policy to deliver 100% clean power by 2035
	UK USA South Africa	Policy to deliver 100% clean power by 2040
Tier 2	Germany Italy Japan Korea Vietnam	Strong policy signal to deliver 100% clean power by 2045
Tier 3	Australia Mexico China India Indonesia Russia Turkey Brazil Argentina Nigeria Saudi Arabia	Strong policy signal to deliver 100% clean power by 2050

Countries with strong commitments towards net zero emissions in power and more widely, and/or facing few challenges in decarbonising power

Countries with moderate commitments towards net zero emissions in power and more widely, or facing greater challenges in decarbonising power

Countries with weaker commitments towards net zero emissions in power and more widely

INEVITABLE POLICY RESPONSE

Clean power – tier 1 countries

Achieve 100% clean power by 2035-40

Country	Reasons for Forecast
France 2035	**High existing share of low-carbon generation, government ambition and policies in place to decarbonise power** • Low carbon sources already contribute 92% of electricity generation in 2018. • France's 2019 National Energy and Climate Plan seeks 'to completely decarbonise energy production by 2050' which includes 'decarbonised electricity'. • As part of this 2019 Plan, government set the objective for a 40% share of renewables in power by 2030. • To complement the renewables' share of the power mix in the 2030s, the 2018 Energy and Climate Strategy sets an objective for nuclear energy to still contribute 50% of total generation by 2035 (down from 70% in 2019). • Government has put policies in place to incentivise zero carbon power: the 2015 Energy Transition for Green Growth Law provides direct contracting and competitive tendering for renewables, which includes solar PV and onshore wind, among other technologies.
Canada 2035	**High existing share of low-carbon generation, government ambition and policies in place to decarbonise power** • Low carbon sources already contribute 82% of electricity generation in 2018. • The 2019 Clean Canada Plan has set the objective to generate 90% of Canada's electricity from clean energy sources by 2030. • Government has put policies in place to incentivise zero carbon power: the Federal Accelerated Capital Cost Allowance offers investors accelerated investment write-off for renewable energy equipment; while at the provincial level, Ontario and Alberta contract renewable energy capacity through auction regimes.

Clean power – tier 1 countries

Achieve 100% clean power by 2035-40

Country	Reasons for Forecast
UK 2040	**Rapidly growing low-carbon generation, government ambition and policies in place to decarbonise power** • Low carbon generation has increased quickly over the last decade: 55% of electricity generation was from low-carbon generation in 2018, which is an increase from 24% in 2010. • The 2018 Clean Growth Strategy recognises that 'emissions from the power sector could need to be close to zero' by 2050. • Government has also set medium-term objectives: the 2019 Offshore Wind Sector Deal, sets an objective to increase offshore wind capacity to 40 GW by 2030. • Government has put policies in place to incentivise zero carbon power: the Energy Act 2013 established a low-carbon electricity auction regime; there have been three low-carbon capacity auctions to date, awarding contracts for 2.1 GW of offshore wind in 2015, 3.3 GW in 2017 and 5.8 GW in 2019.

Clean power – tier 1 countries

Achieve 100% clean power by 2035-40

Country	Reasons for Forecast
USA 2040	**Government ambition and policies in place to decarbonise power** • In his 2020 manifesto for climate and energy policy, President Biden set the objective to 'achieve a carbon pollution-free power sector by 2035'. • IPR2021 forecasts the USA will announce a 2050 net zero target by 2023. • However, it is unclear whether the USA can achieve this objective given political opposition in gas-rich states and a lack of evidence on deliverability in this timeframe. • Government has put policies in place to incentivise low carbon power: at the federal level, the Production Tax Credit and Investment Tax Credit offer tax incentives of up to 60% for the output from renewable projects; while at the state level, 30 states have adopted renewable portfolio standards and several states such as New York hold renewable energy auctions. The federal tax credits were extended by up to 2 years with the December 2020 signing of The Consolidated Appropriations Act (2021).
South Africa 2040	**Coal generation phase-out by 2040 and high government ambition on renewable power** • IPR2021 forecasts South Africa will phase-out all unabated coal-fired generation by 2040. • The 2019 Integrated Resource Plan sets the objective for renewables to meet 33% of electricity demand by 2030, with 31 GW of installed renewable capacity in that year. • South Africa has minimal gas-fired generation: natural gas contributed no electricity generation in 2018; there is low access to natural gas in South Africa given low proven domestic gas reserves.

Clean power – tier 2 countries

Achieve 100% clean power by 2045

Country	Reasons for Forecast
Germany	**Existing government ambition on low carbon power; need for action to meet net zero target** • Low carbon generation is already high and growing, contributing 49% of the total in 2018, up from 41% in 2010. • Prior to the EU announcing a net zero target for 2050, Germany already had high ambition to achieve deep decarbonisation in power: the 2017 Amendment of the Renewable Energy Sources Act sets an objective of 80% renewable generation by 2050. • Complete decarbonisation of power will be needed to meet the EU's net zero target by 2050. • Government has put policies in place to incentivise low carbon power: the 2017 Amendment of the Renewable Energy Sources Act established a renewables energy auction regime; under this law, government had procured 14 GW of renewable energy capacity in 38 rounds by November 2019. • IPR2021 forecasts Germany will end all unabated coal-fired generation by 2038. • Germany has high access to gas for electricity generation through the Nord Stream pipeline and potentially Nord Stream 2, which it could continue to rely on for unabated gas-fired generation prior to achieving net zero by 2050.

Clean power – tier 2 countries

Achieve 100% clean power by 2045

Country	Reasons for Forecast
Italy	**Existing government ambition on low carbon power; need for action to meet net zero target** • Low carbon generation is already high and growing, contributing 41% of the total in 2018, up from 27% in 2010. • Italy's 2019 Integrated National Energy and Climate Plan sets the objective of a 55% share of renewables in power by 2030. • Complete decarbonisation of power will be needed to meet the EU's net zero target by 2050. • Government has put policies in place to incentivise low carbon power: the 2019 Ministerial Decree will award contracts for 8 GW of renewables in six auction rounds through to 2021. • IPR2021 forecasts Italy will end all unabated coal-fired generation by 2025. • Italy has high access to gas for electricity generation from Russia, which it could continue to rely on for unabated gas-fired generation prior to achieving net zero by 2050.

Clean power – tier 2 countries

Achieve 100% clean power by 2045

Country	Reasons for Forecast
Japan	**Existing government ambition on low carbon power; need for action to meet net zero target** • In his first address to Parliament, Prime Minister Suga set the objective for net zero emissions by 2050 and to 'fundamentally shift our long-standing policy on coal-fired power generation'. • Complete decarbonisation of power will be needed to meet Japan's net zero target by 2050. • Government has put policies in place to incentivise low carbon power: Japan has contracted 600 MW of new solar PV across five auction rounds since 2017, and 230 MW of offshore wind in 2017. • IPR2021 forecasts Japan will end unabated coal-fired generation by 2040. • Japan could continue to rely on imported LNG for unabated gas-fired generation prior to achieving net zero by 2050.

Clean power – tier 2 countries

Achieve 100% clean power by 2045

Country	Reasons for Forecast
Korea	**Existing government ambition on low carbon power; need for action to meet net zero target** • Prior to Korea announcing a net zero target by 2050, government already had ambition to deploy low carbon power: the 2019 Third Energy Masterplan sets the objective to increase renewables' share of the electricity mix to 20% by 2030 and 30-35% by 2040. • Complete decarbonisation of power will be needed to meet Korea's net zero target by 2050. • Government has put policies in place to incentivise low carbon power: the 2012 Renewable Portfolio Standard requires power producers to generate electricity from renewable sources, with a target of 8% of generation in 2020, 9% in 2021 and 10% in 2022. • IPR2021 forecasts Korea will end unabated coal-fired generation by 2040. • Korea could continue to rely on imported LNG for unabated gas-fired generation prior to achieving net zero by 2050.

Clean power – tier 2 countries

Achieve 100% clean power by 2045

Country	Reasons for Forecast
Vietnam	**Government ambition on low carbon power but high reliance on fossil generation** • Low carbon generation is already high and growing, contributing 35% of the total in 2018, up from 29% in 2010. • The 2016 Power Development Plan 7 sets the objective for renewable generation, excluding large hydropower, to generate 11% of electricity by 2030. • Government has put policies in place to incentivise low carbon power: Vietnam has a feed-in tariff for onshore and offshore wind. • IPR2021 forecasts Vietnam will end unabated coal-fired generation by 2040. • Vietnam could use domestically produced natural gas and imported LNG for unabated gas-fired generation after a phase-out of unabated coal generation.

Clean power – tier 3 countries

Achieve 100% clean power by 2050

Country	Reasons for Forecast
Australia	**No federal ambition to achieve deep decarbonisation of power** • IPR2021 forecasts Australia to end all coal generation by 2040. • Federal government has not set the objective or put policies in place to achieve deep decarbonisation in the power sector. • Australia has high access to gas which it could use for unabated gas-fired generation: total proved natural gas reserves amount to 16 years of production under existing economic and operating conditions.[1]
Mexico	**No government ambition to achieve deep decarbonisation of power and limited recent renewables growth** • IPR2021 forecasts Mexico to end all coal generation by 2040. • Limited increase in low carbon electricity capacity in recent years: 21% of electricity generation was from low-carbon generation in 2018, up from 19% in 2010. • Government has not set the objective or put policies in place to achieve deep decarbonisation in power. • The 2020 Transition Strategy to Promote the Use of Cleaner Technologies and Fuels, sets an objective for 'clean energy'[1] to contribute 35% of total generation for 2024, 40% for 2033 and 50% for 2050.

Notes: 1) Clean energy in Mexico's 2020 Transition Strategy to Promote the Use of Cleaner Technologies and Fuels includes renewables, nuclear and fossil power plants with CCUS
Source: 1) BP (2020) Statistical Review of World Energy 2020

Clean power – tier 3 countries

Achieve 100% clean power by 2050

Country	Reasons for Forecast
China	**No government ambition to achieve deep decarbonisation of power and natural gas policy push** • IPR2021 forecasts China to end all coal generation by 2040. • Government has not set the objective or put policies in place to achieve deep decarbonisation in power in its most recent Energy Development Strategy Action Plan (2014-2020) or in the 13th Five Year Plan (2016-20). • The 13th Five Year Plan (2016-20) sets the objective to develop 'gas peaking power plants' and 'set up work on the development of strategic land corridors for importing oil and gas', which could increase the share of gas in the electricity mix.
India	**No government ambition to achieve deep decarbonisation of power and natural gas policy push** • IPR2021 forecasts India to end all coal generation by 2040. • Limited growth over the last decade in the low carbon share of total electricity generation: it was 21% of the total in 2018, up from 19% in 2010. • Government has not set the objective or put policies in place to achieve deep decarbonisation in power. • Government has set the objective to raise the share of natural gas in primary energy to 15% by 2030, up from 6.5% in 2016, which could increase the share of gas in the electricity mix.

Clean power – tier 3 countries

Achieve 100% clean power by 2050

Country	Reasons for Forecast
Indonesia	**No government ambition to achieve deep decarbonisation of power and low renewables share of generation** • IPR2021 forecasts Indonesia to end all coal generation by 2040. • Government has not set the objective or put policies in place to achieve deep decarbonisation in power. • Wind and solar PV continues to contribute minimal electricity generation: their combined share of total generation was less than 1% in 2018. • The low carbon share of total generation has increased minimally over the last decade, amounting to 17% in 2018 compared to 16% 2010. • Indonesia has high access to gas which it could use for unabated gas-fired generation: total proved natural gas reserves amount to 21 years of production under existing economic and operating conditions.[1]
Brazil	**No government ambition to achieve deep decarbonisation of power** • IPR2021 forecasts Brazil to end all coal generation by 2040. • Government has not set the objective or put policies in place to achieve deep decarbonisation in power. • Brazil has moderate access to gas which it could use for unabated gas-fired generation: there are gas pipelines from Bolivia and Argentina; Brazil also has total proved natural gas reserves equal to 15 years of production under existing economic and operating conditions.[1]

Source: 1) BP (2020) Statistical Review of World Energy 2020

Clean power – tier 3 countries

Achieve 100% clean power by 2050

Country	Reasons for Forecast
Russia	**No government ambition to achieve deep decarbonisation of power and low renewables share of generation** • IPR2021 forecasts Russia to end all coal generation by 2040. • Wind and solar PV continues to contribute minimal electricity generation: their combined share of total generation was less than 1% in 2018. • The low carbon share of total generation has increased minimally over the last decade, contributing 36% in 2018 compared to 33% 2010. • Government has not set the objective or put policies in place to achieve deep decarbonisation in power. • Russia has high access to gas which it could use for unabated gas-fired generation: total proved natural gas reserves amount to 56 years of production under existing economic and operating conditions.[1]
Turkey	**No government ambition to achieve deep decarbonisation of power** • IPR2021 forecasts Turkey to end all coal generation by 2040. • Government has not set the objective or put policies in place to achieve deep decarbonisation of power. • Turkey has high access to gas which it could use for unabated gas-fired generation: there are several pipelines that connect Turkey with major gas suppliers including Azerbaijan and Russia; Turkey also has two LNG terminals.

Source: 1) BP (2020) Statistical Review of World Energy 2020

Clean power – tier 3 countries

Achieve 100% clean power by 2050

Country	Reasons for Forecast
Argentina	**No government ambition to achieve deep decarbonisation of power and low renewables share of generation** • IPR2021 forecasts Argentina to end all coal generation by 2040. • Wind and solar PV continues to contribute a low share of electricity generation, amounting to a combined share of 1% in 2018. • Government has not set the objective or put policies in place to achieve deep decarbonisation in power. • Argentina has high access to gas which it could use for unabated gas-fired generation: total proved natural gas reserves amount to 13 trillion cubic feet (Tcf) which is 9 years of production under existing economic and operating conditions.[1] • However, proven gas reserves could be significantly higher in the future given the ongoing development of the world's second largest shale gas deposit at Vaca Muerta, which has an estimated 310 Tcf of gas.[2]

Sources: 1) BP (2020) Statistical Review of World Energy 2020; 2) US Energy Information Administration (2017) Argentina

Clean power – tier 3 countries

Achieve 100% clean power by 2050

Country	Reasons for Forecast
Nigeria	**No government ambition to achieve deep decarbonisation of power and declining low carbon share of generation** • IPR2021 forecasts Nigeria to end all coal generation by 2040. • Wind and solar PV continues to contribute a low share of electricity generation, amounting to a combined share of less than 1% in 2018. • The low carbon share of total generation has fallen in recent years, from 24% in 2010 to 18% in 2018. • Government has not set the objective or put policies in place to achieve deep decarbonisation in power. • Nigeria has high access to gas which it could use for unabated gas-fired generation: total proved natural gas reserves amount to 109 years of production under existing economic and operating conditions and 2.7% of the global total.[1]
Saudi Arabia	**No government ambition to achieve deep decarbonisation of power and minimal low carbon share of generation** • Saudi Arabia does not use coal for electricity generation. • There is minimal existing low carbon generation, with 0% of electricity generation from low-carbon sources in 2018. • Government has not set the objective or put policies in place to achieve deep decarbonisation in power. • Saudi Arabia has high access to gas which it could use for unabated gas-fired generation: total proved natural gas reserves amount to 53 years of production under existing economic and operating conditions.[1]

Source: 1) BP (2020) Statistical Review of World Energy 2020

Detailed Policy Forecasts

ICE sales bans

ICE sales bans – Overview

Zero emission vehicle trends

The market share for electric vehicles is increasing…

Electric vehicles accounted for 2.6% of new car sales globally in 2019, up from 2.4% in 2018 and 1.5% in 2017.[1]

…especially in the UK and EU

In 2020, 11% of new car sales were electric vehicles in EU countries and the UK, up from 3% in 2019. Sales accelerated in late 2020 and amounted to 23% of all new car sales in December.[2]

Policy trends

Sales bans are in place in several countries

3 IPR countries have set the objective to end sales of new fossil cars and vans. In addition, 12 IPR countries have targets or policies in place to increase uptake of electric vehicles.

Policy incentivises uptake of zero emission heavy goods vehicles

Although no IPR country has set an objective to phase-out fossil heavy goods vehicles, 7 IPR countries have targets or policies in place to increase uptake of zero emission heavy goods vehicles or to reduce transport sector emissions.

Policy forecast

Ban in leading countries by 2035

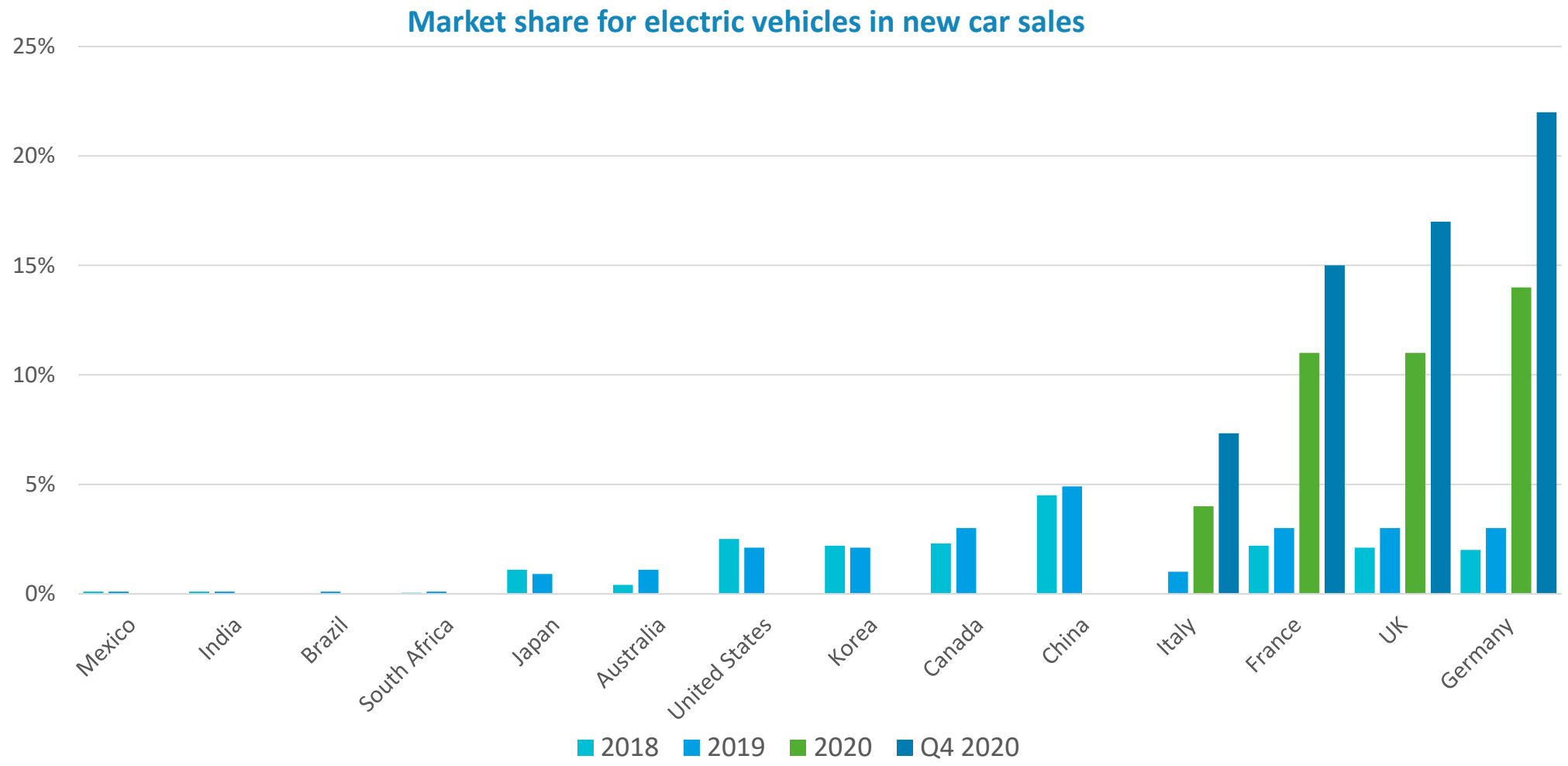
Early sales ban for first mover countries by 2030-2035.

Industry drives change

Other countries follow as industry reaches tipping point.

Sources: 1) IEA EV Outlook 2020; 2) ICCT Market Monitor January 2021

The market share of electric vehicles in new car sales is accelerating rapidly

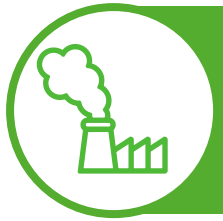


Note: Data not available for Indonesia, Vietnam, Russia, Turkey, Saudi Arabia, Argentina and Nigeria. Figures for Q4 2020 may be partly driven increased purchase subsidies under Covid-19 stimulus packages and a contraction of the car market in 2020

Sources: IEA EV Outlook 2019 IEA EV Outlook 2020; ICCT Market Monitor January 2021

Drivers and barriers of ICE sales bans policy

Drivers[1]



Air pollution concerns

Policymakers face stronger incentives to phase-out fossil vehicles in countries where the death rate from air pollution is high. 15 out of 21 IPR countries, have over 30 deaths from air pollution annually per 100,000 residents.

Techno-economics

Policymakers are more likely to end the sale of new fossil vehicles when cost-effective alternatives exist. Electric vehicles are expected to reach cost parity with internal combustion engines before 2030 and the total cost of ownership of electric heavy goods vehicles is expected to be less than the cost of diesel heavy goods vehicles by 2030.

Barriers[2]

Just Transition

Policymakers are less likely to end the sale of new fossil-fuelled cars, vans and heavy goods vehicles in countries that specialise in the manufacture of internal combustion engines, due to concerns over job losses in this industry. 8 out of 21 IPR countries specialise in exporting internal combustion engines.

INEVITABLE POLICY RESPONSE

Notes: 1) Factors which are likely to cause policymakers to accelerate ambition (or at least not hinder it); 2) Factors which are likely to cause policymakers to delay ambition (or at least hinder it)

Current policy ambition for ICE sales bans

Net zero ambition countries[1]

France has set the objective for all new cars to be zero emission by 2040 and to decarbonise the transport sector by 2050.

Germany has set a target to reduce transport sector emissions by 40% below 1990 levels by 2030.

China requires automakers to achieve a 25% share for zero emission vehicles in production in 2025 and offers purchase subsidies for electric cars and heavy goods vehicles.

Several US states have targets and purchase subsidies in place for cars and heavy goods vehicles.

Policy is under consideration in South Africa, Australia and Brazil.

The UK's 2020 Ten Point Plan sets a target to end the sale of new petrol and diesel cars and vans from 2030.

Italy's 2019 Integrated National Energy and Climate Plan sets an objective to achieve 6 million 'electrically powered vehicles' by 2030.

Canada has set an objective for 100% of new light-duty vehicles to be zero emission by 2040.

Korea has a target of 1.1 million electric vehicle sales by 2025 and of 30,000 hydrogen trucks by 2040.

Japan has set an objective for 100% of car production to be hybrid or electric by 2050.

Argentina has reduced import duties for electric, hybrid and hydrogen vehicles.

Other countries[2]

India has set an objective for 30% of all vehicle sales to be electric by 2030.

Indonesia has set a target for electric vehicles to account for 20% of domestic car production by 2025.

Mexico has set an objective to reduce greenhouse gas emissions by up to 5 MtCO2 by 2030 relative to business as usual through the electrification of transport.

Turkey has reduced consumption tax on electric vehicles.

Nigeria, Russia, Vietnam and Saudi Arabia have no policies in place to incentivise a phase-out of fossil cars and vans or heavy goods vehicles.

INEVITABLE POLICY RESPONSE

Notes: 1) Countries which have set a net zero target in law or in a policy document; 2) Countries which have not officially set zero targets in law or in a policy document

Developments in zero emissions vehicles policy since IPR2019

Net zero ambition countries[1]

- The UK announced an objective to end sales of fossil cars and vans in the 2020 Ten Point Plan for a Green Industrial Revolution.
- In the US, California requires 55% of all new heavy goods vehicle sales to be zero emission by 2035 under the 2020 Advanced Clean Trucks Regulation.
- In July 2020, 14 US states and Washington D.C. signed a memorandum of understanding in which they agreed to phase-out fossil heavy goods vehicle sales by 2050.
- In France, the 2020 budget included purchase subsidies for electric vehicles that are amongst the highest in Europe.
- France's 2020 National Low-Carbon Strategy set the objective of a complete decarbonisation of the transport sector by 2050.
- The French 2020 Pluriannuelle Energy Programme sets an objective of 800-2200 Hydrogen heavy duty vehicles on the road nationally by 2028.
- Germany increased the purchase subsidies for electric vehicles under the June 2020 Covid-19 stimulus package.

Other countries[2]

- Australia published a Discussion Paper for the forthcoming Future Fuels Strategy in February 2021. The full Strategy is expected to be published in the first half of 2021.

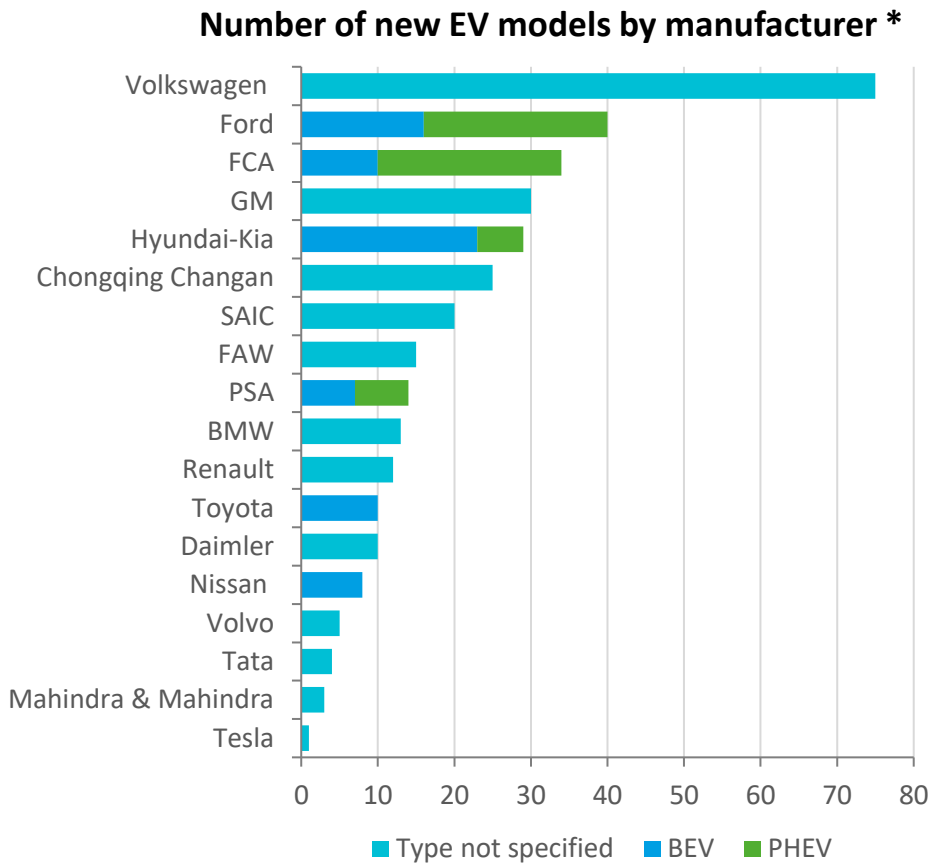
Notes: 1) Countries which have set a net zero target in law or in a policy document; 2) Countries which have not officially set zero targets in law or in a policy document

Auto manufacturers are phasing out fossil fuelled light duty vehicles and investing in production of electric vehicles

Many automakers have already announced a transition to zero emission vehicles….

- In February 2021, **Jaguar** announced it will be an all-electric car brand by 2025.
- **BMW** aims for '5-25% of the group's sales to be electric vehicles in 2025'.
- **Volvo** announced in March 2021 that it will phase-out cars with internal combustion engines by 2030 and has set an interim target for 50% of sales to be fully electric vehicles by 2025.
- **Volkswagen** has set a target for 25% of the group's sales in 2025 to be electric vehicles.
- **Ford** has set a target for all cars for sale in Europe to be electric by 2030.
- In January 2021, **GM** announced that it 'hopes to offer only zero-emissions vehicles by 2035'.
- **Daimler** aims for 50% of sales to be electric in 2030.

…and aim to increase the number of electric vehicle models in production



Source: IEA EV Outlook 2020

* Target year varies between 2021 and 2029. Includes targets listed in the IEA EV Outlook 2020 and the announcement from GM in January 2021

INEVITABLE POLICY RESPONSE

IPR2021 ICE phase out forecast: light duty vehicles

Tier	Country	Forecast Policy Response	Change from IPR2019 Survey	Change from IPR2019 IPR2021
Tier 1	UK	100% ZEV sales from 2030	▲	▲
	China	100% ZEV sales from 2035		
	France			
	Germany			
	Italy			
	Korea		▲	▲
Tier 2	Argentina	100% ZEV sales from 2040		
	Australia			
	Canada			
	India			
	Indonesia			
	Japan			
	Mexico			
	South Africa		▲	▲
	Turkey		▲	▲
	USA			
	Vietnam			
Tier 3	Brazil	100% ZEV sales from 2045	▼	▼
	Nigeria			
	Russia			
	Saudi Arabia			

Legend ▲ higher ambition ▼ lower ambition ● no change

- The UK has announced an end to the sale of fossil cars and vans by 2030.
- South Korea upgraded to tier 1, with increase in ambition expected given requirements of 2050 net zero target.
- South Africa and Turkey upgraded to tier 2; ambition in South Africa driven by net zero target, and in Turkey by proximity to EU vehicle market.

INEVITABLE POLICY RESPONSE

ICE sales bans (light duty vehicles) – tier 1 countries

End the sale of fossil fuelled light duty vehicles by 2030 - 2035

Country	Reasons for Forecast
UK 2030	**The UK has committed to end sales of new fossil cars and vans from 2030** • The 2020 Ten Point Plan for a Green Industrial Revolution sets a target to end the sale of new petrol and diesel cars and vans from 2030 and Prime Minister Johnson's confirmation of the phase-out date in late 2020 is consistent with this ambition. • The UK Government has a history of setting targets for phasing out fossil cars and vans: the 2017 Clean Growth Strategy committed to ending the sale of petrol and diesel cars and vans by 2040 and in 2020 the Government ran a public consultation to seek views on bringing forward the end to the sale of new petrol, diesel and hybrid cars and vans to 2035. • Uptake of electric vehicles is increasing: in 2020 11% of new car sales were electric vehicles, up from 3% in 2019.[1]
Italy 2035	**Government ambition and existing policies incentivise increased uptake of electric vehicles** • The 2019 Integrated National Energy and Climate Plan sets an objective to achieve a 22% share of renewables in transport, and for 6 million 'electrically powered vehicles' by 2030. • The 2017 Budget exempts buyers of full-electric or hybrid vehicles from the annual registration tax for the first five years and the 2019 Decree-Law No 34 provides a 30% subsidy for electric cars, conditional on scrappage of their existing internal combustion engine vehicle. • Uptake of electric vehicles is increasing: in 2020 4% of new car sales were electric vehicles, up from 1% in 2019.[1]

Source: 1) ICCT Market Monitor January 2021

ICE sales bans (light duty vehicles) – tier 1 countries

End the sale of fossil fuelled light duty vehicles by 2030 - 2035

Country	Reasons for Forecast
Germany 2035	**The market for electric vehicle market is large; domestic automakers are transitioning to electric vehicles** • Uptake of electric vehicles is increasing: electric vehicles accounted for 14% of new car sales in Germany in 2020, up from 3% in 2019. • The 2019 Climate Action Programme sets a target to reduce overall transport sector emissions by around 40% below 1990 levels by 2030. • The Environmental Bonus program provides purchase subsidies for electric vehicles, which rose during June 2020 as part of the Covid-19 stimulus package. • German automakers are increasingly shifting to production of electric vehicles: the German Association of the Automotive Industry estimates that 16% of total passenger vehicle production was electric vehicles in November 2020, compared to 6% in November 2019.[1]
France 2035	**France has committed to phase-out sales of new fossil-fuelled cars** • France has set multiple targets for a phase-out of fossil cars and vans: The 2019 National Energy and Climate Plan sets the objective to end the sale of 'new cars emitting greenhouse gases by 2040' and the 2020 Pluriannuelle Energy Programme sets intermediate targets for alternative fuel vehicles, including 660,000 battery electric and fuel cell vehicles and 500,000 plug-in hybrid electric vehicles by 2023. • The 2020 Budget provides a subsidy of up to €12,000 for electric vehicles. • Uptake of electric vehicles is increasing: in 2020 11% of new car sales were electric vehicles, up from 3% in 2019.[1]

Source: 1) ICCT Market Monitor January 2021

ICE sales bans (light duty vehicles) – tier 1 countries

End the sale of fossil fuelled light duty vehicles by 2030 - 2035

Country	Reasons for Forecast
China 2035	**High uptake of electric vehicles; existing policies incentivise increased uptake of electric vehicles** • Uptake of electric vehicles and access to charge points are above the world average: in 2019, electric vehicles accounted for 4.9% of new car sales in China, compared with 2.6% globally; additionally, there were 38 publicly accessible charge points for every 10,000 cars in China in 2019, compared with 9 charge points for every 10,000 cars globally.[1] • The 2018 New Energy Vehicle mandate requires automakers to achieve a 25% share for electric and fuel-cell vehicles in passenger vehicle production in 2025. • Purchase subsidies for electric vehicles of up to CNY 25,000 (US$3,800) are in place through the 2009 Electric Vehicle Subsidy Scheme. • Industry is increasing ambition: in October 2020 China's organisation of automobile experts, under the guidance of the Ministry of Industry and Information Technology, set the objective for electric, plug-in hybrid or fuel cell vehicles to account for 50% of new vehicles sold in 2035.
Korea 2035	**Existing policies incentivise electrification and hydrogen for transport** • The Government has already set multiple targets: The 2019 Korea New Green Deal sets the objective of 1.1 million electric vehicle sales by 2025 and in 2019 President Moon Jae-in announced an objective for 33% of new vehicles to be either electric or hydrogen-powered by 2030. • The 2015 Electric Vehicle Subsidy System provides subsidies for purchase of electric vehicles of up to KRW 22.5 million (US$20,000) depending on type.

Source: 1) IEA EV Outlook 2020

ICE sales bans (light duty vehicles) – tier 2 countries

End the sale of fossil fuelled light duty vehicles by 2040

Country	Reasons for Forecast
USA	**The uptake of electric vehicles is relatively low; targets for zero emission vehicles are in place in some states** • Uptake of electric vehicles is below the world average: in 2019 electric vehicles accounted for 2.1% of new car sales, a fall from 2.3% in 2018, compared with the global average of 2.6% in 2019.[1] • Electric vehicle polices are in place in several states: 11 states have joined the ZEV Alliance which sets a goal to make all passenger vehicle sales in member's jurisdictions Zero Emission Vehicles (ZEVs) by 2050 and 14 states (representing nearly 40% of new car sales) have adopted or announced the intention to adopt California's 1990 ZEV mandate, requiring manufacturers to hold ZEV credits of 22% of sales in 2025, obtained by achieving an 8% share of ZEVs in total car and light-duty truck sales in that year. • Although there are no federal targets for a phase-out of fossil cars and vans, tax incentives for electric vehicle purchases are in place at both the federal and state level: the Federal Government provides a tax credit for purchases of electric and plug-in hybrid vehicles and 16 states offer additional subsidies.
Canada	**Canada has set an ambition to phase-out sales of fossil cars and vans by 2040** • The 2019 Budget sets an objective for 100% of new light-duty vehicles sold in Canada to be zero emission by 2040, with interim targets of 30% by 2030 and 10% by 2025. • The Federal Government has purchase subsidies in place for battery electric, hydrogen fuel cell and plug-in hybrid vehicles. • Uptake of electric vehicles is above the global average: 3% of new car sales were electric vehicles in 2010, compared to 2.6% globally.[1]

Source: 1) IEA EV Outlook 2020

ICE sales bans (light duty vehicles) – tier 2 countries

End the sale of fossil fuelled light duty vehicles by 2040

Country	Reasons for Forecast
Australia	**No federal policy is in place, but existing policy in several states supports uptake of electric vehicles** • Uptake of electric vehicles is below the world average: sales of electric vehicles were 1.1% of new car sales in 2019, up from 0.4% in 2018, compared with the global average of 2.6% in 2019.[1] • There is no electric vehicle policy in place at the federal level. However, in February 2021 the Government published a discussion paper on the Future Fuels Strategy, which sets out five priority areas including charging and hydrogen refuelling infrastructure, an early focus on commercial fleets and integrating battery electric vehicles into the electricity grid. The full Strategy is expected to be published in the first half of 2021. • State level policies are incentivising uptake: the Australian Capital Territory exempts owners of zero-emission vehicles from stamp duty and provide them with a 20% discount on vehicle registration; in Victoria, electric vehicles are exempt from the luxury vehicle rate of stamp duty and receive an annual discount on vehicle registration.
Japan	**The current market share for electric vehicles is small, but existing policy supports electrification of transport** • Uptake of electric vehicles is below the world average: sales of electric vehicles were 0.9% of new car sales in 2019, down from 1.1% in 2018, compared with the global average of 2.6% in 2019.[1] • The 2018 Long-Term Goal and Strategy of Japan's Automotive Industry for Tackling Global Climate Change sets an objective for battery electric vehicles and plug-in hybrids to account for 30% of car sales by 2030 and for 100% of production to be hybrid electric, battery electric, plug-in hybrid or fuel-cell electric by 2050. • Purchase subsidies of up to JPY 400,000 (US$3,600) for battery electric vehicles and JPY 2.25 million (US$20,000) for fuel cell electric vehicles are in place under annual Budgets.

Source: 1) IEA EV Outlook 2020

ICE sales bans (light duty vehicles) – tier 2 countries

End the sale of fossil fuelled light duty vehicles by 2040

Country	Reasons for Forecast
Mexico	**The current market share for electric vehicles is small, but existing policy supports electrification of transport** • The market share for electric vehicles is below the world average: electric vehicles accounted for 0.1% of new car sales in Mexico in 2019, compared with 2.6% globally.[1] • The 2018 National Electric Mobility Strategy sets the objective to reduce greenhouse gas emissions by up to 5 $MtCO_2$ by 2030 relative to business as usual through the electrification of transport. • The 2016 Federal Law on New Automobiles Taxation exempts electric and plug-in hybrid vehicles from import, export, and vehicle acquisition taxes, and the 2017 Income Tax Law grants a tax credit of 30% to public charging infrastructure investments.
India	**The current market share for electric vehicles is small, but existing policy supports electrification of transport** • The market share for electric vehicles and access to charging points are both below the world average: electric vehicles accounted for 0.1% of new car sales in India in 2019, compared with 2.6% globally; while there was 1 publicly accessible charge point for every 10,000 cars in India in 2019, compared with 9 globally.[1] • Transport Minister Nitin Gadkari announced in 2017 an objective for 30% of all vehicle sales to be electric vehicles by 2030, an objective that has been incorporated in the 2018 National E-Mobility Program. • The Faster Adoption and Manufacturing of Hybrid and EV (FAME) II scheme offers purchase subsidies of up to INR 150,000 (US$2,300) for electric vehicles. • The 2017 Goods and Services tax levies a reduced rate of 5% on electric vehicles and 12% on fuel cell vehicles, compared to 28% on vehicles with internal combustion engines.

Source: 1) IEA EV Outlook 2020

ICE sales bans (light duty vehicles) – tier 2 countries

End the sale of fossil fuelled light duty vehicles by 2040

Country	Reasons for Forecast
Indonesia	**Oil subsidies create barrier for transition to electric vehicles, but existing policy supports uptake** • Indonesia subsidises consumption of fossil fuels which reduces the cost of ownership of fossil vehicles relative to electric. In 2019, subsidies for oil consumption amounted to US$19.2bn, equivalent to 1.7% of GDP.[1] • Market share and infrastructure for electric vehicles are minimal. • The Government has set a target for electric vehicles to account for 20% of domestic car production by 2025. • The 2019 Presidential Regulation No. 55 provides incentives to consumers and manufacturers of battery electric vehicles, including exempting them from the luxury car tax and lower import duties of battery electric vehicle components.
Vietnam	**No existing policies, but increased uptake of electric two-wheelers and air pollution incentivises phase-out** • No policy is currently in place to encourage uptake of electric vehicles. • Market share and infrastructure for electric vehicles are minimal. • Increasing problems with air pollution – Hanoi was the most polluted city in Southeast Asia outside of Indonesia in 2019 – increases the public benefits of switching to zero emission vehicles.[2] • Electric two-wheelers are gaining an increasingly large market share: domestic production of electric two-wheelers commenced in 2018 and close to 50,000 electric scooters have been produced so far.[3]

Sources: 1) IEA (2020); 2) IQAir World Air Quality Report 2019; 3) Reuters (2018), Vietnam Plus (2020)

ICE sales bans (light duty vehicles) – tier 2 countries

End the sale of fossil fuelled light duty vehicles by 2040

Country	Reasons for Forecast
Argentina	**Oil subsidies create barrier for transition to electric vehicles, but existing policy supports uptake** • Argentina subsidises consumption of fossil fuels which reduces the cost of ownership of fossil vehicles relative to electric. In 2019, subsidies to fossil fuels amounted to US$4.3bn, equivalent to 1% of GDP, of which US$3.2 bn was for consumption of oil.[1] • Market share and infrastructure for electric vehicles are minimal. • A 2017 Presidential Decree reduced import duties on electric, hybrid and hydrogen vehicles to 0-5%, compared to up to 35% for vehicles with internal combustion engines.

Source: 1) IEA (2020)

ICE sales bans (light duty vehicles) – tier 2 countries

End the sale of fossil fuelled light duty vehicles by 2040

Country	Reasons for Forecast
Turkey	**Lack of existing targets and small market share for electric vehicles, but policy incentivises uptake** • There are no targets in place for a phase-out of fossil cars and vans. • Market share and infrastructure for electric vehicles are minimal. • The Government reduced the Special Consumption Tax on electric and plug-hybrid cars in 2016.
South Africa	**No policies are currently in place, but policy is under consideration and emission reduction target is in place** • There are currently no policies or targets in place for a phase-out of fossil cars and vans. • Market share and infrastructure for electric vehicles are below the world average: electric vehicles accounted for 0.1% of new car sales in 2019, compared with 2.6% globally and there was fewer than 1 publicly accessible charge point for every 10,000 cars in South Africa in 2019, compared with 9 charge points for every 10,000 cars globally.[1] • The 2018 Green Transport Strategy states that the Department of Transport will 'consider removing or relaxing import duties on electric vehicles' and 'offer producers of electric vehicle manufacturing incentives to both produce and sell affordable electric vehicles in South Africa'. • The 2018 Green Transport Strategy sets an objective to reduce transport sector greenhouse gas emissions by at least 5% by 2050.

Source: 1) IEA EV Outlook 2020

ICE sales bans (light duty vehicles) – tier 3 countries

End the sale of fossil fuelled light duty vehicles by 2045

Country	Reasons for Forecast
Brazil	**Large biofuel industry create barriers for uptake of electric vehicles, but a sales ban is under consideration** • Brazil is the world's second largest producer of ethanol and biodiesel, which creates a barrier for a phase-out of internal combustion engine vehicles.[1] • The market share and infrastructure for electric vehicles are below the world average: electric vehicles accounted for 0.1% of new car sales in Brazil in 2019, compared with 2.6% globally and there was fewer than 1 publicly accessible charge point for every 10,000 cars in Brazil in 2019, compared with 9 charge points for every 10,000 cars globally.[2] • The Federal Senate is considering the prohibition of internal combustion engines from 2060 under Senate Bill No 454.
Russia	**Lack of policy ambition and small market size for electric vehicles create barriers to uptake of electric vehicles** • Government has not set an objective to end the sales of new fossil cars and vans and no policies are in place. • The market share and infrastructure for electric vehicles are minimal.

Sources: 1) IEA (2019); 2) IEA EV Outlook 2020

ICE sales bans (light duty vehicles) – tier 3 countries

End the sale of fossil fuelled light duty vehicles by 2045

Country	Reasons for Forecast
Nigeria	**Lack of existing objectives, but policies indicate future action** • There are currently no policies in place to incentivise a phase-out of fossil cars and vans. • Market share and infrastructure for electric vehicles are minimal. • However, the 2018 National Energy Policy strategy states that 'the nation shall encourage carbon credit incentives for the use of non-fossil fuel vehicles', which indicates future action.
Saudi Arabia	**Lack of policy ambition and heavily subsidised petrol create barriers to uptake of electric vehicles** • Saudi Arabia heavily subsidises consumption of fossil fuels which reduces the cost of ownership of fossil vehicles relative to electric. In 2018, subsidies to fossil fuels amounted to US$28.7bn (3.7% of GDP), of which US$18.2bn was for the oil industry.[1] • Market share and infrastructure for electric vehicles are minimal.

Source: 1) IEA (2020)

IPR2021 ICE phase out forecast: heavy goods vehicles

Tier	Country	Forecast Policy Response	Change from IPR2019 Survey	Change from IPR2019 IPR2021
Tier 1	UK	100% ZEV sales from 2035	▲	▲
	China	100% ZEV sales from 2040		
	France			
	Germany			
	Italy			
	Japan		▲	▲
	Korea		▲	▲
Tier 2	Argentina	100% ZEV sales from 2045		
	Australia			
	Brazil			
	Canada			
	India			
	Indonesia			
	Mexico			
	South Africa		▲	▲
	Turkey		▲	▲
	USA			
	Vietnam			
Tier 3	Nigeria	100% ZEV sales from 2050		
	Russia			
	Saudi Arabia			

Legend ▲ higher ambition ▼ lower ambition ● no change

- Ambition on heavy duty vehicles is expected to follow light duty: decarbonisation presents a greater challenges, but technological progress is strongly driven by progress in light duty vehicles, and policy drivers are comparable
- UK and Korea are upgraded to tier 1 in line with light duty vehicles
- Japan upgraded to tier 1 with similar ambition to light duty vehicles, as strong national push for hydrogen favours decarbonisation of heavy vehicles
- South Africa and Turkey upgraded to tier 2

INEVITABLE POLICY RESPONSE

ICE sales bans (heavy goods vehicles) – tier 1 countries

End the sale of fossil fuelled heavy goods vehicles by 2035 - 2040

Country	Reasons for Forecast
UK 2035	**Ambition to reduce emissions from heavy goods vehicles; net zero target likely to induce phase-out** • The 2018 Clean Growth Strategy states that emissions from heavy goods vehicles will 'need to reduce significantly' to contribute towards the 2050 net zero target. • The UK has already demonstrated ambition to reduce emissions in the transport sector by setting the target to end sales of fossil fuelled cars and vans by 2030. • The UK's 2050 net zero emissions target will require new policies to drive a substantial decrease in emissions from heavy goods vehicles.
Germany 2040	**Support for electrification of heavy goods vehicles; emission reduction targets are in place for transport** • The 2019 Climate Action Programme sets the ambition for a 40% reduction in transport emissions by 2030 relative to 1990 levels and 'approximately one third' of vehicle mileage in the heavy road transport sector to be electric or based on zero-carbon or carbon-neutral fuels by 2030. • Government-sponsored projects such as the trial of 'eHighways' for heavy goods vehicles on the Autobahn, indicate action on electrification of heavy goods vehicles.[1] • The EU's 2050 net zero emissions target will require new policies to drive a substantial decrease in emissions from heavy goods vehicles.

Source: 1) Business Insider (2019)

ICE sales bans (heavy goods vehicles) – tier 1 countries

End the sale of fossil fuelled heavy goods vehicles by 2035 - 2040

Country	Reasons for Forecast
France 2040	**Decarbonisation targets and policies supporting hydrogen are already in place** • The 2020 National Low-Carbon Strategy sets the objective of a 28% reduction in transport sector GHG emissions by 2030 relative to 2015 levels, and a complete decarbonisation of the transport sector by 2050. • The 2020 Pluriannuelle Energy Programme sets an objective of 800-2200 hydrogen heavy duty vehicles on the road nationally by 2028. • The 2050 net zero emissions target will require new policies to drive a substantial decrease in emissions from heavy goods vehicles.
Japan 2040	**Existing policies support electrification and hydrogen in transport; net zero target likely to induce phase-out** • The 2019 Long-term Strategy under the Paris Agreement states that it 'aims to electrify vehicle technology' for heavy goods vehicles. • The 2019 Strategic Road Map for Hydrogen and Fuel Cells sets the objective to promote 'technological development in an effort to diffuse fuel cell trucks' and sets a target for 320 hydrogen refill stations by 2025. • The 2050 net zero emissions target will require new policies to drive a substantial decrease in emissions from heavy goods vehicles.
Korea 2040	**Government support for hydrogen vehicles is in place; net zero target likely to induce phase-out** • The 2019 Hydrogen Economy Plan sets a target of 30,000 Hydrogen trucks by 2040. • The 2050 net zero emissions target will require new policies to drive a substantial decrease in emissions from heavy goods vehicles.

ICE sales bans (heavy goods vehicles) – tier 1 countries

End the sale of fossil fuelled heavy goods vehicles by 2035 - 2040

Country	Reasons for Forecast
Italy 2040	**Ambition to reduce emissions from heavy goods vehicles; net zero target likely to induce phase-out** • The 2019 Integrated National Energy and Climate Plan includes heavy goods vehicles in its target for 6 million 'electrically powered vehicles', including 4 million battery electric vehicles, by 2030. • The EU's 2050 net zero emissions target will require new policies to drive a substantial decrease in emissions from heavy goods vehicles.
China 2040	**Existing policies support electrification and hydrogen in transport; net zero target likely to induce phase-out** • Uptake of zero emission heavy goods vehicles is already high and China is currently the world's largest market for electric and fuel cell trucks: in 2019 sales of electric medium- and heavy-duty vehicles in China amounted to 6,100 vehicles, out of just under 6,500 sales globally, and cumulative sales of fuel cell road freight vehicles in China amounts to 98% of the global stock.[1] • The 2009 Electric Vehicle Subsidy Scheme provides purchase subsidies for battery electric trucks and plug-in hybrids of up to CNY 50,000 (US$7,600) and CNY 32,000 (US$4,900) respectively. • The 2060 net zero emissions target will require new policies to drive a substantial decrease in emissions from heavy goods vehicles.

Source: 1) IEA EV Outlook 2020

ICE sales bans (heavy goods vehicles) – tier 2 countries

End the sale of fossil fuelled heavy goods vehicles by 2045

Country	Reasons for Forecast
USA	**No federal target to phase-out fossil heavy goods vehicles, but policies and targets are in place in several states** • There is currently no federal policy in place to phase-out fossil heavy goods vehicles. • In July 2020, 14 US states and Washington D.C. signed a memorandum of understanding in which they agreed to make 30 percent of all heavy goods vehicle sales zero emission vehicles by 2030 and to phase-out fossil heavy goods vehicle sales by 2050. • Policy to incentivise low carbon heavy goods vehicles is already in place at the state level: California's 2020 Advanced Clean Trucks Regulation requires 55% of all new heavy goods vehicle sales to be zero emission by 2035; the 2019 Colorado Modifications to Income Tax Credits for Innovative Motor Vehicles Act offers credit of up to US$20,000 for the purchase of electric heavy goods vehicles. • President Biden signed an executive order in January 2021 which states that all vehicles in the federal fleet, including over 78,000 heavy goods vehicles, should be zero-emission vehicles. • IPR2021 forecasts that the USA will set a net zero emissions target for 2050. This target will require new policies to drive a substantial decrease in emissions from heavy goods vehicles.

ICE sales bans (heavy goods vehicles) – tier 2 countries

End the sale of fossil fuelled heavy goods vehicles by 2045

Country	Reasons for Forecast
Canada	**No policy in place; Canada is a producer of electric heavy goods vehicles and net zero target in place** • There is currently no policy in place to phase-out fossil heavy goods vehicles. • Domestic electrification policy would support the Canadian manufacturing industry given Canada is an early manufacturer of electric heavy goods vehicles: Canadian firms have a 50% market share in the Canadian market for electric heavy goods vehicles.[1] • The 2050 net zero emissions target is likely to require new policies to drive a substantial decrease in emissions from heavy goods vehicles.
Australia	**No policy in place, but alternative fuels strategy shows support for electrification and increased use of hydrogen** • There is currently no policy in place to phase-out fossil heavy goods vehicles. • In February 2021, the Government published a discussion paper on the Future Fuels Strategy, which sets out five priority areas including electric vehicle charging and hydrogen refuelling infrastructure, an early focus on commercial fleets and integrating battery electric vehicles into the electricity grid. The full Strategy is expected to be published in the first half of 2021. • IPR2021 forecasts that Australia will set a net zero emissions target for 2050. This target is likely to require new policies to drive a substantial decrease in emissions from heavy goods vehicles.

Source: 1) ICCT (2020)

ICE sales bans (heavy goods vehicles) – tier 2 countries

End the sale of fossil fuelled heavy goods vehicles by 2045

Country	Reasons for Forecast
India	**No policy in place, but severe air pollution and higher emission standards indicate shift to cleaner vehicles** • There is currently no policy in place to phase-out fossil heavy goods vehicles. • Severe air pollution – in 2019, India had the 5th highest level of air pollution in the world and Delhi was the world's most polluted capital – has led to policy action to reduce vehicle emissions.[1] The 2016 Government Notification G.S.R. 187(E) announced an increase in emission standards from BS IV (equivalent to Euro 4) to BS VI (Euro 6 equivalent) by 2020, which aligns with EU regulations. • IPR2021 forecasts that India will set a net zero emissions target for 2060. This target is likely to require new policies to drive a substantial decrease in emissions from heavy goods vehicles.
Mexico	**No policy in place, but air pollution creates incentives to implement sales ban** • There is currently no policy in place to phase-out fossil heavy goods vehicles. • Mexico was the 4th most polluted country in the Latin America and Caribbean region in 2019, which increases the public benefits of switching to zero emission heavy goods vehicles. [1] Mexico City announced in 2016 that the city will ban all diesel vehicles, including heavy duty vehicles, by 2025 in order to reduce air pollution.

Source: 1) IQAir World Air Quality Report 2019

ICE sales bans (heavy goods vehicles) – tier 2 countries

End the sale of fossil fuelled heavy goods vehicles by 2045

Country	Reasons for Forecast
Indonesia	**Oil subsidies creates barrier for uptake of electric vehicles, but electrification of transport taking place** • Indonesia subsidises consumption of fossil fuels which reduces the cost of ownership of fossil vehicles relative to electric. In 2019, subsidies for oil consumption amounted to US$19.2bn, equivalent to 1.7% of GDP.[1] • However, domestic automakers are already switching to production of electric vehicles, due to the Government's target for electric vehicles to account for 20% of domestic car production by 2025.
Vietnam	**No policies are currently in place, but air pollution creates incentives for a sales ban** • There are currently no policies in place to phase-out fossil heavy goods vehicles. • Increasing problems with air pollution – Hanoi was the most polluted city in Southeast Asia outside of Indonesia in 2019 – increases the public benefits of switching to zero emission heavy goods vehicles.[2]

Sources: 1) IEA (2020); 2) IQAir World Air Quality Report 2019

ICE sales bans (heavy goods vehicles) – tier 2 countries

End the sale of fossil fuelled heavy goods vehicles by 2045

Country	Reasons for Forecast
Turkey	**No existing policies, but air pollution creates an incentive for a phase-out of fossil heavy goods vehicles** • There are currently no policies in place to phase-out fossil heavy goods vehicles. • Problems with air pollution - 5 Turkish cities were among the 10 most polluted cities in Europe in 2019 – increases the public benefits of switching to zero emission heavy goods vehicles, following a sales ban for fossil cars and vans. [1]
South Africa	**No policies are currently in place; emission reduction target and net zero target likely to induce phase-out** • The Government has not set an objective or implemented policy to phase-out fossil heavy goods vehicles. • The Government has set an objective to reduce transport sector greenhouse gas emissions by at least 5% by 2050 in the 2018 Green Transport Strategy. • The 2050 net zero emissions target will require new policies to drive a substantial decrease in emissions from heavy goods vehicles.

Source: 1) IQAir World Air Quality Report 2019

ICE sales bans (heavy goods vehicles) – tier 2 countries

End the sale of fossil fuelled heavy goods vehicles by 2045

Country	Reasons for Forecast
Argentina	**No policies are in place to phase-out fossil heavy goods vehicles, but net zero target likely to induce sales ban** • There are currently no policies in place to phase-out fossil heavy goods vehicles. • Argentina subsidises consumption of fossil fuels which reduces the cost of ownership of fossil vehicles relative to electric. In 2019, subsidies to fossil fuels amounted to USD 4.3bn, equivalent to 1% of GDP, of which USD 3.2bn was for consumption of oil.[1] • The 2050 net zero emissions target will require new policies to drive a substantial decrease in emissions from heavy goods vehicles.
Brazil	**Biofuel industry create barriers for uptake of electric vehicles, but some policy is in place** • Brazil is the world's second largest producer of ethanol and biodiesel, which creates a barrier for a phase-out of internal combustion engine vehicles.[2] • Electrification of heavy goods vehicles is supported through a reduction of the Tax on Industrialized Products for vehicles with hybrid or electric engines by at least three percentage points relative to internal combustion engine vehicles, under the 2018 Rota 2030 Program - Mobility and Logistic. • The 2060 net zero emissions target will require new policies to drive a substantial decrease in emissions from heavy goods vehicles.

Sources: 1) IEA (2020); 2) IEA (2019)

ICE sales bans (heavy goods vehicles) – tier 3 countries

End the sale of fossil fuelled heavy goods vehicles by 2050

Country	Reasons for Forecast
Russia	**No policies to phase-out fossil heavy goods vehicles are currently in place** • Government has not set an objective or put policies in place to induce a phase-out of new fossil heavy goods vehicles.
Nigeria	**No policies to phase-out fossil heavy goods vehicles are currently in place** • Government has not set an objective or put policies in place to induce a phase-out of new fossil heavy goods vehicles.
Saudi Arabia	**Lack of policy ambition and heavily subsidised petrol create barriers to uptake of electric vehicles** • Government has not set an objective or put policies in place to induce a phase-out of new fossil heavy goods vehicles. • Saudi Arabia subsidises consumption of fossil fuels which reduces the cost of ownership of fossil vehicles relative to electric. In 2018, subsidies to fossil fuels amounted to US$28.7bn (3.7% of GDP), of which US$18.2bn was for the oil industry.[1]

Source: 1) IEA (2020)

Detailed Policy Forecasts

Low-carbon buildings

Low-carbon buildings – Overview

Low-carbon building trends

Limited electric heat

The share of total heat demand which is provided by electricity is higher than 10% only in Australia, France, USA, Canada and Japan. Fossil heating dominates in other countries with heating demand.

Heat pump sales are still low

Heat pumps had sales of 20m and met 4.9% of global heating demand in 2019

Policy trends

Some countries have policies to decarbonise buildings…

Of IPR countries with net zero ambition, 6 (out of 11) provide financial incentives to switch to low-carbon heating. In addition, Australia offers incentives for low-carbon heating despite no national net zero target

…but an equal number do not

7 countries (including 5 with net zero ambition) do not provide incentives to switch to low-carbon heating. 8 other countries were not considered as they have temperate climates and do not typically have heating requirements

Policy forecast

All countries act to decarbonise the buildings sector

All countries implement new building and product standards targeting an end to the sale of fossil-based appliances, phasing out use of fossil fuels in heating and cooking

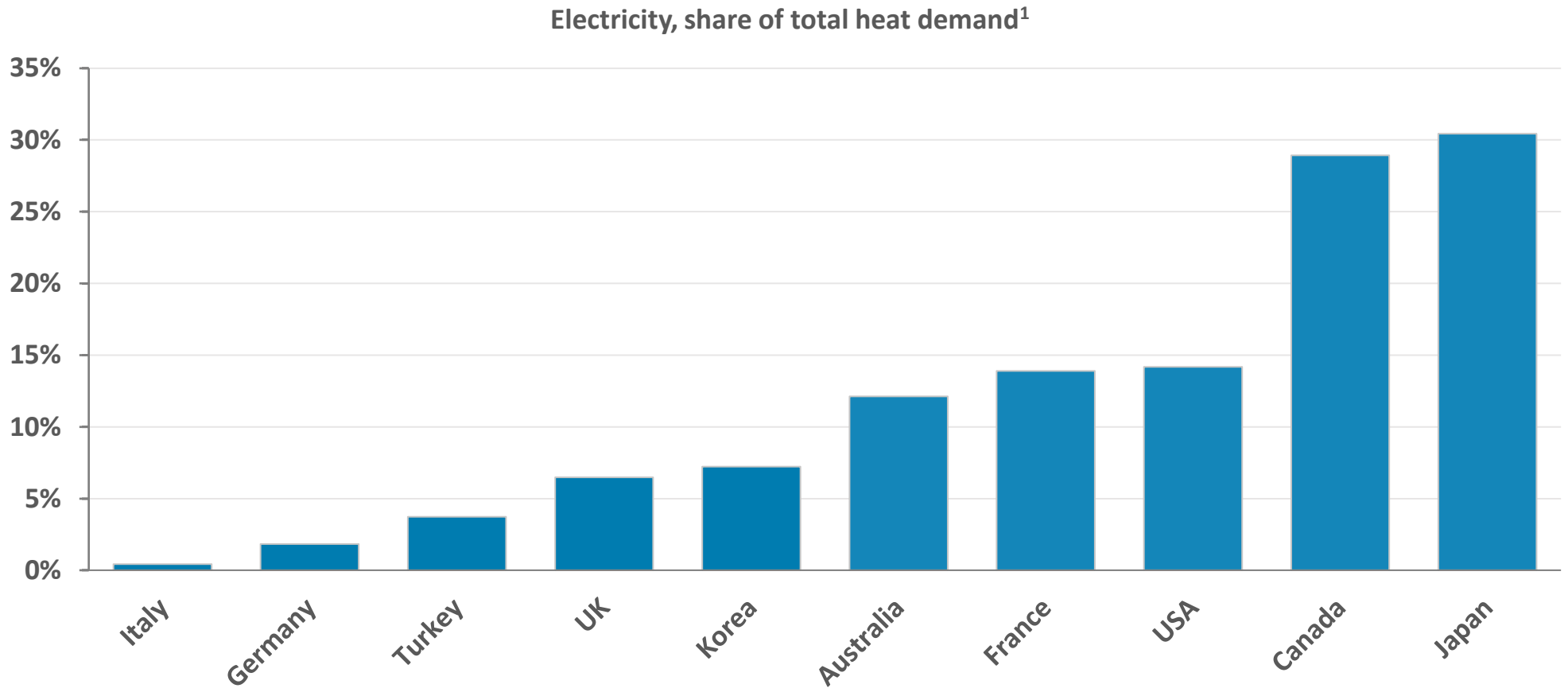
Fossil-fuelled appliance are banned early in net zero countries

Countries with ambitious net zero targets end the sale of fossil-based appliances by 2035

All countries ban fossil-fuelled appliances by 2050

Other major countries follow by 2050

The share of total heat demand which is provided by electricity is lower than 15% in most IPR 2021 countries



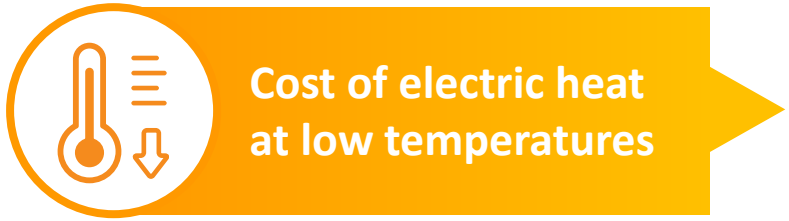
Notes: 1) Excludes countries where either electric heat market share is less than 1% or where there is typically no heating requirement
Source: Vivid Economics, reproduced from IEA special report on Energy Efficiency

Drivers and barriers of low-carbon buildings policy

Drivers[1]

Policymakers will aim to end the installation of new fossil heating systems sooner in countries with industrial capabilities in low-carbon heating, as market growth will support national firms to achieve greater export success. 5 out of 14 IPR countries specialise in exporting heat pumps.[3]

Barriers[2]



Policymakers will end the installation of new fossil heating systems in buildings later in countries with high heating needs. Buildings typically need to be heated at temperatures below 18 degrees Celsius. Average winter temperatures in 5 out of 14 IPR countries are below zero, making electric heat more costly in these countries.[4]

Notes: 1) Factors which are likely to cause policymakers to accelerate ambition (or at least not hinder it); 2) Factors which are likely to cause policymakers to delay ambition (or at least hinder it); 3) IPR defines specialising in exports as a country exporting more of this technology as a proportion of total exports compared to the world average; 4) Low-carbon buildings policy was not forecast for 7 countries which typically do not typically have high heating requirements due to temperate climates

Summary of major policies for low-carbon buildings

Net zero ambition countries[1]

USA has tax credits for renewable heat technologies

France has set an objective for all buildings to use carbon-free heat by 2050

Germany and Italy have grants of up to 50% for installation of zero-carbon heating systems

China provides subsidies to households to switch from coal to alternative technologies

Several Canadian provinces offer rebates or low-interest financing programmes for installation of heat pumps

The UK has set a target of 600,000 heat pumps per year by 2028 and provides financial support for low-carbon heat in residential and non-residential buildings

Korea, South Africa and Argentina do not have policies for low carbon buildings

Japan has an objective to achieve sector coupling of heat, power and transport

Other countries[2]

Low-carbon heating systems already accounted for over 40% of energy used in space heating in Australia in 2015. Government offers incentives for small-scale installers of renewable systems

Turkey and Russia do not have policies or strategies in place to decarbonise heating

India, Nigeria, Saudi Arabia, Brazil, Vietnam, Indonesia, Mexico have warm climates and minimal space heating needs

Notes: 1) Countries which have set a net zero target in law or in a policy document; 2) Countries which have not officially set zero targets in law or in a policy document

IPR2021 low-carbon buildings forecast: zero carbon heating

Tier	Country	Forecast Policy Response
Tier 1	UK Germany France Italy Canada South Africa Australia	100% zero carbon heating sales from 2035
	USA Japan Argentina Korea	100% zero carbon heating sales from 2040
Tier 2	China	100% sales from 2045
Tier 3	Russia Turkey	100% zero carbon heating sales from 2050
	Mexico India Indonesia Vietnam Brazil Nigeria Saudi Arabia	Space heating not needed in these countries

Countries with clear or forecast 2050 net zero targets, requiring low-carbon heating to be phased in from 2035 due to typical heating system lifetimes

2060 net zero target, and existing support schemes

Countries without net zero targets and limited incentives to shift to low-carbon heating systems

INEVITABLE POLICY RESPONSE

Low-carbon buildings – tier 1 countries

End the installation of fossil heating systems by 2035-40

Country	Reasons for Forecast
UK 2035	**Government policy to incentivise low-carbon heat; net zero target** • The 2018 Clean Growth Strategy sets the objective that 'by 2050, we will also likely need to fully decarbonise how we heat our homes'. • Additionally, the Prime Minister's Ten Point Plan for a Green Industrial Revolution (2020) has set the objective for 600,000 heat pumps per year by 2028 including 'bringing forward regulations to support this especially in off gas grid properties'. • Given heating systems will last around 10-15 years on average, the UK will require an early end to the installation of new fossil heating systems in buildings to achieve its 2050 net zero target. • Government is already incentivising low-carbon heat: the Domestic and Non-Domestic Renewable Heat Incentive schemes provide financial support for low-carbon heat in residential and non-residential buildings. • The UK has moderate winter temperature (averaging around 4 degrees Celsius), suggesting manageable costs of electrifying heat.

Low-carbon buildings – tier 1 countries

End the installation of fossil heating systems by 2035-40

Country	Reasons for Forecast
Germany 2035	**Government policy to incentivise low-carbon heat; net zero target** • The 2019 Climate Action Programme has set the objective to increase the share of renewable heat from 14% to 27% by 2030. • Government is currently incentivising low-carbon heat: the Market Incentive Programme provides a grant of up to 35% of the investment cost of renewable heating systems, such as heat pumps and biomass. • Given heating systems will last around 10-15 years on average, Germany will require an early end to the installation of new fossil heating systems in buildings to achieve the EU's 2050 net zero target. • Germany has moderate winter temperature (averaging around 2 degrees Celsius), suggesting manageable costs of electrifying heat.
France 2035	**High existing use of low-carbon heat, government policy to incentivise low-carbon heat; net zero target** • Low-carbon heating systems (based on renewables, waste or electricity) already accounted for 38% of energy used in space heating in France in 2015. • The 2020 National Low-carbon Strategy has set the objective for all buildings to use carbon-free heat by 2050. • To achieve this ambition, and meet national and EU-wide net zero targets for 2050, France will require an early end to the installation of new fossil heating systems given their average 10-15-year lifetime. • France has moderate winter temperature (averaging around 5 degrees Celsius), suggesting manageable costs of electrifying heat.

Low-carbon buildings – tier 1 countries

End the installation of fossil heating systems by 2035-40

Country	Reasons for Forecast
Italy 2035	**Government policy to incentivise low-carbon heat; net zero target** • Low-carbon heating systems (based on renewables, waste or electricity) already accounted for 29% of energy used in space heating in Italy in 2015. • The Integrated National Energy and Climate Plan 2019 has set the objective for a 34% share of renewables in heating and cooling by 2030. • Government already incentivises low-carbon heat: the 2020 Conto Termico 2.0 scheme provides subsidies for zero-carbon heat installations of up to 50% of the purchase price (subject to efficiency conditions). • Given heating systems will last around 10-15 years on average, Italy will require an early end to the installation of new fossil heating systems in buildings to achieve the EU's 2050 net zero target. • Italy has moderate winter temperature (averaging around 5 degrees Celsius), suggesting manageable costs of electrifying heat.

Low-carbon buildings – tier 1 countries

End the installation of fossil heating systems by 2035-40

Country	Reasons for Forecast
Australia 2035	**Government policy to incentivise low-carbon heat; net zero target** • Low-carbon heating systems (based on renewables, waste or electricity) already accounted for 42% of energy used in space heating in Australia in 2015. • Government is already incentivising low-carbon heat: the Small-Scale Renewable Energy scheme, legislated under the 2010 Renewable Energy Target, offers financial incentives for small-scale installers of renewable systems such as air-source heat pumps. • IPR2021 forecasts that Australia will announce a 2050 net zero target by 2023. • Given heating systems will last around 10-15 years on average, Australia will require an early end to the installation of new fossil heating systems in buildings to achieve its 2050 net zero target. • Australia has moderate winter temperature (averaging around 15 degrees Celsius), suggesting manageable costs of electrifying heat.

Low-carbon buildings – tier 1 countries

End the installation of fossil heating systems by 2035-40

Country	Reasons for Forecast
Canada 2035	**High existing use of low-carbon heat; government policy to incentivise low-carbon heat; net zero target** • Low-carbon heating systems (based on renewables, waste or electricity) already accounted for 52% of energy used in space heating in Canada in 2015. • Several provinces have policies: Ontario, British Columbia and Quebec offer rebates and low-interest financing programmes for the installation of heat pumps. • Given heating systems will last around 10-15 years on average, Canada will require an early end to the installation of new fossil heating systems in buildings to achieve its 2050 net zero target.
South Africa 2035	**Net zero target** • Given heating systems will last around 10-15 years on average, South Africa will require an early end to the installation of new fossil heating systems in buildings to achieve its 2050 net zero target. • South Africa has moderate winter temperature (averaging around 24 degrees Celsius), suggesting manageable costs of electrifying heat.

Low-carbon buildings – tier 1 countries

End the installation of fossil heating systems by 2035-40

Country	Reasons for Forecast
USA 2040	**Government policy to incentivise low-carbon heat; net zero ambition** • Low-carbon heating systems (based on renewables, waste or electricity) accounted for 18% of energy used in space heating in the US in 2015. • Government already incentivises low-carbon heat: the Federal Residential Renewable Energy Tax Credit offers a 26% tax credit for renewable heat technologies. • IPR2021 forecasts the USA will announce by 2023 a net zero target for 2050. • Given heating systems will last around 10-15 years on average, the USA will require an early end to the installation of new fossil heating systems in buildings to meet a net zero target for 2050.
Argentina 2040	**Net zero target** • Given heating systems will last around 10-15 years on average, Argentina will require an early end to the installation of new fossil heating systems in buildings to achieve its 2050 net zero target. • Argentina has moderate winter temperature (averaging around 8 degrees Celsius), suggesting manageable costs of electrifying heat.

Low-carbon buildings – tier 1 countries

End the installation of fossil heating systems by 2035-40

Country	Reasons for Forecast
Japan 2040	**Government ambition to incentivise low-carbon heat; net zero target** • Low-carbon heating systems (based on renewables, waste or electricity) already accounted for 18% of energy used in space heating in Japan in 2015. • Japan's 2019 Long-term Strategy under the Paris Agreement states government 'aims to achieve the sector coupling of electricity, heat, and mobility in general, using electrified vehicles, heat pump-type water heaters, fuel cells and cogeneration'. • Given heating systems will last around 10-15 years on average, Japan will require an early end to the installation of new fossil heating systems in buildings to achieve its 2050 net zero target. • Japan has moderate winter temperature (averaging around 1 degrees Celsius), suggesting manageable costs of electrifying heat.
Korea 2040	**Net zero target** • No policy is current in place for phasing out fossil heating or incentivising low-carbon heating. • Given heating systems will last around 10-15 years on average, Korea will require an early end to the installation of new fossil heating systems in buildings to achieve its 2050 net zero target. • Korea has moderate winter temperature (averaging around -1 degrees Celsius), suggesting manageable costs of electrifying heat.

Low-carbon buildings – tier 2 countries

End the installation of fossil heating systems by 2045

Country	Reasons for Forecast
China	**Government policy to incentivise low-carbon heat; net zero target for 2060** • Government is already incentivising low-carbon heat: the 2017 Clean Winter Heating Plan provides subsidies to coal-burning households in northern China to install new electric heaters and heat pumps, as well as gas and biomass boilers. • Given heating systems will last around 10-15 years on average, China will require a medium-term sales ban for fossil-based heating systems to fully decarbonise the buildings sector and achieve its 2060 net zero target.

Low-carbon buildings – tier 3 countries

End the installation of fossil heating systems by 2050

Country	Reasons for Forecast
Russia	**No Government ambition or net zero target, and unsuitability of heat pumps** • Government has not set an objective or put policies in place to deploy low-carbon heat to date. • Heat pump technology is not well suited to Russia given extreme cold temperatures,[1] which increases the difficulty of decarbonising the building sector.
Turkey	**No Government ambition or net zero target** • Government has not set an objective or put policies in place to deploy low-carbon heat to date.

Notes: 1) heat pumps typically lose efficiency at sub-zero temperatures and have a lower limit of ~-20 degrees Celsius

Detailed Policy Forecasts

Industry Decarbonisation

Industry decarbonisation – Overview

Low carbon industry trends

Limited low carbon industry
No IPR country has installed commercial-scale zero-carbon manufacturing processes in the steel, chemicals or cement sectors

Limited deployment of CCUS
The majority of operational or planned CCUS capacity is in USA (27.7 Mt per year), the UK (7.3 Mt) and Australia (6.2 Mt), with further capacity in China, Canada, Brazil and Saudi Arabia

Policy trends

Some industry decarbonisation policies in net zero ambition countries
2 out of 11 IPR countries with a net zero ambition have policies to decarbonise industry, whilst 4 have the objective to decarbonise industry and the remaining 5 will require policies due to net zero ambition

Limited industry decarbonisation ambition elsewhere
All 10 IPR countries without net zero ambition do not have policies or strategies to achieve decarbonisation of industry

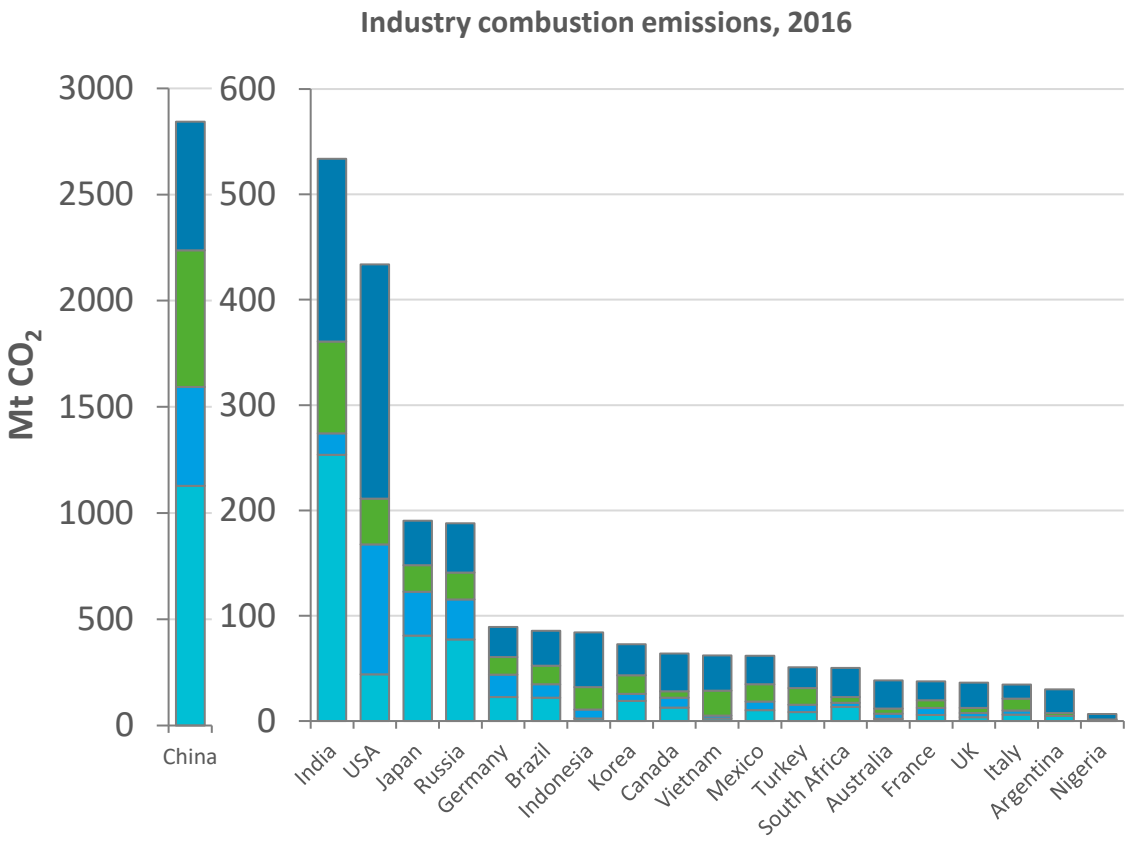
Policy forecast

Policy movement by 2040 in net zero countries
IPR countries with net zero ambition, end the installation of new unabated fossil-based industrial plant by 2040, putting energy-intensive industry on a clear decarbonisation pathway

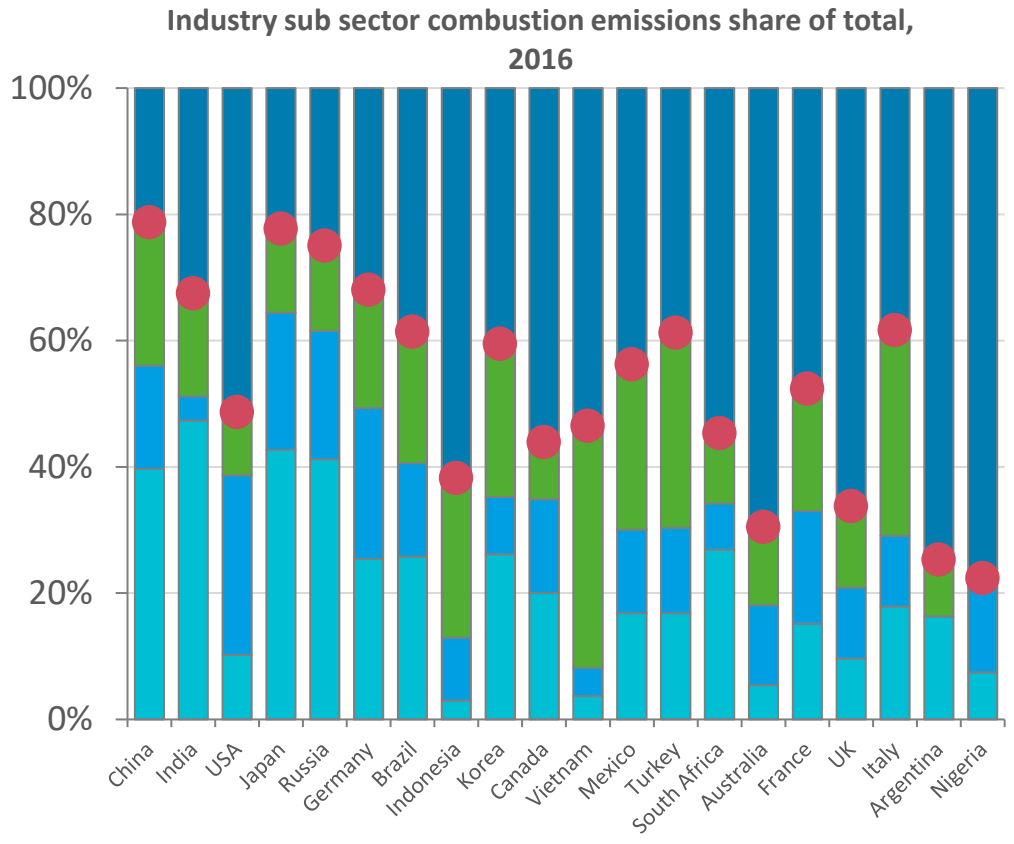
Slower action elsewhere
Other major countries are slower to act on new plant due to competitiveness concerns

Hard-to-abate sectors make up a high share of industry emissions

China, India and USA have by far the largest industry combustion emissions globally



Hard-to-abate sectors account for >50% of industry combustion emissions in 11 IPR countries



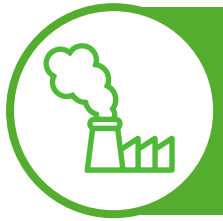
Notes: The figures do not include Saudi Arabia due to a lack of data on industry sub-sector combustion emissions
Source: IEA (2018) CO_2 Emissions from Fuel Combustion

Drivers and barriers of industry decarbonisation policy

Drivers[1]

Net zero targets

Policymakers will require emission falls for industry where countries have announced net zero targets. 11 out of 21 IPR countries have either legislated for or produced policy documents with net zero targets.



Air pollution concerns

Policymakers will face stronger incentives to put policies in place to decarbonise industry where the death rate from air pollution is high. 15 out of 21 IPR countries have over 30 deaths per 100,000 people from air pollution annually.

Barriers[2]

Industrial competitiveness

Policymakers will be more concerned that decarbonising energy-intensive industry will put industrial competitiveness at risk and destroy jobs in countries where iron and steel, and chemicals - highly traded, energy intensive sectors - make up a large share of GDP. 15 out of 21 IPR countries have an iron, steel and chemicals share in GDP over 2%.

Notes: 1) Factors which are likely to cause policymakers to accelerate ambition (or at least not hinder it); 2) Factors which are likely to cause policymakers to delay ambition (or at least hinder it)

Summary of major policies for industry decarbonisation

Net zero ambition countries[1]

USA has some industrial CCS facilities which capture ~7% of industrial emissions, as well as a tax credit for industrial facilities which install CCS.

France has set an objective to decrease emissions by 81% by 2050 relative to 2015 levels.

Germany and Italy recognise the need to decarbonise industry in national climate plans and will need to reduce emissions to comply with the EU's 2050 net zero target.

China has announced a 2060 net zero target, which will require industrial decarbonisation.

Canada has some industrial CCS facilities which capture ~4% of industrial emissions, as well as a 2050 net zero objective.

The UK has a US$1.1 billion CCS Infrastructure Fund to facilitate industrial CCS and a 2050 net zero target.

Korea, Argentina and South Africa have all announced a 2050 net zero target.

Japan has a 2050 net zero target and the objective to decarbonise manufacturing.

Other countries[2]

Nigeria, Saudi Arabia, India, Russia, Brazil, Turkey, Vietnam, Indonesia, Australia and Mexico do not have ambition or policies in place to achieve industrial decarbonisation.

Notes: 1) Countries which have set a net zero target in law or in a policy document; 2) Countries which have not officially set zero targets in law or in a policy document

Summary of major industry energy efficiency policies

Industry

- The US' 45Q tax credit provides price support for industry facilities to install carbon capture and storage. Industrial facilities that capture at least 25,000 tons of CO2 per year are eligible for the tax credit, which is valued at US$50 per tonne of captured CO2.
- The UK Government announced in the March 2020 Budget 'at least £800 million' (US$1.1 billion) for a new CCUS Infrastructure Fund to facilitate the delivery of CCUS in at least two clusters, one by the mid-2020s; and a second by 2030; government has a £170m Industrial Decarbonisation Challenge fund to invest in developing technologies such as CCUS.
- China provides subsidies for demonstration of CCUS in industrial facilities.
- Japan provides funding for R&D and demonstration of CCUS in industrial facilities.
- In Australia, the Carbon Capture Storage Flagships programme provides funding for CCUS demonstration projects that will capture CO2 emissions from industrial processes and safely store them underground.

Power

- The US' 45Q tax credit provides price support for power sector facilities to install carbon capture and storage. Power sector facilities that capture at least 25,000 tons of CO2 per year are eligible for the tax credit, which is valued at US$50 per tonne of captured CO2.
- The UK's Industrial Decarbonisation Challenge fund invests in developing technologies including bioenergy with CCS for the power sector.
- China provides subsidies for demonstration of CCS in power generation.
- Japan provides funding for R&D and demonstration of bio energy with CCS in power generation

Summary of major industry energy efficiency policies

Regulation

- China: mandatory energy efficiency targets cover around 30,000 firms under the 13th Five Year Plan (2016-2020).
- India: the Perform, Achieve and Trade (PAT) instrument sets energy savings targets for large energy-intensive companies and issues tradable certificates for companies who exceed them, which can be sold to companies who have not met their targets.
- Japan: firms are required to achieve a 1% energy efficiency improvement per year under the 1979 Act on the Rational Use of Energy.
- Korea: the 2010 GHG and Energy Target Management Scheme sets mandatory energy conservation targets for large businesses that emit over 15,000 tCO2e per year.

Financial incentives

- Germany: the Federal Funding for Energy Efficiency in the Economy scheme awards funding through competitive tenders for industry energy efficiency investments.
- Canada: the Accelerated Capital Cost Allowance for Canadian Renewable and Conservation Expenses provides accelerated depreciation for industrial energy efficiency investments.
- Saudi Arabia: Saudi Energy Efficiency Program provides concessional finance for energy efficiency investment in industry.
- UK: Climate Change Agreements schemes provide financial incentives (energy taxes and tax exemptions) for energy efficiency improvements for large energy users.
- South Africa: tax incentives have been available since 2013 for energy efficiency investments and will be available until at least 2022, under Tax incentive 12L.
- Turkey: government provides VAT, customs duty, and interest payment incentives for industrial energy efficiency investments under the Resolution of the Council of Ministers 2014/6058.

IPR2021 clean industry forecast

Tier	Country	Forecast Policy Response
Tier 1	UK Germany France Italy USA Canada Japan Korea South Africa Australia Argentina	100% new zero carbon production facilities from 2040
Tier 2	China Brazil India	100% new zero carbon production facilities from 2050
Tier 3	Mexico Indonesia Vietnam Russia Turkey Nigeria Saudi Arabia	No clear policy to phase-out conventional iron and steel, chemicals and cement production

Countries with clear or forecast 2050 net zero targets, requiring early progress phasing in low-carbon manufacturing processes due to typical plant lifetimes

2060 net zero target

Countries without net zero targets and limited incentives to shift to low-carbon manufacturing processes

INEVITABLE POLICY RESPONSE

Clean industry – tier 1 countries

Require all new production processes to be zero emissions by 2040

Country	Reasons for Forecast
UK	**Government ambition; policies in place to decarbonise industry; net zero target** • The UK Government's 2018 Clean Growth Strategy states that 'Meeting our target of reducing emissions by at least 80 per cent by 2050 implies decarbonising… most industrial processes'. • Government has put policies in place to support industry decarbonisation: in the March 2020 Budget, government announced 'at least £800 million' (US$1.1 billion) for a new CCUS Infrastructure Fund to facilitate the delivery of CCUS in at least two clusters, one by the mid-2020s and a second by 2030. This was confirmed in the November 2020 Ten Point Plan for a Green Industrial Revolution. In addition, the Industrial Energy Transformation Fund, a £315 million (US$420 million) programme, is aimed at supporting businesses with high energy use transition to a low carbon future. • The UK has strengthened its 2050 climate target to net zero since the launch of the 2018 Clean Growth Strategy, raising prospects for greater ambition on industrial decarbonisation.
Germany	**Government ambition to decarbonise industry; net zero target** • The Government's 2019 Climate Action Programme sets an objective for process-related greenhouse gas emissions to be 'eliminated or extensively reduced in future' but does not set a timeframe to achieve this objective. • As an EU member state, Germany will require an early fall in industry emissions to contribute towards the EU's Climate Law target to achieve net zero emissions by 2050.

INEVITABLE POLICY RESPONSE

Clean industry – tier 1 countries

Require all new production processes to be zero emissions by 2040

Country	Reasons for Forecast
France	**Government ambition to decarbonise industry; net zero target** • The Government's 2020 National Low-Carbon Strategy sets the objective of an 81% reduction of industry GHG emissions by 2050 (and a 35% reduction by 2030) relative to 2015 levels. • As an EU member state, France will require an early fall in industry emissions to contribute towards the EU's Climate Law target to achieve net zero emissions by 2050.
Italy	**Government ambition to decarbonise industry; net zero target** • The Government's 2019 Integrated National Energy and Climate Plan states that overproduction of renewable energy can produce 'zero-emission forms of energy such as hydrogen, biomethane, and e-fuels in general, which can be used to promote decarbonisation in sectors that are more difficult to electrify such as industry'. • As an EU member state, Italy will require an early fall in industry emissions to contribute towards the EU's Climate Law target to achieve net zero emissions by 2050.

Clean industry – tier 1 countries

Require all new production processes to be zero emissions by 2040

Country	Reasons for Forecast
USA	**Existing CCUS facilities; policies in place to decarbonise industry; net zero ambition** • Industrial CCUS facilities are already in operation in the fuel processing sector with a total capacity of 27.7 $MtCO_2$, equivalent to 6.4% of national industrial emissions. • Government has put policies in place to support industrial decarbonisation – the 2018 45Q tax credit provides price support for industry facilities to install carbon capture and storage. Industrial facilities that capture at least 25,000 tons of CO_2 per year are eligible for the tax credit, which is valued at US$50 per tonne of captured CO_2. The start date for projects eligible for the 45Q tax credit was extended from the end of 2023 to the end of 2025, with the December 2020 signing of The Consolidated Appropriations Act (2021). • IPR2021 forecasts the USA will announce by 2023 a net zero target for 2050, which would require a substantial fall in industry emissions.
Canada	**Existing CCUS facilities; net zero ambition** • CCUS facilities are already in operation in the fuel processing sector with a total capacity of 2.3 $MtCO_2$ and additional industrial CCUS facilities are under development with a total capacity of 0.5 $MtCO_2$; these facilities have combined capture and storage capacity equivalent to around 4.3% of national industrial emissions. • Government has proposed legislation for a 2050 net zero emissions target, which will require a substantial fall in industry emissions.

Clean industry – tier 1 countries

Require all new production processes to be zero emissions by 2040

Country	Reasons for Forecast
Japan	**Government ambition to decarbonise industry and net zero target in place** • The Government's 2019 Long-term Strategy under the Paris Agreement sets the objective to establish 'new production processes to achieve decarbonised manufacturing with disruptive innovation', stating that 'challenges will be made to achieve 'zero-carbon steel with super-innovative technology'. • Additionally, Japan has set the target to achieve net zero emissions by 2050, raising the prospects of more stringent policy action on industrial decarbonisation.
Korea **South Africa** **Argentina** **Australia**	**Net zero ambition** • The Government of Korea has announced a target to achieve net zero emissions by 2050, raising the prospects of more stringent policy action on industrial decarbonisation. • The Government of South Africa has set the target to achieve net zero emissions by 2050 in its 2019 Low Emissions Development Strategy, raising the prospects of more stringent policy action on industrial decarbonisation. • The Government of Argentina has set the target to achieve net zero emissions by 2050 in its second NDC submitted in December 2020, raising the prospects of more stringent policy action on industrial decarbonisation. • IPR 2021 forecasts Australia will set a 2050 net zero target, raising the prospects of more stringent policy action on industrial decarbonisation.

Clean industry – tier 2 countries

Require all new production processes to be zero emissions by 2050

Country	Reasons for Forecast
China	**Net zero ambition** • China's 2060 net zero ambition, announced by President Xi Jinping in September 2020, raises the prospect of stringent policy action on industrial decarbonisation. • Brazil's 2060 net zero ambition, announced in its updated 2020 NDC, raises the prospect of stringent policy action on industrial decarbonisation. • IPR2021 forecasts that India will set a 2060 net zero emissions target, raising the prospect of stringent policy action on industrial decarbonisation.
Brazil	
India	

Clean industry – tier 3 countries

No clear policy to phase-out conventional iron and steel, chemicals and cement production

Country	Reasons for Forecast
Mexico	**No government ambition and absence of net zero target** • Government has not set the objective or put policies in place to achieve industrial decarbonisation. • Government has not set a net zero target, which would otherwise require substantial industrial emissions reductions.
Indonesia	
Vietnam	
Russia	
Turkey	
Nigeria	
Saudi Arabia	

Detailed policy forecasts
Low-emissions agriculture

Low-emissions agriculture – Overview

Emission trends

Major contributor to greenhouse gas emissions

The agriculture sector was responsible for GHG emissions of around 5.4 Gt CO2e per year in 2016[1], or around 13% of current GHG emissions

Livestock and fertiliser use are two main emission sources

Livestock accounted for 40% of total emissions from agriculture in 2016, and emissions from fertiliser use amounted to 23% of total emissions from agriculture in the same year

Policy trends

Policies to reduce emissions from agriculture are in place

12 IPR countries have objectives or policies in place aimed at reducing emissions from crop production and livestock

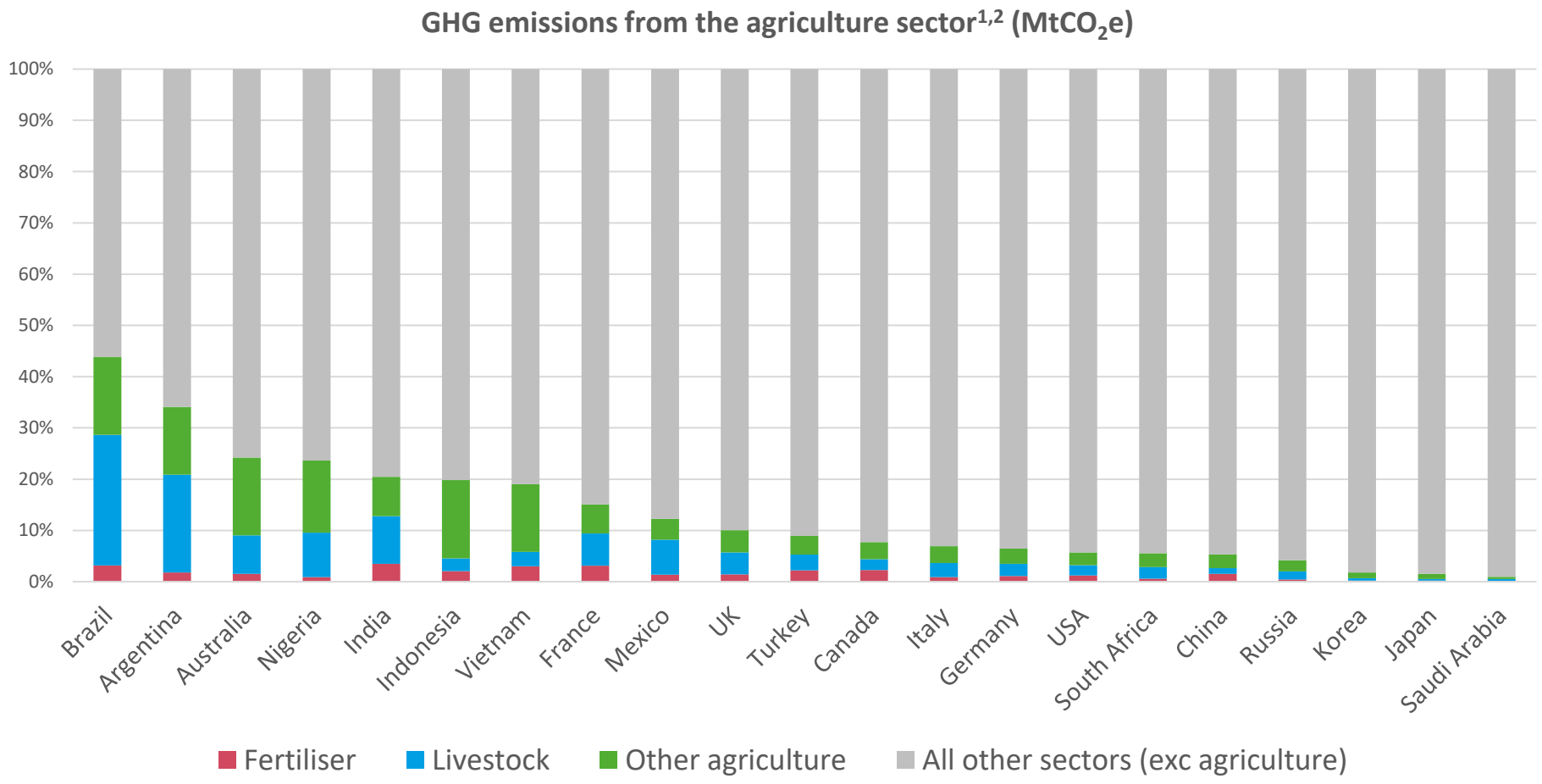
Policy forecast

Policy to reduce agriculture emissions in place in all countries by 2035

Comprehensive policy in place in leading countries by 2025, and in all countries by 2035

Source: 1) FAO (2020)

Agriculture emissions account for more than a third of total GHG emissions in only 2 IPR countries



Notes: 1) For 2017; 2) CO_2 equivalent for non-CO_2 gases such as N_2O are based on 100-year Global Warming Potentials (GWP)
Source: 1) FAOSTAT for agriculture emissions and Potsdam Institute Paris Reality Check for all other sectors

Current policy ambition to reduce emissions from agriculture

Net zero ambition countries[1]

- The EU's Farm to Fork Strategy sets a target to reduce fertiliser use by at least 20% by 2030.
- Germany's Integrated Climate and Energy Plan aims to develop a model for livestock farming that takes the 2050 climate targets into account.
- France has set an objective for an 18% reduction in GHG emissions in agriculture by 2030[3] in the 2020 National Low-Carbon Strategy.
- Italy has committed to reduce ammonia emissions by 16% in 2030 relative to 2005 as part of a 2016 EU Directive.
- In USA, President Biden has set the objective of 'decarbonising the food and agriculture sector'.
- Japan's 2019 Fourth Biennial submission aims to reduce the use of synthetic fertilisers and pesticides from conventional farming by more than 50%.
- China has a target of zero growth of chemical fertiliser by 2020 in the 2015 Action Plan for Zero Increase of Fertiliser Use.
- The UK 2018 Clean Growth Strategy aims to encourage the use of low-emissions fertiliser and to explore breeding technologies to reduce livestock emissions
- The Pan-Canadian Framework on Clean Growth and Climate Change aims to 'enhance innovation to advance GHG efficient management… in agriculture'.
- South Africa, Argentina and Korea have no polices in place but have net zero targets

Other countries[2]

- Mexico aims to implement agricultural policies orientated towards the better use of fertilisers in the Climate Change Mid-Century Strategy.
- Vietnam's 2015 NDC sets a target to 'research and develop solutions to reduce GHG emissions' in farming.
- Turkey's 2015 NDC aims to control 'the use of fertilisers'.
- India's Ration Balancing Programme aims to reduce emissions from livestock.
- Australia's Emissions Reduction Fund scheme provides financial incentives for reducing emissions from agriculture.
- Indonesia, Russia, Brazil and Nigeria have no policies in place to reduce emissions from agriculture.

Notes: 1) Countries which have set a net zero target in law or in a policy document; 2) Countries which have not officially set zero targets in law or in a policy document; 3) Does not specify a baseline

IPR2021 low-carbon agriculture forecast

Tier	Country	Forecast Policy Response
Tier 1	UK Germany France Italy USA Canada Australia Japan China Korea	Nationwide market incentives to encourage farmers to reduce emissions from crop production and livestock from 2025
Tier 2	Mexico India Vietnam Turkey	Nationwide incentives from 2030
Tier 3	Indonesia Russia South Africa Brazil Argentina Nigeria	Nationwide incentives from 2035
	Saudi Arabia	Minimal agriculture

Countries with objectives to reduce emissions from agriculture and moderate barriers to reducing emissions in this sector

Countries with objectives to reduce emissions from agriculture but with strong barriers to reducing emissions in this sector

Countries without objectives to reduce emissions from agriculture

INEVITABLE POLICY RESPONSE

Low-emissions agriculture – tier 1 countries

Reduce agriculture emissions by 2025

Country	Reasons for Forecast
UK	**Government ambition to reduce crop production and livestock emissions** • Government has already set the objective to reduce agricultural emissions: the 2018 Clean Growth Strategy states that 'we want our land and agriculture sectors to play a significant role in low carbon growth'. • The 2018 Clean Growth Strategy also sets the objective for the UK Government to 'work with industry to encourage the use of low-emissions fertiliser' and to 'explore the mitigation potential of new breeding technologies' to reduce livestock emissions.
Germany	**National and EU ambition to reduce crop production and livestock emissions** • The national 2016 Climate Action Plan 2050 sets an objective for a 'significant reduction in nitrous oxide emissions arising from the overuse of fertilisers'. • The 2019 Integrated Climate and Energy Plan sets the objective for the 'development of a model for livestock farming taking into account the 2050 climate targets of the Paris Agreement'. • Policy in Germany will need to align to the EU's Farm to Fork Strategy which sets the objective to reduce fertiliser use by at least 20% by 2030 and to 'develop with Member States an integrated nutrient management action plan to address nutrient pollution at source and increase the sustainability of the livestock sector'.

Low-emissions agriculture – tier 1 countries

Reduce agriculture emissions by 2025

Country	Reasons for Forecast
France	**National and EU ambition to reduce crop production and livestock emissions** • The 2020 National Low-Carbon Strategy sets an objective for an 18% reduction in GHG emissions in agriculture by 2030', 'to reduce the use of mineral fertilisers, and use of the least emitting mineral fertilisers' and 'to improve the management of livestock effluents'. • Government already has policy in place to reduce agricultural emissions: the Farm Competitiveness and Adaptation Plan offers financing and subsidies to farmers to reduce livestock emissions. • Policy in France will need to align to the EU's Farm to Fork Strategy which sets the objective to reduce fertiliser use by at least 20% by 2030 and to 'develop with Member States an integrated nutrient management action plan to address nutrient pollution at source and increase the sustainability of the livestock sector'.
Italy	**National and EU ambition to reduce crop production and livestock emissions** • The 2016 Reduction of National Emissions of Certain Atmospheric Pollutants policy commits Italy to reduce ammonia emissions by 16% in 2030 relative to 2005 by mandating farmers alter fertiliser use. • The 2019 Integrated National Energy and Climate Plan states that a national code for controlling ammonia emissions will include 'livestock feeding strategies'. • Policy in Italy will need to align to the EU's Farm to Fork Strategy which sets the objective to reduce fertiliser use by at least 20% by 2030 and to 'develop with Member States an integrated nutrient management action plan to address nutrient pollution at source and increase the sustainability of the livestock sector'.

Low-emissions agriculture – tier 1 countries

Reduce agriculture emissions by 2025

Country	Reasons for Forecast
USA	**Federal ambition to reduce agricultural emissions** • President Biden has set the objective to reduce agricultural emissions: the Biden Plan for a Clean Energy Revolution and Environmental Justice sets the objective of 'decarbonising the food and agriculture sector'.
Canada	**Federal, provincial and territorial ambition to reduce agricultural emissions** • The 2016 Pan-Canadian Framework on Clean Growth and Climate Change, adopted by the federal government and all provinces and territories except Saskatchewan, states that 'federal, provincial, and territorial governments will work together to enhance innovation to advance GHG efficient management practices in forestry and agriculture'. • Policies are in place at the provincial level to reduce crop production and livestock emissions: British Columbia's Nutrient Management Program provides funding and education to farmers to improve nutrient management to reduce GHG emissions; Manitoba's 4R Nutrient Stewardship System provides fertiliser best management practices to farmers; and Saskatchewan's 2018-23 Landscape Integrity Program provides funding to farmers to implement best management practices for manure management to reduce livestock GHG emissions.
Australia	**Existing policy to reduce crop production and livestock emissions** • The voluntary Emissions Reduction Fund scheme provides financial incentives for reducing emissions from fertiliser use and livestock management.

Low-emissions agriculture – tier 1 countries

Reduce agriculture emissions by 2025

Country	Reasons for Forecast
Japan	**Government ambition to reduce crop production and livestock emissions** • Japan's 2019 Fourth Biennial submission to the UNFCCC sets an objective to reduce the use of synthetic fertilisers and pesticides from conventional farming practices by more than 50%. • Japan's 2019 Long-term Strategy under the Paris Agreement seeks to 'limit methane emissions with the improvement of feed and its use and the control of livestock numbers to go along with productivity improvement measures with the improved breed'.
China	**Government ambition to reduce fertiliser emissions** • Government has already acknowledged fertiliser over-use and has previously indicated clear ambition to mitigate this problem: the 2015 Action Plan for Zero Increase of Fertiliser Use sets an objective of zero growth of chemical fertiliser by 2020 in China.
Korea	**Growing government ambition on climate policy** • In October 2020, Korea set a target to achieve net zero emissions by 2050 which will require policy action to reduce emissions across all sectors, including agriculture.

Low-emissions agriculture – tier 2 countries

Reduce agriculture emissions by 2030

Country	Reasons for Forecast
Mexico	**Government ambition to reduce crop production and livestock emissions but trade-off with food security** • Government may face a trade-off between food security for a growing population and policy to reduce crop production and livestock emissions, which could delay government action. • Mexico's Climate Change Mid-Century Strategy (2016) sets an objective 'to implement agricultural policies orientated towards the better use of fertilisers, a more calculated application of fertilisers, producing and applying biofertilisers, as well as efficiently using nitrogenates' and 'to establish livestock production programs that reduce emissions'. • India has already set the objective to reduce livestock emissions: the Ration Balancing Programme sets an objective to 'improve animal productivity by optimising feeding and to reduce emission of greenhouse gases per unit of animal product'. • Vietnam's 2015 NDC sets the objective to 'research and develop solutions to reduce GHG emissions' in farming. • Turkey has already set the objective for 'controlling the use of fertilisers and implementing modern agricultural practices' in the 2015 Nationally Determined Contribution.
India	
Vietnam	
Turkey	

Low-emissions agriculture – tier 3 countries

Reduce agriculture emissions by 2035

Country	Reasons for Forecast
Indonesia	**No government ambition** • Government has not set the objective or put policies in place to reduce crop production and livestock emissions.
Russia	
South Africa	
Brazil	
Argentina	
Nigeria	

Detailed Policy Forecasts

Land use and forestry

Land use and forestry – Overview

Forestry trends

Forest cover has increased in several countries…

In 8 IPR countries, forest cover increased between 2015 and 2020 through afforestation and natural expansion of forests; in an additional 6 IPR countries, the forest cover was unchanged.

…but substantial deforestation is still taking place

In 7 IPR countries, forest cover decreased by up to 4% between 2015 and 2020 due to deforestation.[1]

Policy trends

Few countries have set a target to reduce deforestation

Only 6 out of 21 IPR countries have set an objective or implemented policy to decrease deforestation.

Several countries encourage afforestation

11 out of 21 IPR countries have policy or strategies in place aimed at increasing afforestation.

Policy forecast

Leading countries implement forestry policies by 2025

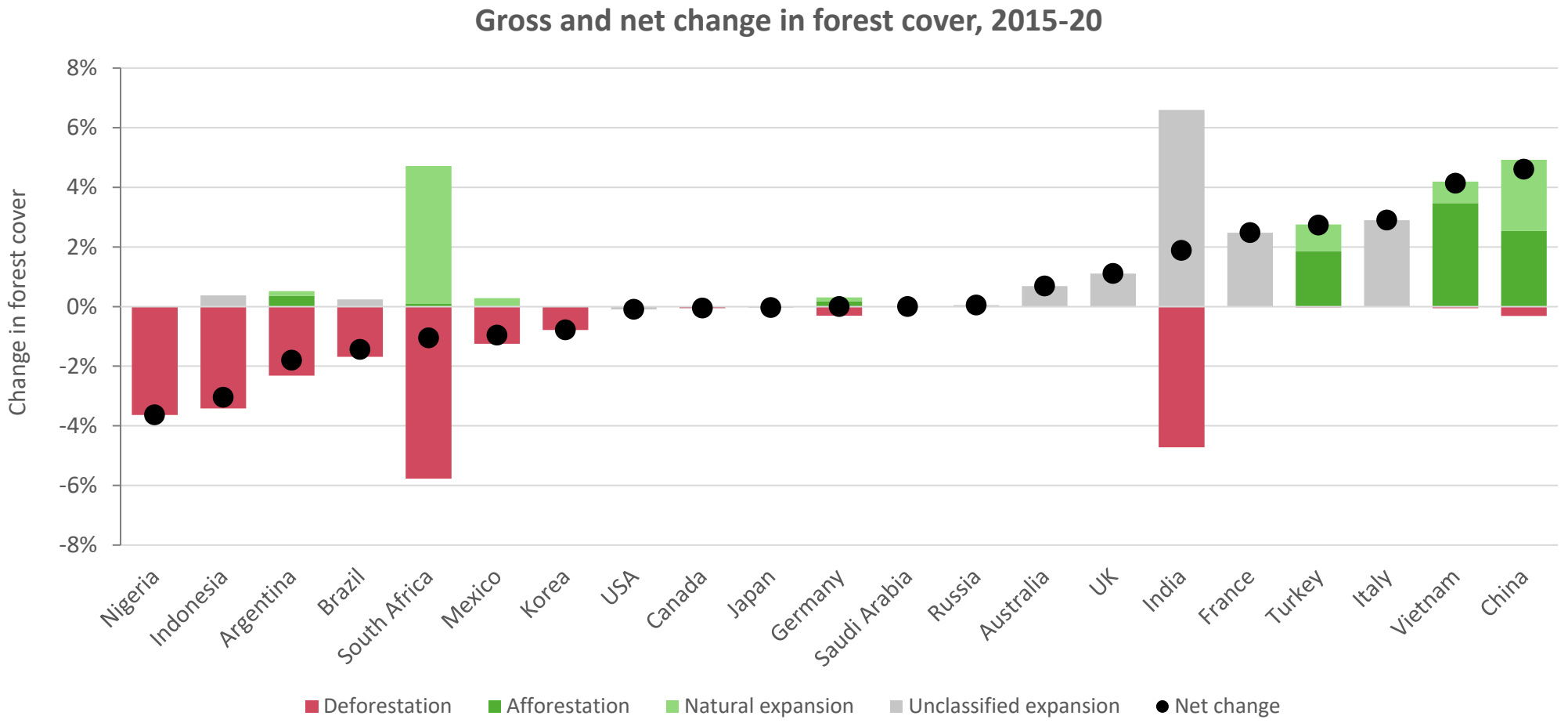
Leading countries end remaining deforestation and encourage large-scale afforestation by 2025.

Remaining countries follow by 2030

Remaining countries implement policies to end large-scale deforestation and encourage afforestation by 2030.

Source: 1) FAO (2020)

While deforestation continues in several countries, other countries show overall forest growth, driven by afforestation policy or natural expansion



Source: FAO (2020)

Current policy ambition for land use and forestry

Net zero ambition countries[1]

- Germany has set an objective to ‘maintain and if possible, enlarge the forest area’.
- China has set a target to increase forest coverage to above 24% of total land area by 2030.
- USA, Italy and Japan have no deforestation policies, but current deforestation is minimal.
- South Africa has no policies in place aimed at decreasing deforestation or increasing afforestation.
- Argentina has set the objective to increase the forested area to 2 million hectares by 2030.
- The UK aims to increase tree planting to 30,000 hectares per year by 2025.
- Korea has set an ambition to ‘establish and implement measures for prevention of deforestation’.
- Canada aims to plant 2 billion trees as part of Natural Resources Canada’s 2020-21 Departmental Plan and several provinces encourage afforestation.
- France’s 2020 National Low-Carbon Strategy sets the objective to ‘develop afforestation’.

Other countries[2]

- Australia aims to plant a billion new plantation trees; afforestation projects can qualify for emissions offsets.
- Vietnam has set a target to end exploitation of natural forests by 2020 and to increase forest coverage to 42%-42.5% by 2030.
- Mexico has set a target to reach a rate of 0% deforestation by 2030.
- India has set a long-term target to bring 33% of its land area under forest cover.
- Turkey aims to increase the forest cover by 5% by 2030.
- Russia has no deforestation policies, but current deforestation is minimal.
- Nigeria has set a target to ‘increase forest cover by 20% by 2030 compared to 2015’.
- Brazil’s 2016 NDC sets the objective to implement policies to achieve zero illegal deforestation by 2030 in the Brazilian Amazonia.

Notes: 1) Countries which have set a net zero target in law or in a policy document; 2) Countries which have not officially set zero targets in law or in a policy document

On top of carbon sequestration, co-benefits provide stronger incentives for policymakers to implement land use policy

Ecological co-benefits

Biodiversity conservation
Forest conservation can help preserve important ecosystems and biodiversity hotspots, particularly in the tropics and locations with endemic species.

Resilient ecosystems
Preserving ecosystems can help increase resilience against extreme weather events and the changing climate.

Watershed protection
Forest restoration increases the soil's storage capacity and reduces the amount of sediment and agricultural chemicals in watercourses.

Restoration of degraded land
Restoration of forest land can help prevent soil erosion and improve the soil's ability to retain nutrients.

Socioeconomic co-benefits

Engagement of local communities
Nature conservation activities can preserve local traditions and activities and create a sense of ownership.

Rural development
Forestry projects can help transition away from "slash and burn" activities and create new opportunities for local communities.

New sources of income
Investments in forestry can lead to income diversification in rural areas, where agriculture is often the only source of income and livelihoods.

Sustainable Development Goals (SDGs)
Several SDGs are supported through nature climate solutions, including 1 (no poverty), 8 (decent work and economic growth), 12 (responsible consumption and production) and 13 (climate action)

Source: Vivid Economics, adapted from Murthy et al. (2018)

The emergence of new investment models for nature-based climate solutions increases the impetus for policy action on forestry

Integration of carbon markets into commercial forestry investment strategies

- **Institutional investors** earn additional carbon revenues through portfolio decarbonisation, investing in assets that 'avoid deforestation'.

Investment in forestry assets primarily for climate benefit

- **Corporations** earn the market rate of return on sale of carbon offset units and to which they have underlying exposure.
- The offsets are purchased at market prices, to achieve corporate decarbonisation targets.

Project finance model with offtake agreement

- **Oil and gas companies** invest in the development of carbon offset projects.
- These are acquired through offtake agreements, but the company does not have exposure to the underlying asset.

Source: Vivid Economics, adapted from New Forests

IPR2021 land use and forestry forecast

Tier	Country	Forecast Policy Response
Tier 1	Korea Canada France Germany Italy Japan UK USA China Turkey Vietnam Australia	End net deforestation by 2025 Deliver afforestation at scale by 2025
Tier 2	Russia	End net deforestation by 2025 Deliver afforestation at scale by 2030
Tier 3	Nigeria India Argentina Brazil South Africa Mexico Indonesia	End net deforestation by 2030 Deliver afforestation at scale by 2030
	Saudi Arabia	Minimal potential for forestry

Countries with low or minimal deforestation and strong climate targets or track record on afforestation

Minimal deforestation but limited climate targets or track record on afforestation

Countries with substantial current deforestation

Land use and forestry – tier 1 countries

Deliver forest protection and afforestation by 2025

Country	Reasons for Forecast
UK	**Deforestation is currently at a very low level and afforestation is already taking place** • There is minimal deforestation in the UK.[1] • The 2020 budget sets the objective to increase tree planting to 30,000 hectares per year by 2025. • The 2019 Woodland Carbon Guarantee incentivises afforestation efforts: the scheme allocates £50 million in afforestation funding, rewarding landowners for carbon captured.
France	**Deforestation has already ended; France has set an objective to increase afforestation** • There is minimal deforestation in France. [1] • France's 2020 National Low-Carbon Strategy sets the objective to 'develop afforestation'.
Germany	**The forest cover has not changed over the past decade; Germany has a target to maintain the forest area** • Germany is already carrying out some afforestation. Between 2015 and 2020 afforestation created 20 thousand hectares of new forest cover (0.2% of total). [1] • The 2020 Forest Strategy states that 'the forest area in Germany is to be maintained and, if possible, enlarged'.

Source: 1) FAO (2020)

Land use and forestry – tier 1 countries

Deliver forest protection and afforestation by 2025

Country	Reasons for Forecast
Italy	**Deforestation is already at a very low level** • There is minimal deforestation in Italy.[1]
USA	**Deforestation has already ended and policies to encourage afforestation are in place** • There is minimal deforestation in the USA. [1] • The Growing Climate Solutions Act, introduced in the Senate in June 2020, creates a certification programme to enable farmers and forest landowners to secure payment for afforestation in carbon credit markets. • The 2020 Trillion Trees Act mandates that the Secretary of Agriculture must set a target for 'increased domestic wood growth for the purposes of capturing and storing carbon' within two years after the enactment of the Act.

Source: 1) FAO (2020)

Land use and forestry – tier 1 countries

Deliver forest protection and afforestation by 2025

Country	Reasons for Forecast
Canada	**Deforestation is currently at a low rate and Canada has set an objective to increase afforestation** • There is minimal deforestation in Canada. [1] • Natural Resources Canada's 2020-21 Departmental Plan sets the objective to 'operationalise a plan to plant two billion trees over the next 10 years' and the 2017 Nationally Determined Contribution sets the objective that 'carbon sinks in forests will be protected and enhanced'. • Several provinces have implemented policies to enhance afforestation: the British Colombia Forest Carbon Offsets policy issues carbon offsets to afforestation or reforestation projects which are then purchased by the Province; while the Prince Edward Island Carbon Capture Tree Planting Program provides funding for the planting of native tree species on about 250 hectares of abandoned or marginal public and private land.
Japan	**Strong protection of forested areas limits the potential deforestation** • There is minimal deforestation in Japan.[1] • A large share of Japan's forest are protected forests, which limits the potential for deforestation. Over 29% of Japan's total land area are protected areas, compared to an average of 15% of total land area in the Asia and Pacific region and an average of 13% in Europe.[2]

Sources: 1) FAO (2020), 2) Protected Planet (2021)

Land use and forestry – tier 1 countries

Deliver forest protection and afforestation by 2025

Country	Reasons for Forecast
Turkey	**Deforestation has almost ended already; Turkey has set a target to increase the forest cover** • There is minimal deforestation in Turkey. [1] • Turkey is carrying out substantial afforestation. Between 2015 and 2020 afforestation created 401 thousand hectares of new forest cover (2% of total). [1] • The 2016 Land Degradation Neutrality National Report sets an objective to increase the forest cover by 5% by 2030, including afforestation of 1.5 million hectares.
Australia	**The current rate of deforestation is low, and large-scale afforestation targets and policies are currently in place** • There is minimal deforestation in Australia. [1] • Policy is in place at the federal level and state level to incentivise afforestation: afforestation projects can qualify for emissions offsets under the Emissions Reduction Fund; while Queensland's Land Restoration Fund provides funding to 'encourage projects that sequester carbon and deliver environmental or socio-economic co-benefits'.

Source: 1) FAO (2020)

Land use and forestry – tier 1 countries

Deliver forest protection and afforestation by 2025

Country	Reasons for Forecast
China	**The current rate of deforestation is low; existing objectives and policies support afforestation** • There is minimal deforestation in China.[1] • China is carrying out substantial afforestation. Between 2015 and 2020 afforestation created 5339 thousand hectares of new forest cover (3% of total). [1] • The 2015 Nationally Determined Contribution states that China will 'vigorously enhance afforestation' by 2030 and the 2017 Land Degradation Neutrality Target Setting Programme sets an objective to increase forest coverage to above 24% of total land area by 2030. • This ambition is in line with previous announcements: the 2009 China Forestry Plan to Deal with Climate Change sets an objective to achieve a 'net increase in forest area of 47 million hectares compared with the amount in 2020 by 2050 and nationwide forest coverage equal to or greater than 26%'. • The Natural Forest Conservation Program incentivises afforestation by providing investment for the expansion of forest cover. • The 2013 Voluntary Greenhouse Gas Emission Reduction Trading scheme allows carbon credits to be generated by forestry projects and sold on the seven regional Emissions Trading System scheme.

Source: 1) FAO (2020)

Land use and forestry – tier 1 countries

Deliver forest protection and afforestation by 2025

Country	Reasons for Forecast
Vietnam	**Targets and policies aimed at ending deforestation and increasing afforestation are already in place** • There is minimal deforestation in Vietnam.[1] • There are already policies in place to reduce deforestation: the 2013 Resolution 24/NQ-TW set a target to end exploitation of natural forests by 2020. • Additionally, the Forest Protection and Development Fund provides payments for forest environmental services to forest owners. The fund is financed by users of forest environmental services, who are required to pay into the fund under the 2010 Government Decree No. 99. • Vietnam is carrying out substantial afforestation. Between 2015 and 2020 afforestation created 488 thousand hectares of new forest cover (3% of total). [1] • The 2020 Updated Nationally Determined Contribution set a target to plant and develop forests and to 'increase forest coverage to 42%-42.5%' by 2030'. • This target aligns with previous announcements: the 2018 Land Degradation Neutrality Setting Programme set a target to 'restore 15% of the degraded forest area by 2020'.

Source: 1) FAO (2020)

Land use and forestry – tier 1 countries

Deliver forest protection and afforestation by 2025

Country	Reasons for Forecast
Korea	**Policies aimed at reducing deforestation and encouraging afforestation are in place** • The 2012 Act on the Management and Improvement of Carbon Sinks, states that the 'Minister of the Korea Forest Service shall establish and implement measures for prevention of deforestation'. • The Forest Carbon Offset Scheme is a voluntary program that allows companies, organisations and individuals to buy carbon offsets from domestic forestry projects.

Land use and forestry – tier 2 countries

Deliver forest protection by 2025 and afforestation by 2030

Country	Reasons for Forecast
Russia	**Deforestation has almost ended in Russia already, but no objectives are in place to increase afforestation** • There is minimal deforestation in Russia. [1] • There are no strategies or policies in place to achieve large-scale afforestation.

Source: 1) FAO (2020)

Land use and forestry – tier 3 countries

Deliver forest protection and afforestation by 2030

Country	Reasons for Forecast
Nigeria	**No deforestation policies and the rate of deforestation is high; afforestation target by 2030 is in place** • Nigeria continues to experience serious deforestation. Between 2015 and 2020 817 thousand hectares of forest cover (4% of total) were lost to deforestation. [1] • There are no policies in place to end deforestation. However, there is a policy objective to increase forest cover: the 2018 Land Degradation Target Setting Programme set a target to 'increase forest cover by 20% by 2030 compared to 2015'.
India	**The current rate of deforestation is high, but long-term target to increase afforestation is in place** • There are no strategies or policies in place to end deforestation. • India continues to experience serious deforestation. Between 2015 and 2020 3342 thousand hectares of forest cover (2% of total) were lost to deforestation. [1] • Afforestation is targeted in India's 2015 Nationally Determined Contribution, which set a long-term goal 'to bring 33% of its geographical area under forest cover', but does not specify a timeline.

Source: 1) FAO (2020)

Land use and forestry – tier 3 countries

Deliver forest protection and afforestation by 2030

Country	Reasons for Forecast
Argentina	**Lack of deforestation objectives and policies** • There are no strategies or policies in place to end deforestation. • Argentina continues to experience serious deforestation. Between 2015 and 2020 674 thousand hectares of forest cover (2% of total) were lost to deforestation. [1] • The 2019 National Action Plan on Agriculture and Climate Change sets the objective to increase the forested area from 1.38 million hectares to 2 million hectares by 2030. • Argentina is already carrying out some afforestation. Between 2015 and 2020 afforestation created 105 thousand hectares of new forest cover (0.4% of total). [1]
Brazil	**The rate of deforestation is high; lack of afforestation policies** • Brazil continues to experience serious deforestation. Between 2015 and 2020 8479 thousand hectares of forest cover (1% of total) were lost to deforestation. [1] • However, the 2016 Nationally Determined Contribution sets the objective to 'strengthen policies and measures with a view to achieve, in the Brazilian Amazonia, zero illegal deforestation by 2030'. • There are no strategies or policies in place to achieve large-scale afforestation.

Source: 1) FAO (2020)

Land use and forestry – tier 3 countries

Deliver forest protection and afforestation by 2030

Country	Reasons for Forecast
Mexico	**Target to end deforestation is in place but current rate is high; desertification increases benefits of afforestation** • The 2015 Nationally Determined Contribution states that Mexico 'will reach a rate of 0% deforestation by the year 2030'. • The 2016 Climate Change Mid-Century Strategy sets the objective to 'formulate and implement plans, programs, and policies for reducing deforestation'. • Mexico continues to experience serious deforestation. Between 2015 and 2020 829 thousand hectares of forest cover (1% of total) were lost to deforestation.[1] • The Government has signalled ambition to increase afforestation, though has not yet translated this ambition into effective policy: Mexico's 2016 Climate Change Mid-Century Strategy sets the objective 'to encourage a mechanism to promote voluntary carbon markets, including forest carbon offset credits'. • 60% of Mexico's land area consists of dry land and is vulnerable for desertification which increases the benefits of afforestation, as tree planting is a key instrument to prevent desertification.[2]

Sources: 1) FAO (2020), 2) IPCC (2020), FAO, n.d.

Land use and forestry – tier 3 countries

Deliver forest protection and afforestation by 2030

Country	Reasons for Forecast
South Africa	**The current rate of deforestation is high, and no deforestation policies or strategies are in place** • The government has not set an objective to end deforestation or implemented policies to reduce deforestation. • South Africa continues to experience serious deforestation. Between 2015 and 2020 995 thousand hectares of forest cover (1% of total) were lost to deforestation. [1] • South Africa is already carrying out some afforestation. Between 2015 and 2020 afforestation created 15 thousand hectares of new forest cover (0.1% of total). [1]
Indonesia	**High rate of deforestation; no afforestation targets or policies are in place** • Indonesia continues to experience serious deforestation. Between 2015 and 2020 3250 thousand hectares of forest cover (3% of total) were lost to deforestation. [1] • The Government has signalled ambition to reduce deforestation, though this has yet to be translated into effective policy. The 2011 decree on harvesting licenses and peatland governance (Suspension of Granting New Licenses and Improvement of Natural Primary Forest and Peatland Governance Decree) suspends issuance of new harvesting licenses in primary forest and peatland areas, and the 2016 Nationally Determined Contribution sets the objective to 'to reduce deforestation and forest degradation'. • There are no strategies or policies in place to achieve large-scale afforestation.

Source: 1) FAO (2020)

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INEVITABLE POLICY RESPONSE

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