

- The Inevitable Policy Response Forecast Policy Scenario 2023
- (IPR FPS 2023)

Policy Forecasts

.....
October 2023

IPR was commissioned by the PRI¹ and is supported by world class research partners and leading philanthropies, financial institutions, & NGOs

1. Principles for Responsible Investment
 2. The conclusions of the report are solely those of Energy Transition Advisers and Theia Finance Labs

Commissioned by PRI

In 2018, the Inevitable Policy Response was commissioned by PRI to advance the finance industry’s knowledge of climate transition risk & support investor efforts to incorporate climate risk & opportunities in portfolio assessment



A Climate Research Consortium

This report was produced by Energy Transition Advisers and Theia Finance Labs²

NGO partners include Carbon Tracker, Climate Bonds & Planet Tracker



Strategic Partners

In 2021, leading financial institutions joined the IPR as Strategic Partners to provide more in-depth industry input, and to further strengthen its relevance to the financial industry






Core philanthropic support

The IPR is funded in part by the Gordon and Betty Moore Foundation through The Finance Hub, which was created to advance sustainable finance, and the ClimateWorks Foundation striving to innovate and accelerate climate solutions at scale



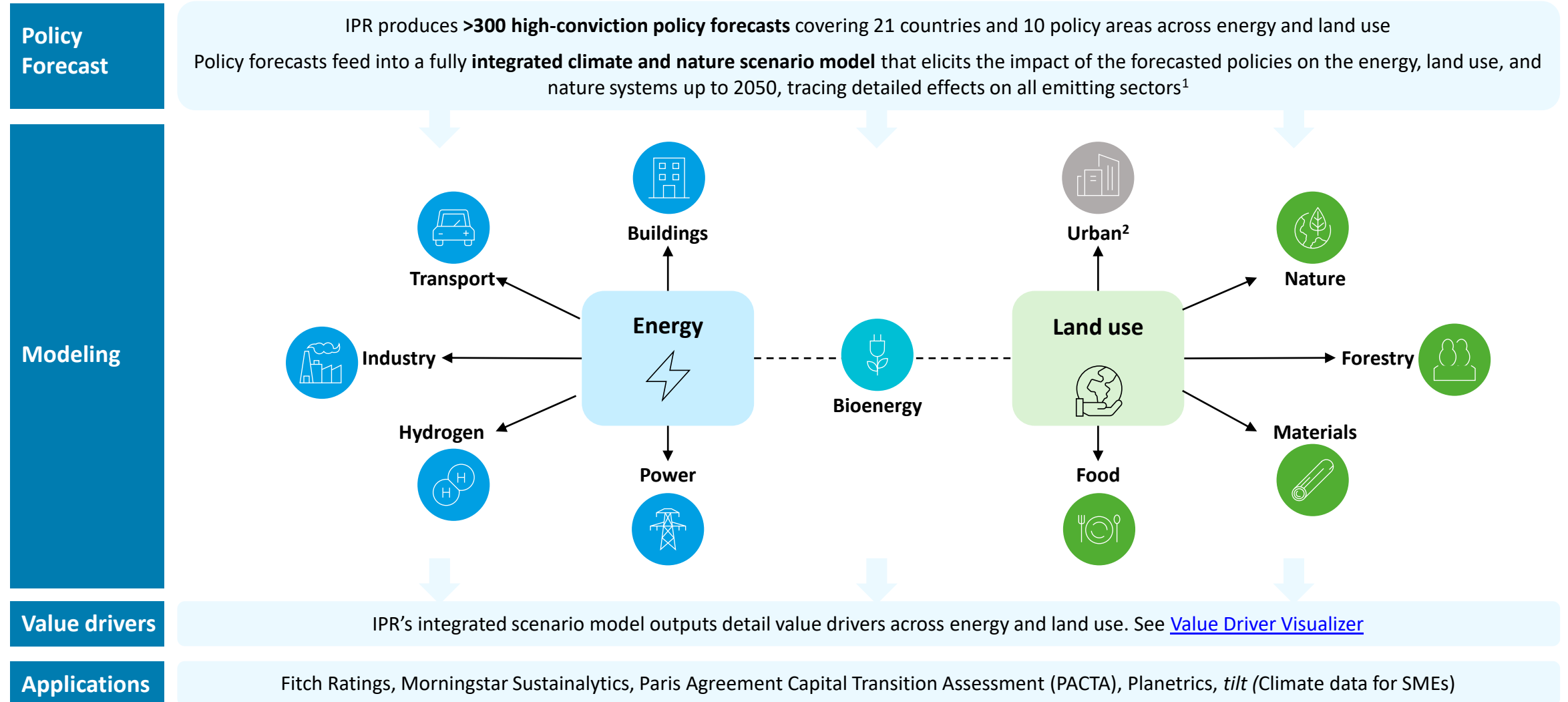
IPR has developed global, policy-based forecasts of forceful policy responses to climate change and implications for energy, agriculture and land use

Please see the IPR [Home Page](#) for further details

Scenario	Policy Forecast Details	Open Access Database
 <p>IPR 2023 Forecast Policy Scenario (FPS)</p> <ul style="list-style-type: none">Models impact of forecasted policies on the real economy	<p>IPR FPS 2023 Summary Report</p> <p>IPR 2023 Policy Forecast</p> <p>IPR FPS 2023 Detailed Energy Results</p> <p>IPR FPS 2023 Detailed Land Use and Nature Results</p> <p>IPR 2023 Bioenergy Report</p>	<p>IPR FPS 2023 Value Drivers</p> <p>IPR Scenario Explorer</p>
 <p>IPR 1.5°C Required Policy Scenario (RPS)</p> <ul style="list-style-type: none">Required policies to align to a 1.5°C objective building on the IEA's Net Zero scenario and deepening analysis on policy, land use, emerging economies and value drivers	<p>IPR 1.5°C RPS Energy and Land Use System Results including Policy Details</p>	<p>IPR RPS 2021 Value Drivers</p>
 <p>IPR Forecast Policy Scenario + Nature (FPS + Nature)</p> <ul style="list-style-type: none">First integrated climate and nature scenario for use by investors	<p>IPR 2022 FPS + Nature detailed results</p>	<p>IPR FPS + Nature Value Drivers</p>

IPR has published a set of publicly available outputs from the FPS and 1.5°C RPS that offer significant granularity at the sector/country level, allowing investors to assess their own climate risk across 4,000+ variables

IPR offers a range of applications to help financial institutions navigate the climate transition



1. IPR also develops a '1.5°C Required Policy Scenario'(1.5°C RPS) building on the IEA NZE by deepening analysis on policy, land use, emerging economies, NETs and value drivers. The RPS scenario is also run through the model and can be used by those looking to align to 1.5°C. 2. Urban areas are not modelled in detail in IPR

The Inevitable Policy Response has begun...

The Inevitable Policy Response is now under way, but there is plenty of work left to do

Nearly 90% of OECD policy announcements are now consistent with the IPR FPS, although implementation and legislation remain key.

This number drops to 40% for the non-OECD, partly driven by their longer decarbonization runway, highlighting the crucial policy gap for the next decade as policies ratchet through 2030.

Despite progress, the 1.5°C low overshoot goal no longer appears feasible.

Only 3% of global policies forecasts (based on their relative importance to emissions) are currently consistent with the IPR Required Policy Scenario (1.5°C low overshoot).

Given policy trends, global net zero only slightly delayed, affirming the IPR forecasts

Advanced Economies (AEs) reach near-zero CO₂ emissions by 2050 and Emerging Market and Developing Economies (EMDEs) reach net zero by the 2060s.

This is consistent with the outcome of our policy pulse survey across sustainability professionals and experts. Of course, these outcomes still require significant policy action.

Just Transition & broader sustainability considerations become key guardrails in the policy transition

Social aspects of the transition inform future land use - as the role of nature conservation increases in parallel - and phase outs of fossil fuels. Just Transition elements will likely play a growing role in the policy landscape.

....Driving a high conviction forecast of temperatures peaking at 1.7-1.8°C by the 2040s...

Our high conviction forecast sees temperatures peak at 1.7°- 1.8°C

Building on 300+ forecasts across 10 policy levers and 21 countries, +100 expert surveys, and the tracking of hundreds of policies, IPR FPS 2023 presents a *high-conviction* forecast that the Paris Agreement “well below 2°C goal” will be met (1.7° - 1.8°C peak by 2040s).

Expected best case ambition by 2100 may see temperatures drop

We expect that climate impacts and risk of tipping points will drive policymakers to not accept temperature stabilization at 1.7-1.8°C and thus to maintain the Paris Agreement goal of making efforts to 1.5°C with a best case outcome through Direct Air Carbon Capture & Storage (DACCS) of 1.6°C by end of century and the potential to stabilize temperatures at 1.5°C by 2120s.

Land becomes the crucial challenge for ensuring temperature stabilization

Land becomes the crucial battleground for reaching climate goals over the next decades – both as a carbon sink (~3 Gt pa) as well as the growing share of land emissions – with beef and lamb reaching >20% of global GHG emissions by 2050, despite only representing ~10% of caloric intake.

The high conviction forecast provides extra runway for emerging markets

Emerging markets have roughly 10-15 years extra runway to net zero in the forecast, implying a slower policy transition. Despite the extra time, we still expect policies to ratchet over the next decade.

NETs are key to temperatures declining towards 1.5°C

While we assume scaling of nature-based solutions in land, our 1.7-1.8°C forecast does not require technology based negative emissions technologies. However, pushing the temperature curve down further while avoiding geoengineering will only be achievable with DACCS. We expect OECD governments to pioneer DACCS development.



Roughly 50% of the policy gap we identify to achieve our forecast is linked to coal power in India and China. Our forecast assumes some degree of ‘economic stranding’. However, relative to our evidence base and expert survey, we don’t see a more pessimistic view extending the time horizon of coal by more than 5-10 years.



The forecast requires some countries (e.g. Russia, Saudi Arabia) currently not globally supportive of the climate agenda to take action on climate. More than 10% of the policy gap is linked to Russia alone. However, we generally take a very conservative view (Russia does not reach net zero until post 2065) and don’t expect the related emissions contributions by the second part of the century to impact climate outcomes.



Ending deforestation needs significant acceleration. We forecast an acceleration of policy ambition around deforestation following the election of Lula in Brazil and shifting dynamics in Indonesia. Some of our forecasts are roughly 5-10 years more ‘ambitious’ than the expert and pulse feedback survey.



Advanced Economies accelerated policy, but they start from a position of significant historic emissions and policy ambition remains misaligned with the IPR Required Policy Scenario delivering 1.5°C low overshoot. The overall policy window across AEs and EMDEs remains ambitious given the lack of accelerated action towards 1.5°C. This points to AEs tackling historic emissions via DACCS, seeking to stabilize long-term temperatures below 1.7°C.

Despite these challenges, we consider our forecast overall to represent a realistic ambition to reach Net Zero AE 2050 and EMDEs 2060s. Potential policy backsliding across these areas by 5-10 years would have at most 0.1°C impact from a temperature perspective.

The drivers of policy momentum make an inevitable and forceful policy response more likely...social tipping points are key



Changes in physical & monetary costs



Increased pressure from society, markets & regulators



Changes in geopolitics, energy security and research

Extreme weather events



Financial markets pressure for net zero



US IRA impact on industrial policy



Competitive Clean energy



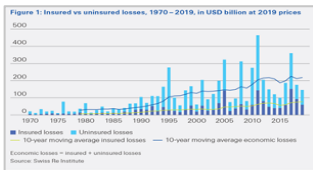
Civil society advocating for 1.5C



Impacts on security



Uninsurable world



Financial regulator interventions

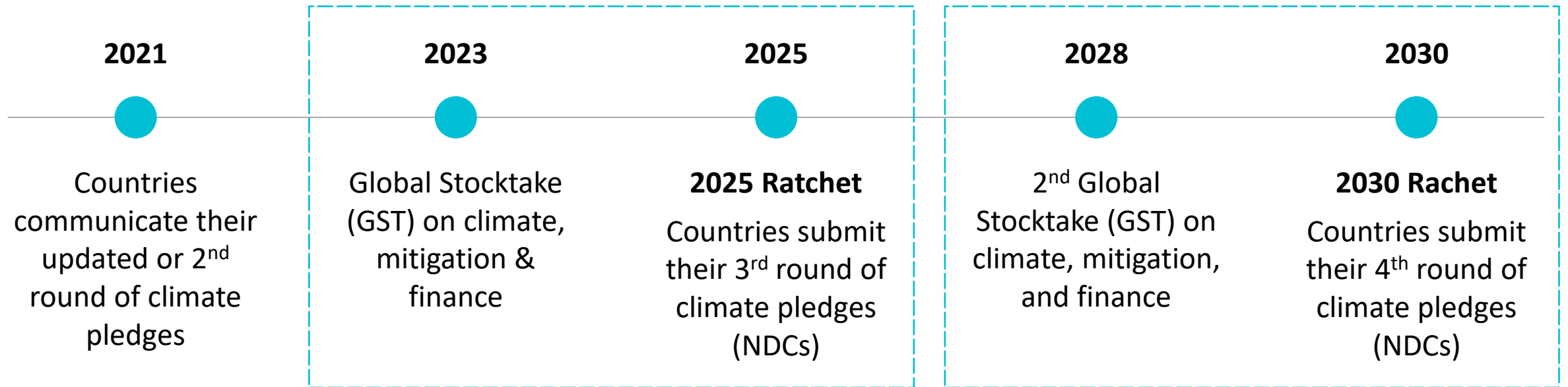


Improved climate collaboration



Ratchet pressures increase the likelihood that governments will strengthen policy by 2025, and again to 2030 and beyond

Paris Ratchet process triggers a cumulating policy response into 2025, 2030 and beyond



Policy announcements are expected to continue in 2023-2025, with continued acceleration in 2028-2030. Recognition of Overshoot grows from 2025.



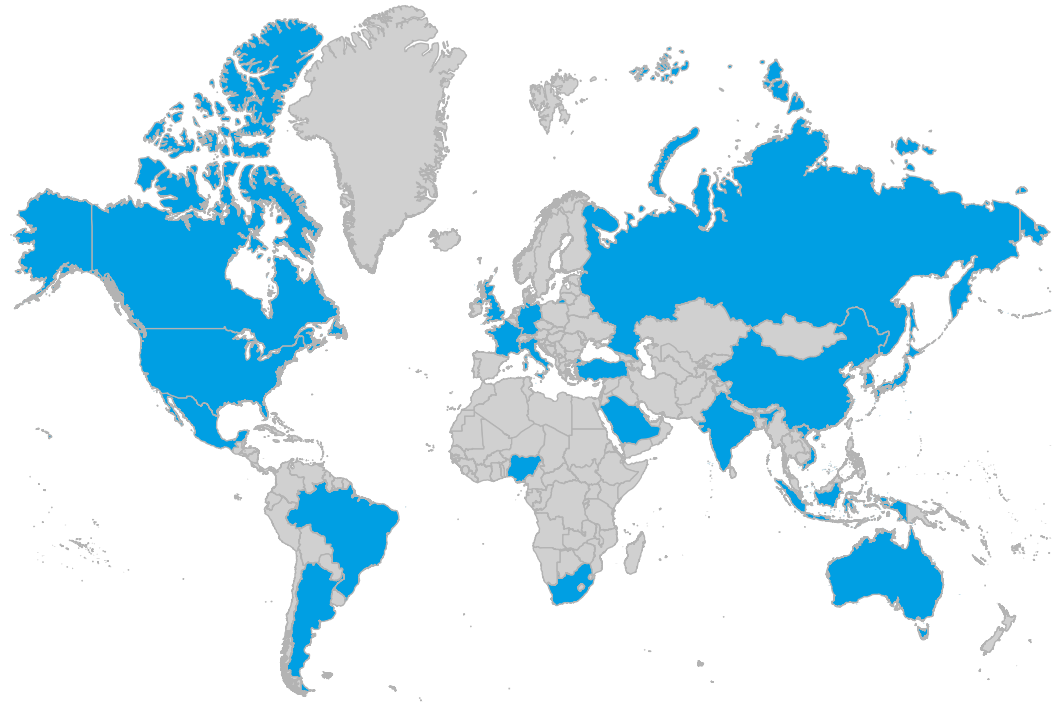
The IPR 2023 forecast provides an update to IPR 2021, covering 21 major economies accounting for 74% of global CO₂ emissions








 New for IPR 2023

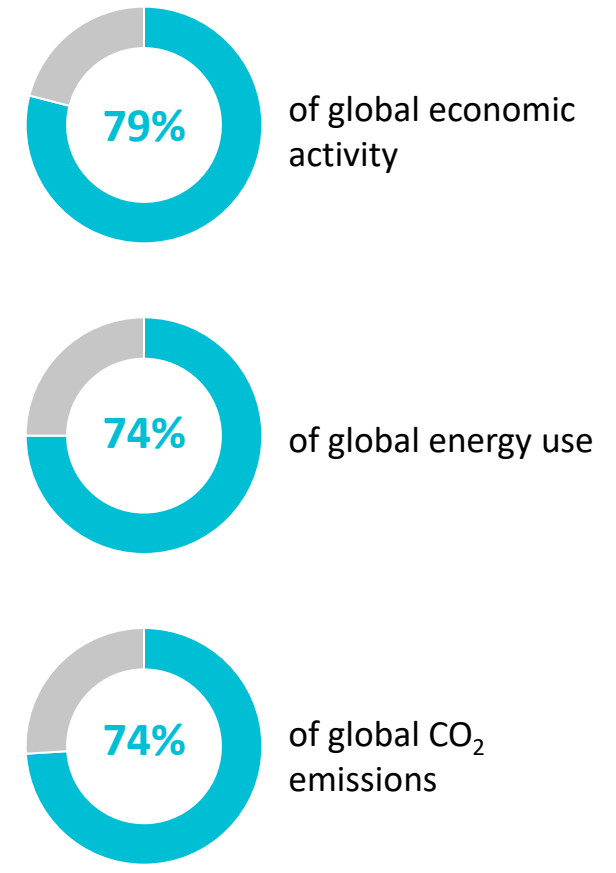
IPR policy forecasts cover G20 countries plus Nigeria and Vietnam...

... And covers policy across all major energy and land use sectors...

... With IPR countries accounting for

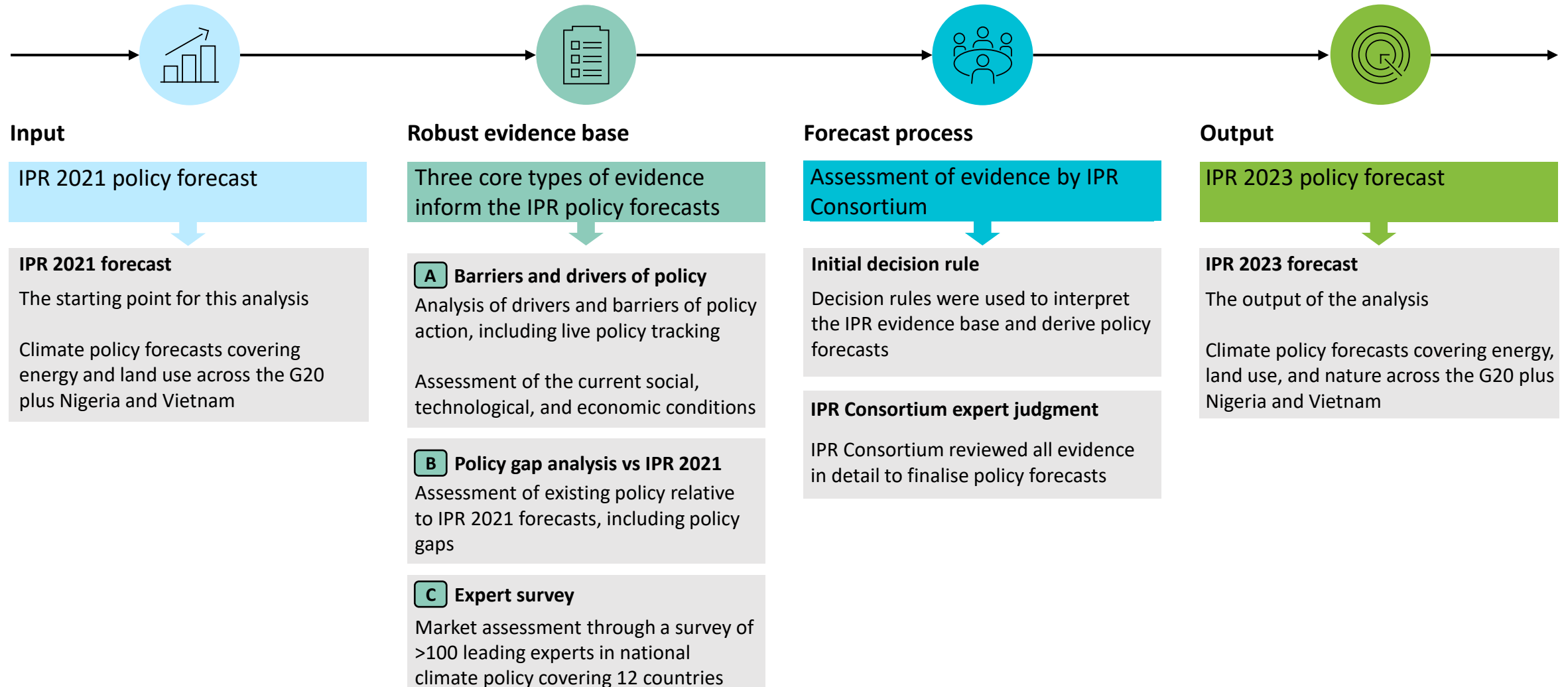


-  Power
-  Transport
-  Buildings
-  Industry
-  Agriculture
-  Land use
-  Nature



Source: [GPD](#), [energy use](#), [emissions](#). Latest available data was used.

IPR policy forecasts are informed by a robust evidence base, including a survey of >100 climate policy experts



Policy developments are scored using a 10-point scale to indicate magnitude and direction of impact on IPR scenario forecasts



A 10-point scale applied to policy developments to indicate impact on IPR 1.8°C FPS policy forecasts (implications for the 1.5°C RPS policy forecasts can also be drawn)

- 0-1 indicates **increasing evidence for deceleration** in policy forecast
- 2-4 indicates **evidence for deceleration** in policy forecast
- 5 indicates **no change** in policy forecast
- 6-8 indicates **evidence for acceleration** in policy forecast
- 9-10 indicates **increasing evidence for acceleration** in policy forecast

A similar 10-point scale is applied to energy/land technology developments

Scale	Details	Impact on policy forecast
0	Evidence for significant deceleration in policy forecast	Potential for 10+ year downgrade
1	Evidence for large deceleration in policy forecast	Potential for 10-year downgrade
2	Evidence for moderate deceleration policy forecast	Potential for 5-year downgrade
3	Evidence for small deceleration in policy forecast	Potential for <5-year downgrade
4	Some evidence for marginal deceleration in policy forecast	Monitor developments
5	Legislated or announced policies that 1) support and increase probability of 1.8°C FPS or 2) confirm FPS policy forecast	No change to 1.8C FPS forecast
6	Some evidence for marginal acceleration in policy forecast	Monitor developments
7	Evidence for small acceleration in policy forecast	Potential for <5-year upgrade
8	Evidence for moderate acceleration in policy forecast	Potential for 5-year upgrade
9	Evidence for large acceleration in policy forecast	Potential for 10-year upgrade
10	Evidence for significant acceleration in policy forecast	Potential for 10+ year upgrade

↑ Greater likelihood of 2.3°C IEA STEPS¹ scenario

1.8°C IPR FPS

↓ Greater likelihood of 1.5°C IPR RPS scenario

* The IEA's 'Stated Policy Scenario' or STEPS reflects current policy settings based on a sector-by-sector assessment of the specific policies that are in place, as well as those that have been announced by governments around the world

Q1-Q4 2022 climate announcements have reinforced the 1.8°C Forecast Policy Scenario pathway and in some instances shown evidence of acceleration

Score	Greater likelihood of 2.3°C IEA STEPS* scenario			1.8°C IPR FPS					Greater likelihood of 1.5°C IPR RPS scenario			Total	
	Significant deceleration	Large deceleration	Moderate deceleration	Small deceleration	Marginal deceleration	No change to policy forecast	Marginal acceleration	Small acceleration	Moderate acceleration	Large acceleration	Significant acceleration		
	0	1	2	3	4	5	6	7	8	9	10		
Global					3	21	3	Catalytic global impact from US IRA [see IPR/Kaya Report]					27
US				1	3	32	3						
China					1	12	4					17	
EU						25	3					28	
Germany						7	5					12	
France						2	3					5	
UK					1	13		1				15	
Brazil					4	7	1					12	
India						7						7	
Indonesia						3	1					4	
Canada						3	1		1			5	
Nigeria						5	1					6	
South Africa						3						3	
Saudi Arabia						2						2	
South Korea						2						2	
Japan						4	2					6	
Australia						8	4					12	
Mexico						2						2	
Vietnam						1	1					2	
Turkey						0	1					1	
COP announcements					1	3						4	
Total				1	13	162	33	1	1			211	

i. This assessment covers the period from COP 26 (in 2021) to January 2023.
 ii. The IEA's 'Stated Policy Scenario' or STEPS reflects current policy settings based on a sector-by-sector assessment of the specific policies that are in place, as well as those that have been announced by governments around the world.

Detail is key: IPR tracks its forecasts to see what is being delivered and where the gaps are

Policy gap assessment relative to IPR 2023 forecast¹ FPS policy gap Acceleration Confirmatory Supportive Deceleration

Country ²	Economy wide		Power			Buildings	Transport		Industry	Agri	Land use		Nature		
	Net Zero CO ₂ emissions	Carbon price	New coal phase out	All coal phase out	Clean power	Zero-carbon heating	Light duty vehicles	Heavy duty vehicles	Industry decarb.	Low-carbon agriculture	Net deforestation ³	Deforestation free supply	Protection ⁴ & restoration	Nature incentives	
Advanced Economies	US	Announced	Policy gap	Legislated	Announced	Announced	Legislated	Announced	Announced	Legislated	Legislated	Announced	Policy gap	Announced	Legislated
	Japan	Legislated	Announced	Policy gap	Announced	Announced	Announced	Announced	Policy gap	Announced	Legislated	Policy gap	Policy gap	Legislated	Policy gap
	Germany	Legislated	Legislated	Legislated	Announced	Announced	Announced	Legislated	Legislated	Legislated	Legislated	Legislated	Legislated	Legislated	Legislated
	South Korea	Legislated	Legislated	Announced	Announced	Announced	Policy gap	Announced	Policy gap	Announced	Announced	Policy gap	Policy gap	Legislated	Policy gap
	Canada	Legislated	Legislated	Legislated	Legislated	Announced	Announced	Announced	Announced	Legislated	Legislated	Legislated	Policy gap	Announced	Legislated
	Australia	Legislated	Legislated	Policy gap	Policy gap	Announced	Policy gap	Announced	Policy gap	Legislated	Legislated	Legislated	Policy gap	Announced	Announced
	UK	Legislated	Legislated	Legislated	Legislated	Announced	Announced	Announced	Announced	Legislated	Legislated	Legislated	Legislated	Announced	Legislated
	Italy	Legislated	Legislated	Announced	Announced	Announced	Announced	Legislated	Legislated	Legislated	Legislated	Legislated	Legislated	Legislated	Legislated
	France	Legislated	Legislated	Legislated	Legislated	Legislated	Announced	Legislated	Legislated	Legislated	Legislated	Legislated	Legislated	Legislated	Legislated
Emerging Markets & Developing Economies	China	Announced	Legislated	Policy gap	Policy gap	Announced	Announced	Announced	Policy gap	Announced	Legislated	Announced	Policy gap	Legislated	Legislated
	India	Announced	Announced	Announced	Policy gap	Announced	N/A	Policy gap	Policy gap	Legislated	Policy gap	Announced	Policy gap	Legislated	Policy gap
	Russia	Announced	Policy gap	Policy gap	Policy gap	Policy gap	Policy gap	Policy gap	Policy gap	Policy gap	Policy gap	Policy gap	Policy gap	Legislated	Policy gap
	Indonesia	Announced	Announced	Announced	Announced	Announced	N/A	Announced	Policy gap	Policy gap	Policy gap	Policy gap	Policy gap	Legislated	Policy gap
	Saudi Arabia	Announced	Policy gap	N/A	N/A	Announced	N/A	Policy gap	Policy gap	Announced	N/A	Announced	Policy gap	Announced	Policy gap
	Brazil	Announced	Announced	Policy gap	Policy gap	Announced	N/A	Policy gap	Policy gap	Policy gap	Announced	Announced	Policy gap	Legislated	Announced
	Turkey	Announced	Announced	Policy gap	Policy gap	Announced	Policy gap	Policy gap	Policy gap	Announced	Policy gap	Announced	Policy gap	Legislated	Policy gap
	South Africa	Announced	Announced	Announced	Announced	Announced	Policy gap	Policy gap	Policy gap	Policy gap	Policy gap	Policy gap	Policy gap	Legislated	Announced
	Mexico	Policy gap	Legislated	Policy gap	Policy gap	Policy gap	N/A	Announced	Policy gap	Policy gap	Policy gap	Announced	Policy gap	Legislated	Legislated
	Vietnam	Announced	Announced	Announced	Announced	Announced	N/A	Announced	Announced	Announced	Announced	Announced	Policy gap	Legislated	Legislated
	Argentina	Announced	Policy gap	Policy gap	Policy gap	Policy gap	Policy gap	Announced	Policy gap	Policy gap	Policy gap	Announced	Policy gap	Legislated	Legislated
Nigeria	Legislated	Policy gap	Policy gap	Policy gap	Announced	N/A	Policy gap	Policy gap	Policy gap	Policy gap	Policy gap	Policy gap	Legislated	Policy gap	

1. Based on major announcements and developments tracked in IPR 2021 Policy Forecast Detailed resource (March 2021) and 2022 and 2023 QFTs
 2. Countries in each bucket (AE and EMDE) are ranked in order of CO₂ emissions, [European Commissions Emissions Database](#)

2. End of deforestation is defined as reduction in average annual deforestation by more than 95% versus the 1990-2020 level, alongside a net increase in forest cover
 4. Policy gap assessment is shown for land protection only

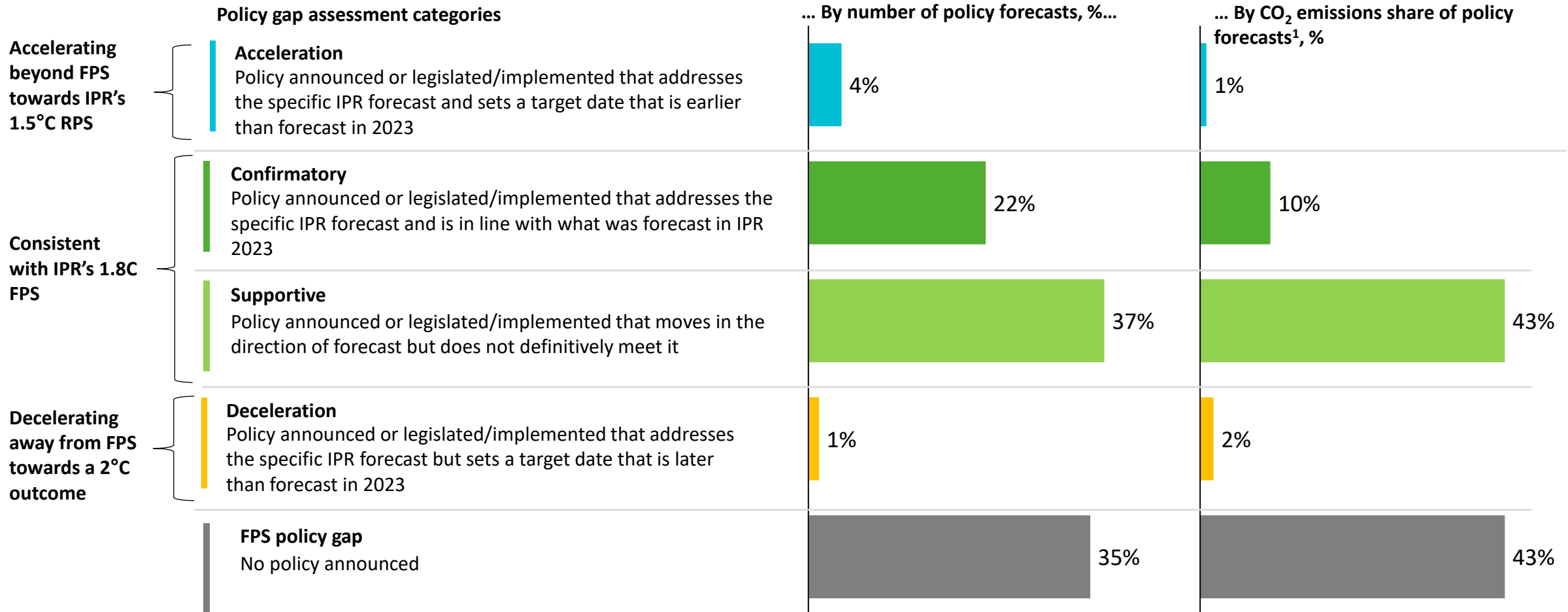
Only 3% of global climate policy levers tracked by IPR are moving towards
2050 net zero (1.5°C)...

...but >50% are now broadly supportive of the Forecast Policy Scenario,
including 90% in OECD

Over 50% of IPR 2023 forecasts have policy in place that is confirmatory or supportive of the forecast

Existing policy developments are assessed against the IPR's 2023 forecasts...

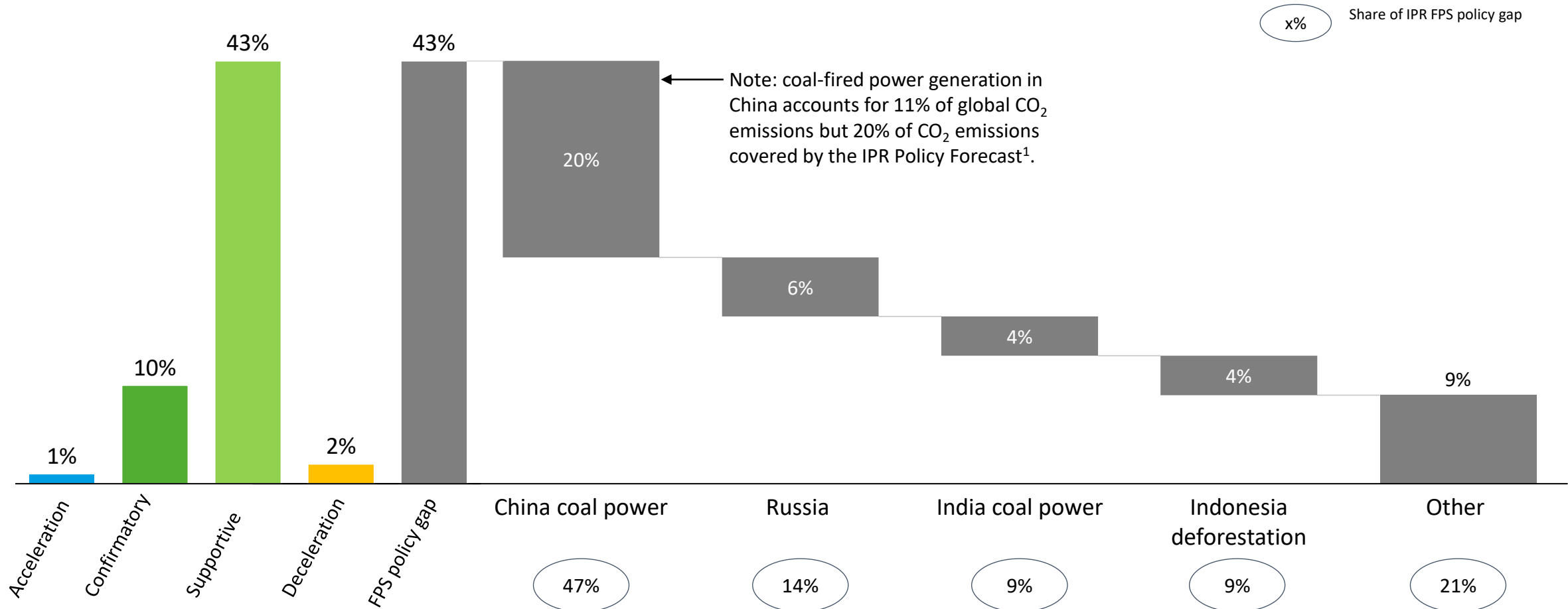
...With over 50% of forecasts having policy in place that is confirmatory or supportive of the forecast and ~40% of forecasts having a policy gap



1. Weighted by CO₂ emissions covered by IPR's policy forecasts.









The key policy gaps (no announcement as yet) in the FPS Forecasts

Breakdown of IPR policy forecasts with no existing policy announcements to meet them, weighted by CO₂ emissions¹



1. Weighted by CO₂ emissions covered by IPR's policy forecasts. IPR policy forecasts do not cover all CO₂ emissions and therefore the percentage breakdowns shown will likely be higher than if this analysis was done for all countries and sectors, covering all global emissions. For example, coal-fired power generation in China accounts for 11% of global CO₂ emissions but 20% of emissions covered by IPR policy forecasts.

IPR 2023 Top 10 Policy Forecasts

 Timing	1. Policy announcements continue to 2025, with continued acceleration to 2030 and beyond
 Economy-wide	2. India will achieve net zero CO2 emissions by 2065, accelerating 5 years ahead of its existing net zero by 2070 target
	3. Turkey and Vietnam will reach net zero by 2060 and South Africa beyond 2065 despite all having 2050 targets
	4. Low-carbon incentives will play an increasingly important role in facilitating the climate transition as countries continue responding to US IRA
 Power	5. China will end the construction of new coal plants by 2030 and end all unabated coal generation by 2045 ¹ , but will keep ~400GW of unabated coal plants in reserve and retrofit ~100GW with CCS
 Nature	6. Land protection reaches 30% of national land area by 2035 in North America and China, and by 2030 in Europe
 Road transport	7. The sale of new cars and vans with CO2 emissions will mostly end by 2040, and by 2035 in Europe and China
 Industry	8. Heavy industry achieves deep decarbonisation (>95% emissions reduction) after economy-wide net zero
 Carbon removals	9. Policy delivers significant DACs deployment from 2040 but there is a limited role for BECCS in the climate transition
 Land use	10. Global deforestation will end by 2030-35, with Brazil and Indonesia ending it by 2030

IPR 2023 policy forecasts across energy, land use and nature

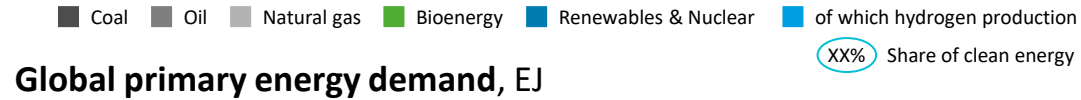
 Policy ambition¹: ■ Tier 1 ■ Tier 2 ■ Tier 3

Country ²	Economy wide		Power			Build-ings	Transport		Industry	Agri	Land use	Nature			
	Net zero CO ₂ emissions	Carbon price (/tCO ₂)	New coal phase out	All coal phase out	Clean power	Zero-carbon heating	Light-duty vehicles	Heavy-duty vehicles	Fuel combustion	Industrial process	Low-carbon agriculture	Net deforestation	Deforestation free supply	Protection & restoration	Nature incentives
China	2060	\$50	2030	2045	2050	2045	2035	2040	2070	>2070	2030	2025	2035	2035	2030
US	2050	\$30	<2023	2035	2040	2040	2040	2045	2055	2065	2030	2025	2035	2035	2030
India	2065	\$50	2025	2060	2060	N/A	2040	2045	>2070	>2070	2035	2025-35	>2035	2040	>2035
Russia	>2065	\$0	2030	2060	2060	2050	2050	2055	>2070	>2070	2035	2025-35	>2035	>2040	>2035
Japan	2050	\$70	2025	2045	2045	2040	2040	2040	2055	2065	2025	2025	2035	2030	2030
Germany	2045	\$120	<2023	2035	2040	2030	2035	2040	2050	2060	2025	2025-30	2030	2025	2030
South Korea	2050	\$70	2025	2045	2045	2040	2035	2040	2055	2065	2030	2030	>2035	2040	2030
Indonesia	2060	\$50	2025	2050	2050	N/A	2045	2050	2070	>2070	2035	2030	>2035	>2040	2035
Saudi Arabia	2060	\$20	N/A	N/A	2060	N/A	2040	2045	2070	>2070	N/A	2030	>2035	2040	>2035
Canada	2050	\$100	<2023	2030	2035	2035	2035	2040	2055	2065	2025	2025	2035	2035	2030
Brazil	2050	\$50	2025	2045	2050	N/A	2045	2050	2060	2070	2030	2030	2035	2030	2030
Turkey	2060	\$30	2030	2045	2050	2050	2040	2045	2070	>2070	2035	2025	>2035	>2040	>2035
South Africa	>2065	\$30	2025	2050	2050	2050	2040	2045	>2070	>2070	2035	2035	>2035	2040	2035
Mexico	>2065	\$30	<2023	2038-40	2050	N/A	2040	2045	>2070	>2070	2035	2030	>2035	2040	2035
Australia	2050	\$70	2023	2038-40	2045	2035	2040	2045	2055	2065	2030	2025-30	2030	2030	2025
UK	2050	\$120	<2023	<2030	2035	2035	2030	2040	2055	2065	2025	2025	2030	2030	2025
Vietnam	2060	\$50	2025	2050	2050	N/A	2040	2045	2070	>2070	2030	2025	>2035	>2040	2030
Italy	2050	\$120	<2023	<2030	2045	2035	2035	2040	2060	2070	2025	2025	2030	2030	2030
France	2050	\$120	<2023	<2030	2035	2035	2035	2040	2055	2065	2025	2025	2030	2030	2025
Argentina	2060	\$30	2023	2045	2050	2045	2040	2045	2070	>2070	2035	2030	>2035	2040	2035
Nigeria	>2065	\$20	2030	2045	2050	N/A	2045	2050	>2070	>2070	2035	2035	>2035	>2040	>2035

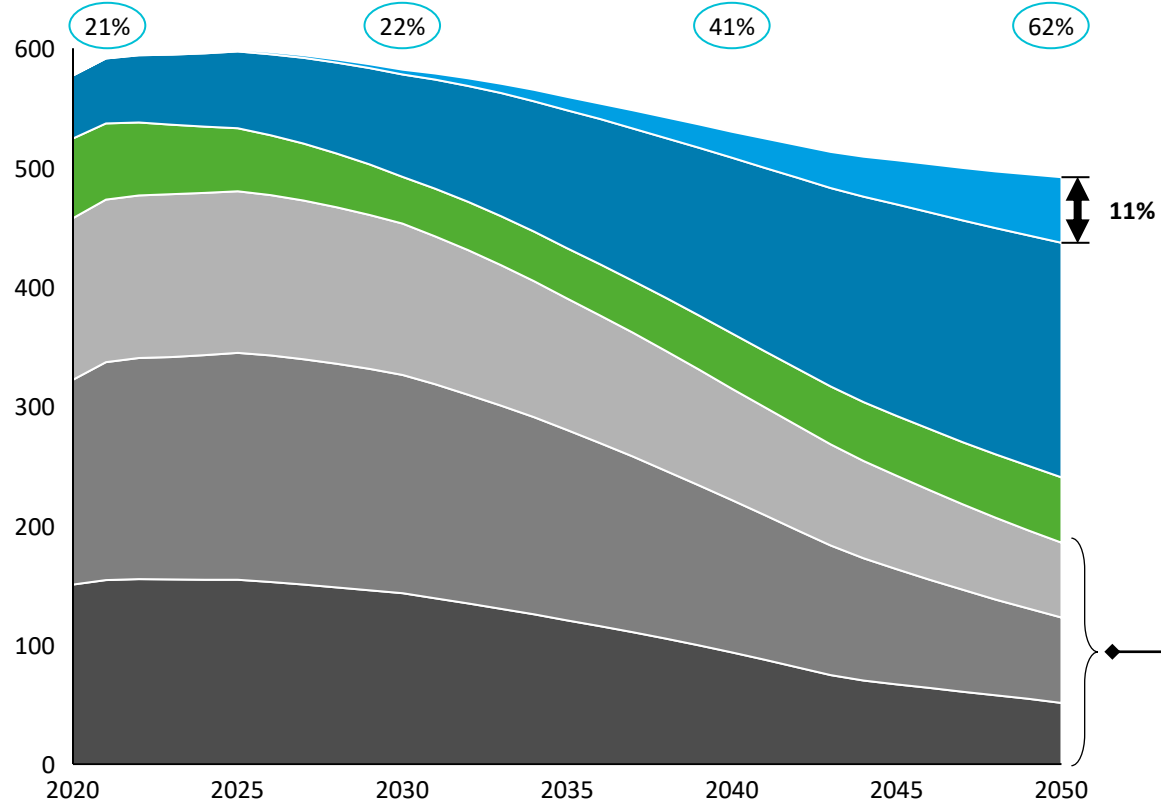
1. Tiers reflect different levels of climate ambition.
2. Ranked by CO₂ emissions, [European Commissions Emissions Database](#)

Clean sources grow to over 60% of primary energy demand by 2050...

~ 10% of primary energy is used to produce green hydrogen



Global primary energy demand, EJ

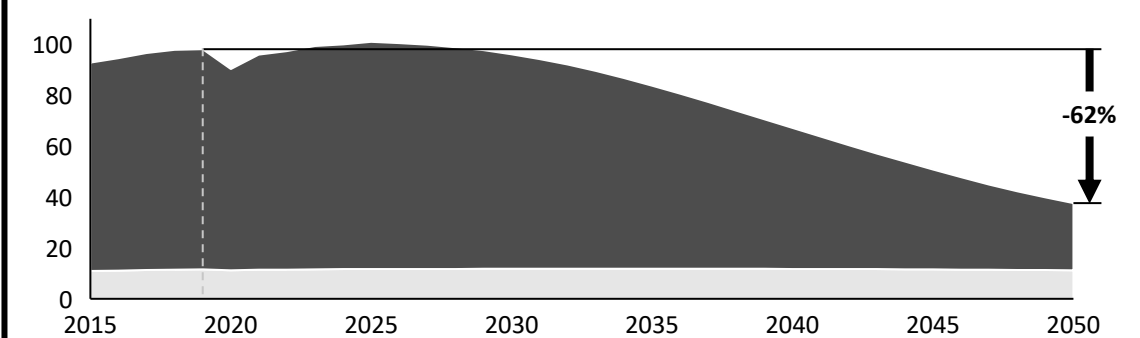


...while global peak oil could occur as soon as 2025

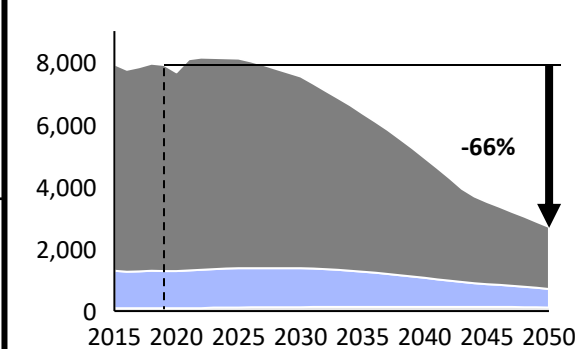
All fossil fuels decline following a mid-2020s plateau



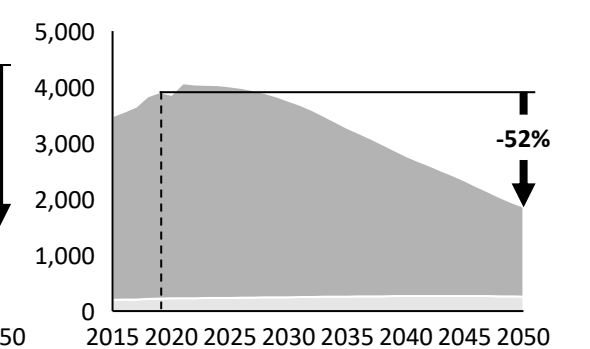
Global oil demand, million barrels per day



Global coal demand, Mt



Global natural gas demand, bcm

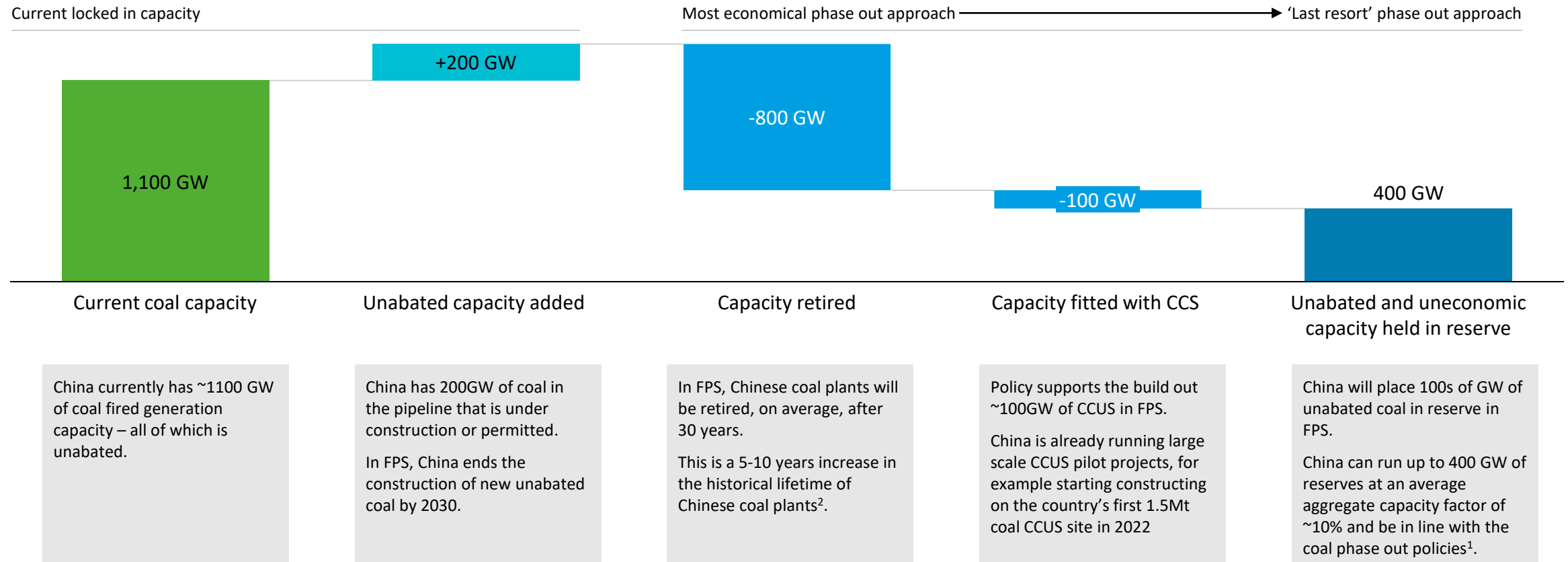


1. Metallurgical – or coking – coal is used in the production of steel, and acts as both a fuel for high temperature process heat and as a reactant in the reduction of iron ore

In the FPS, China retires 60% of its coal fleet by 2045, with 100GW fitted with CCUS, and additional unabated capacity held as reserve

IPR's pathway for China's unabated coal fleet from 2020-45, GW

IPR policy forecasts



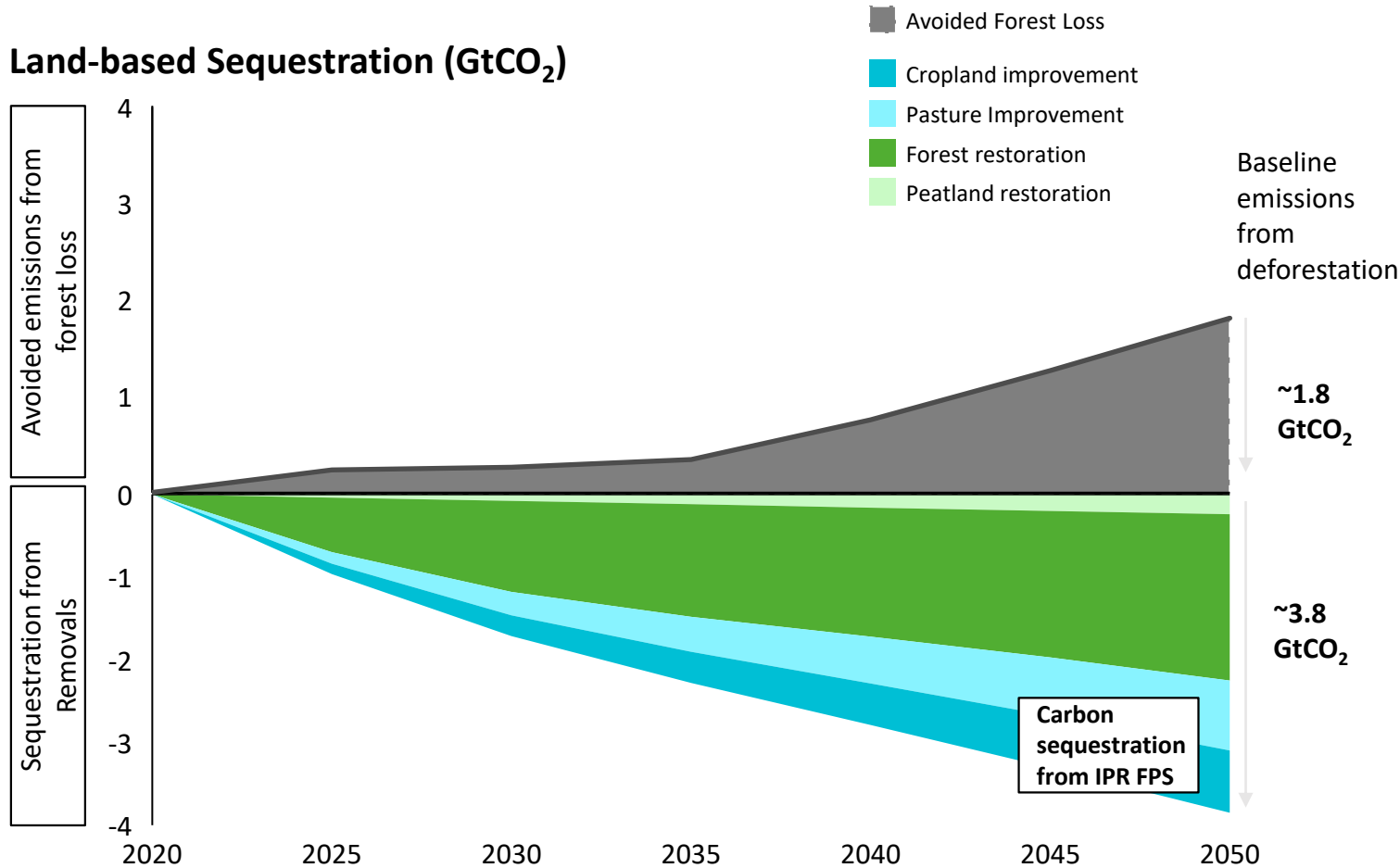
1.IPR coal phase out definition: 97% of dispatched power generation comes from sources other than unabated coal. Coal is considered abated when installed with CCS with a capture rate of 90% or equivalent.

2.Historical retirement age of coal plants has been 20-25 years. Future Chinese coal plant lifetime is modelled to be longer given the higher efficiency of China's existing coal fleet, compared with historically retired plants.

Sources: China coal pipeline: [GEM](#), China coal plant lifetime: [source](#), Distribution of China coal plant age: [GEM](#), China modelled reserve capacity in 2050: [source](#), UK coal capacity factor: [DUKES](#), China CCS suitability: [IEA](#), China coal spatial location: [IEA](#), China CCUS pilots: [CHN Energy](#)

By 2050, action to halt deforestation reduces emissions by 1.8 GtCO₂/yr, while other policy and market incentives helps capture an additional ~3.8 GtCO₂/yr

Land-based Sequestration (GtCO₂)



Land protection reaches 30% of national land area by 2035 in North America and China, and by 2030 in Europe. Globally, an additional 980Mha of natural vegetation is protected by 2050, stabilising biodiversity intactness to 2020 levels.

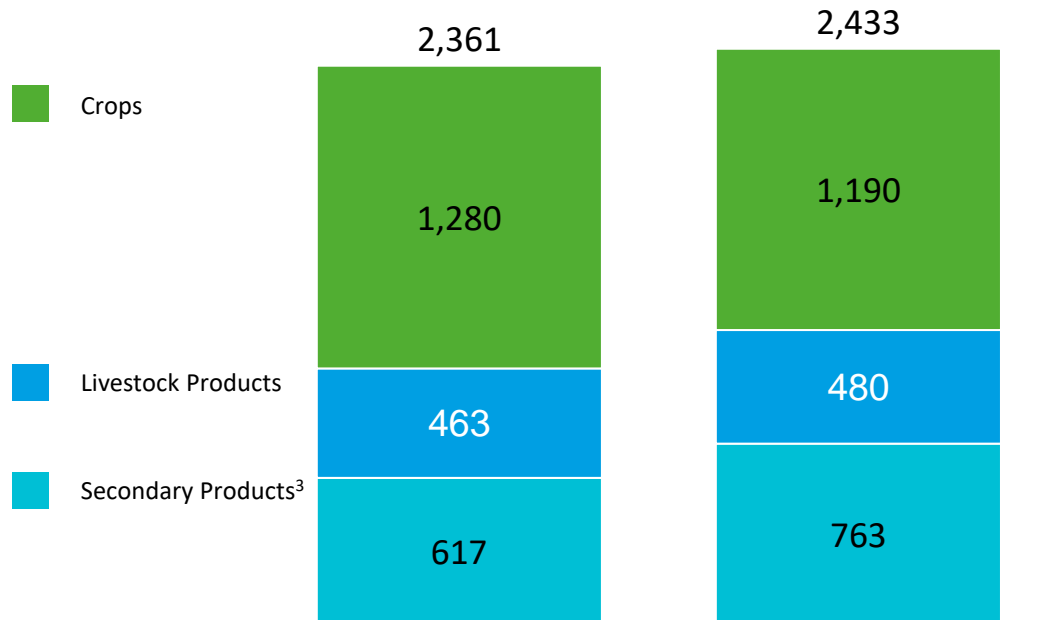
Brazil and Indonesia end effective deforestation by 2030 (each country contributes 25% of CO₂ emissions from land use change), with global deforestation ending by 2035.

1. The reference scenario projects the land use change we would expect to see without NBS policies that conserve forest land, improve practices to optimize sequestration, and create new ecosystems. These values represent the difference in removals and reduction between the FPS 2023 scenario and this reference scenario, as a baseline.
2. Ecosystems described here refer to major land-based and carbon-rich ecosystems (e.g. forests, peatland, mangroves, pastureland)

Cattle and sheep represents a small percentage of global average per capita caloric intake, but they could be responsible for ~20% of global emissions by 2050

Global Caloric Intake⁴

Kcal/capita/day



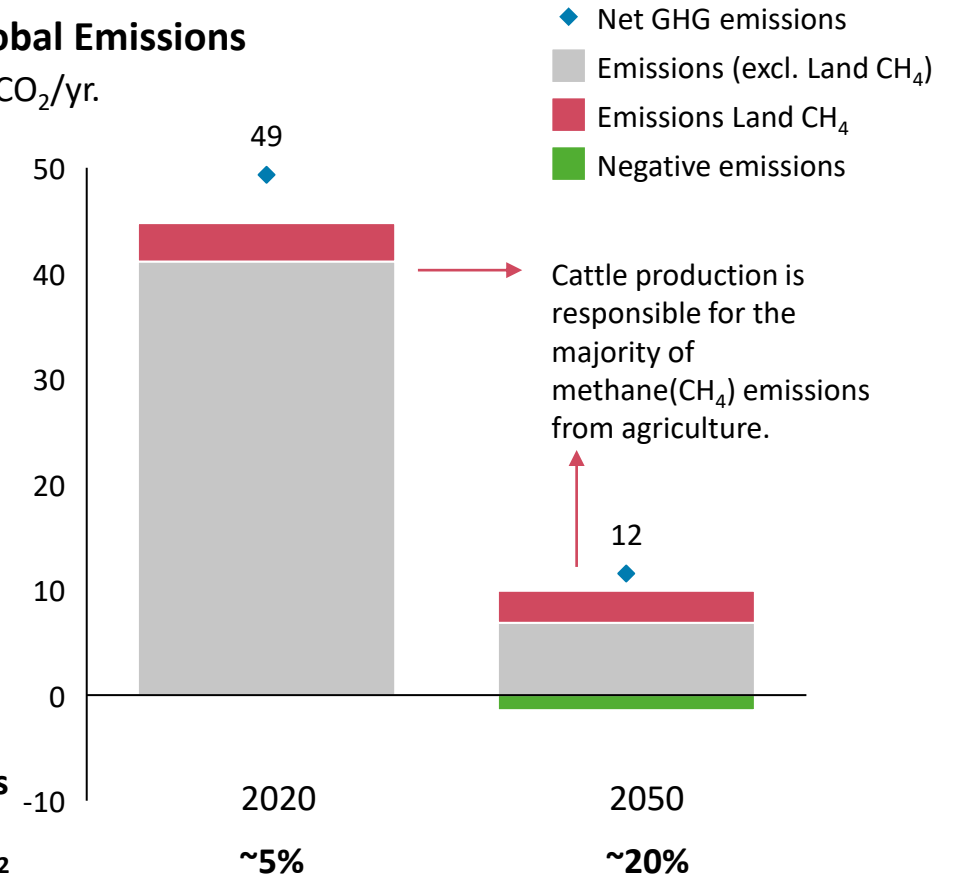
Dairy and beef consumption, %

2020
~12%

2050
~10%

Global Emissions

Gt CO₂/yr.



Dairy and beef as share of total global emissions², %

2020
~5%

2050
~20%

1. Using GWP 100 emissions values

2. We use enteric fermentation as a proxy for methane emissions from ruminants, which account for 70%-80% of total methane emissions from agriculture. This excludes a portion of emissions from animal waste management. Total emissions from animal waste management (covering all livestock products, not just ruminants) account for only 5-15% of overall methane emissions from land.

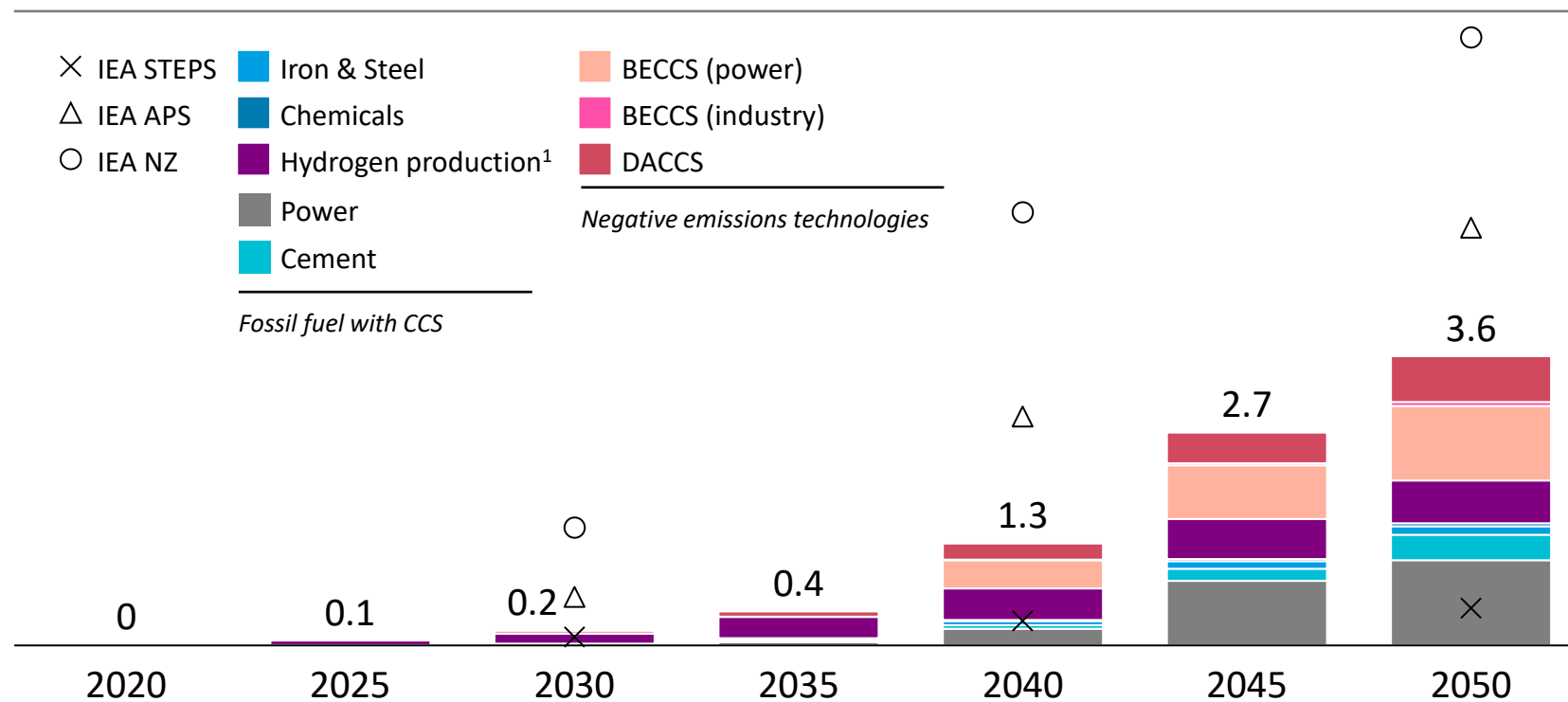
3. Including sugars, alcohol, brans and other secondary products

4. Caloric intake is caloric demand net of food waste

Source: Springmann M, Wiebe K, Mason-D' Croz D, Sulser T, Rayner M, Scarborough P. Health and nutritional aspects of sustainable diet strategies and their association with environmental impacts: a global modelling analysis with country-level detail

Over 3 GtCO₂ are captured by 2050 in FPS 2023, a third of which is from negative emissions technologies

Carbon dioxide captured by CCS removed by BECCS and DACCS, GtCO₂

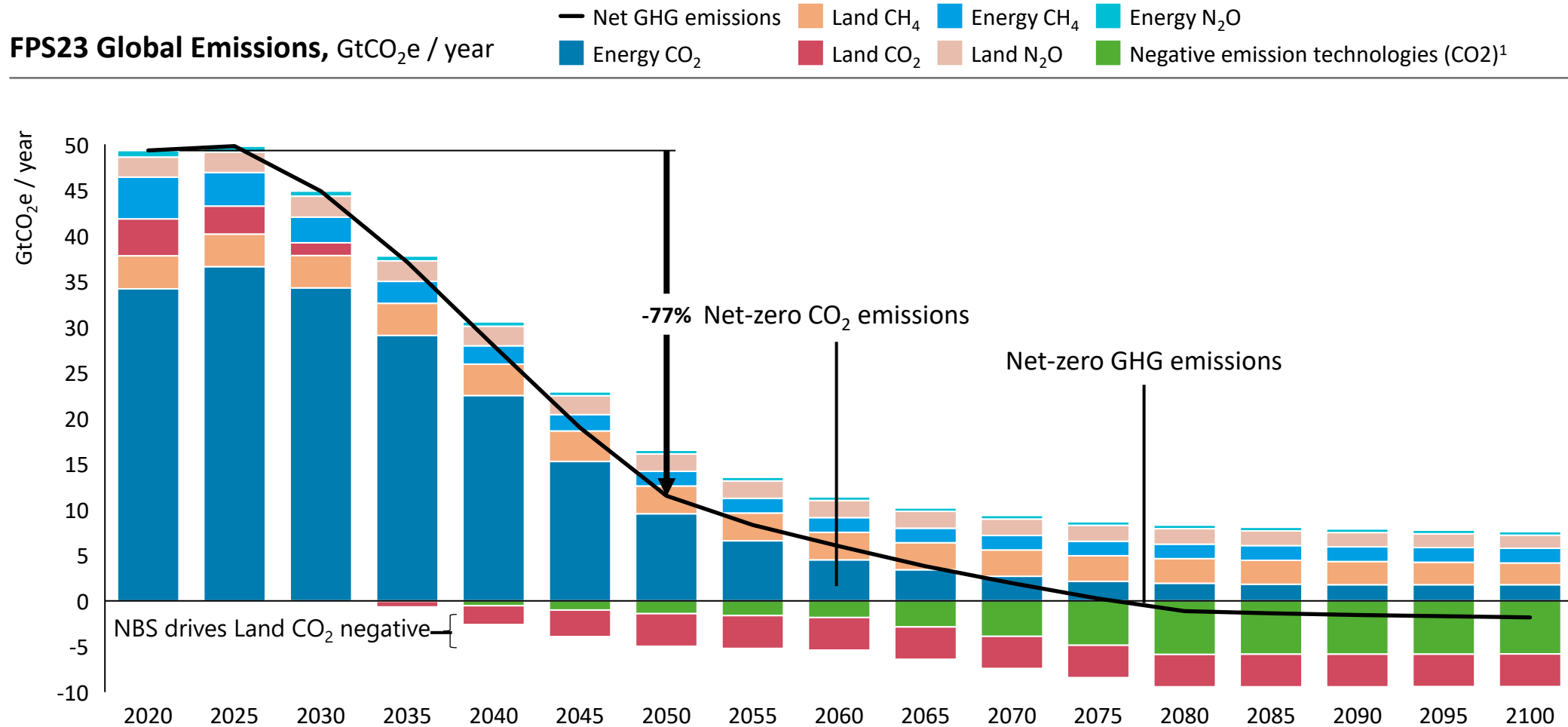


- Carbon capture and storage (CCS) and removals in the FPS is comparable to the IEA APS, where policy requires hard-to-abate sectors to reduce their emissions
- In FPS, a larger uptake of Direct Air Carbon Capture & Storage (DACCS) happens in the 2040s when stakeholders act to accelerate towards net negative emissions, even while industrial sources are slower to decarbonize

1. Not including that used in ammonia and methanol production

Ultimately, our central forecast implies temperatures will peak at 1.7°C-1.8°C suggesting the Paris Agreement will be achieved...recognizing that uncertainties around temperature sensitivities remain and the battle is not won.

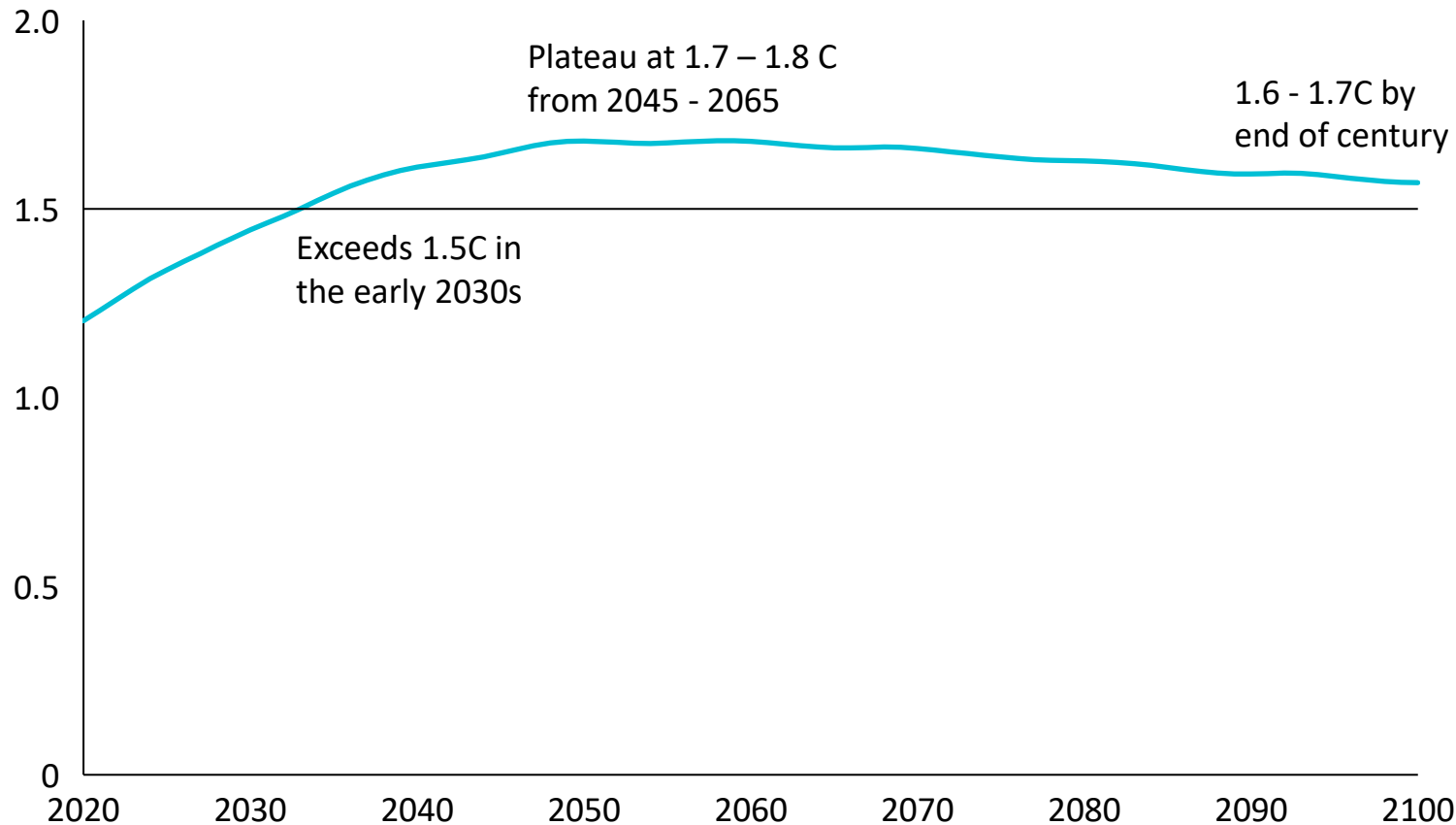
Greenhouse gas emissions drop 80% by 2050 and reach net-zero by 2080, but only because negative emissions technologies remove 6 GtCO₂ per year by 2080



1. Direct air carbon capture and storage (DACCS) and Bioenergy with carbon capture and storage (BECCS)

FPS 2023 forecasts peak temperatures of 1.7-1.8C around 2045, dropping to 1.6-1.7 C by 2100 if DACCS continues

Surface temperature anomaly, degrees C above pre-industrial reference period¹



IPR FPS 2023 forecasts²

- An exceedance of 1.5C in the early 2030s
- Peak temperatures of 1.7 - 1.8C around 2045 - 2065
- A decline to 1.6 – 1.7C by 2100 and 1.5C by 2130³, based on direct air carbon capture and storage (DACCS) deployment estimates
- Net-zero CO₂ emissions around 2060 and net-zero GHG emissions around 2080
- Overall likelihood of staying below 2°C warming is at >90%

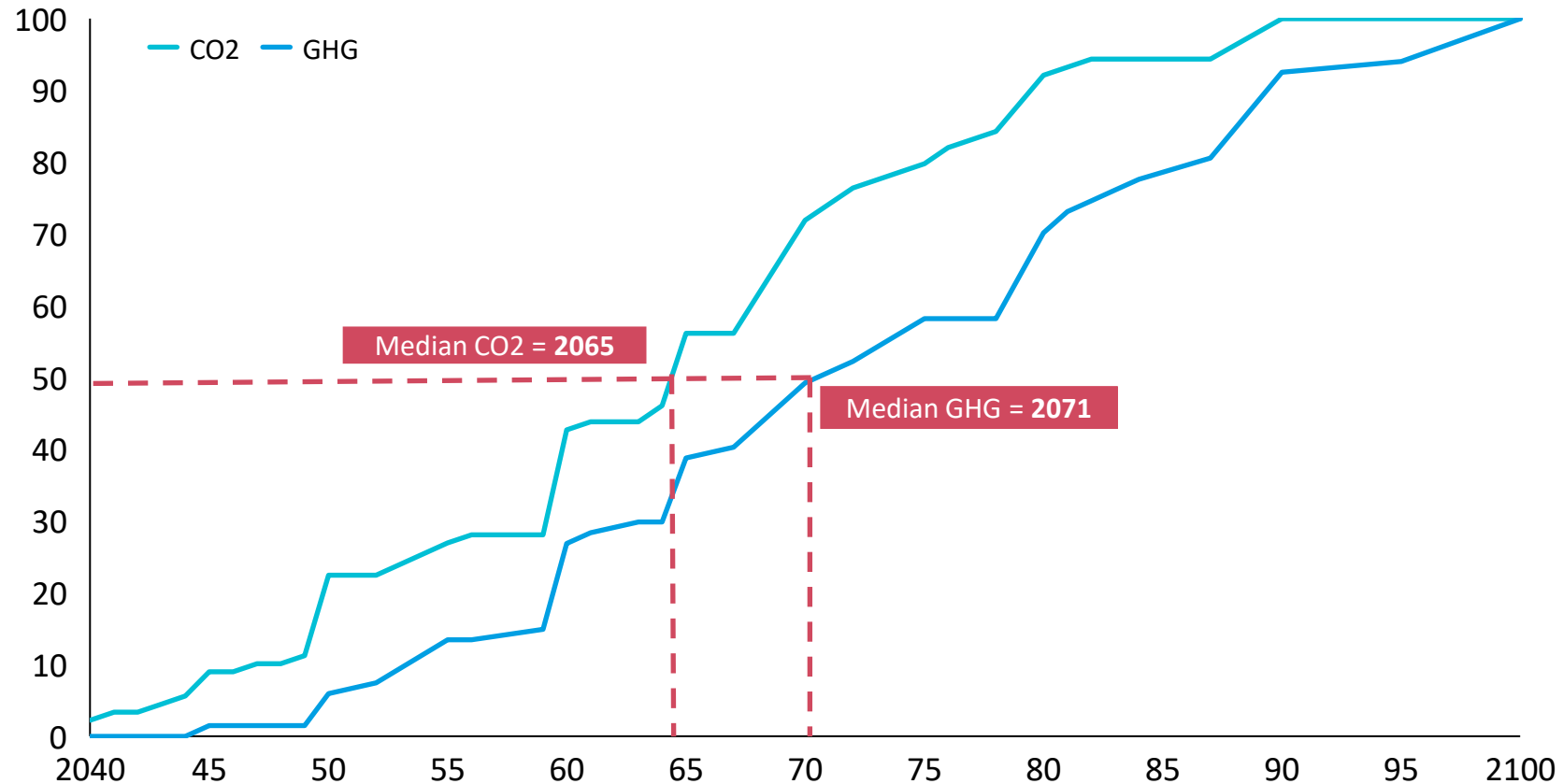
1. The pre-industrial reference period is 1850 to 1900, defined in Kelvin. Temperature anomalies in Kelvin and Celsius are equivalent.
2. Based on MAGICC 7
3. Assuming only impact of continuation of DACCS levels

Our survey of 100 sustainability experts confirms our conviction

N = 89 (CO2), 67 (GHG)

When will the world reach net zero across CO2 and all greenhouse gases?

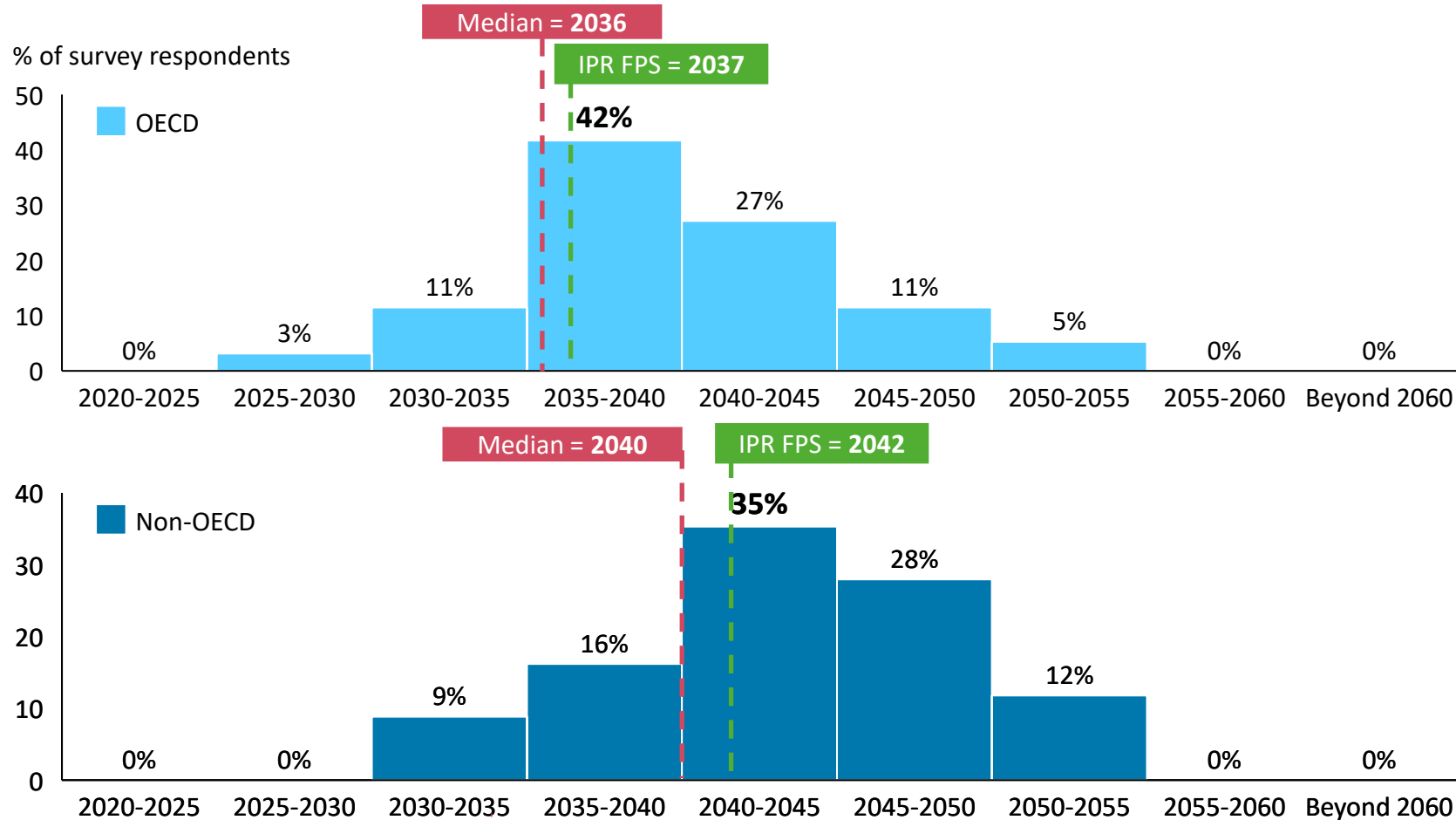
Cumulative % of survey respondents



Respondents on average expect the phase out of CO2 vehicles ~5 years earlier in OECD countries than others

N = 96 (OECD), 68 (Non-OECD)

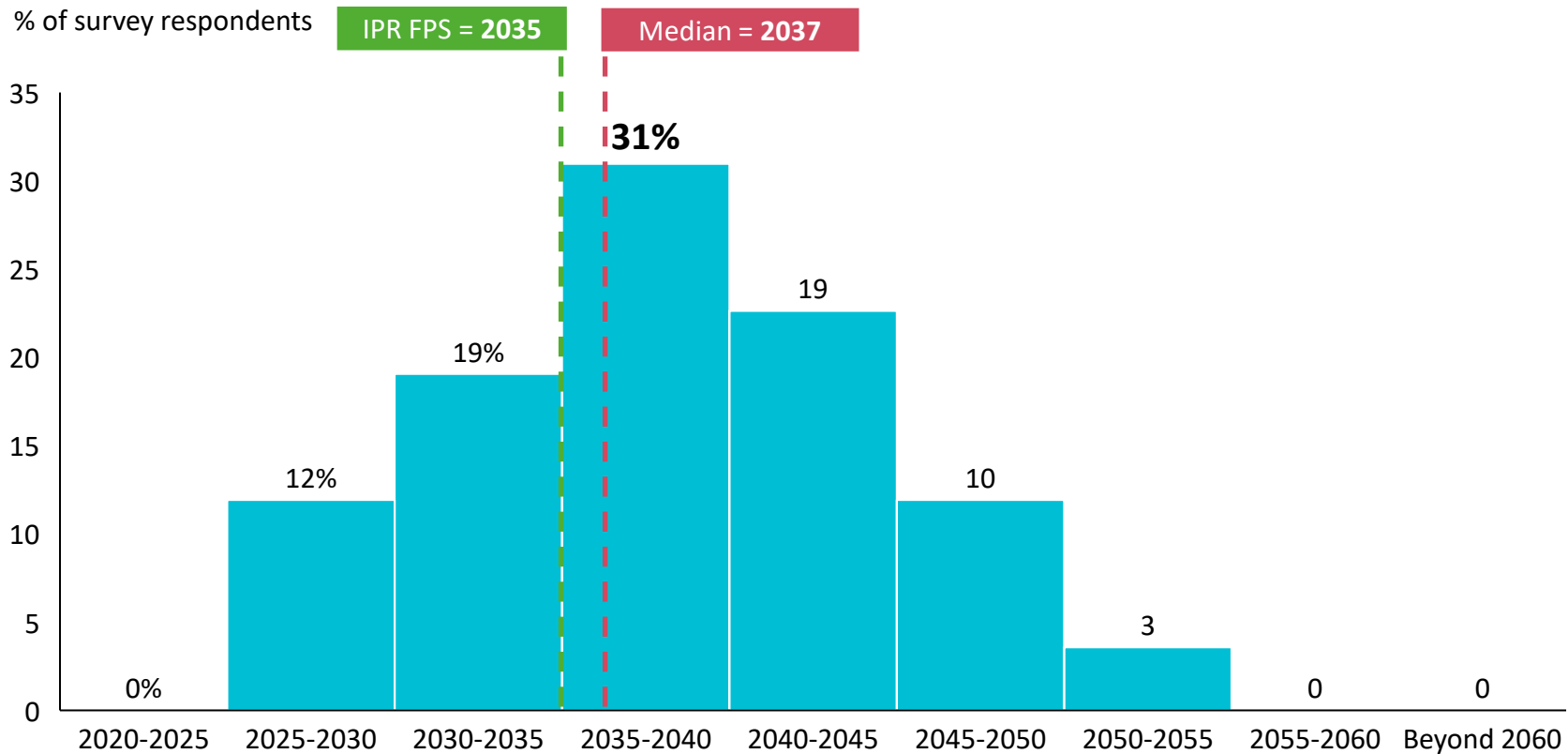
When will zero-CO2 emission cars and vans make up more than 95% of new vehicle sales on aggregate in OECD and non-OECD countries?



31% of respondents expect the construction of unabated coal in Asia to end between 2035-2040

N = 84

When will the construction of new unabated coal generation power capacity end in Asia (including China)?



IPR offers investors the opportunity to “build their own forecast”

A dedicated ‘Forecast Workshop’ for different stakeholders



Disclaimer

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