

The Inevitable Policy Response

Preparing financial markets for climate-related policy/regulatory risks



Financial markets are underprepared for climate-related policy risks

A forceful policy response to climate change within the near term is not priced into today's markets.

Yet it is inevitable that governments will be forced to act more decisively than they have so far, leaving investor portfolios **exposed to significant risk**.

The longer the delay, the more disorderly, disruptive and abrupt the policy will inevitably be.

In anticipation, PRI, Vivid Economics and ETA have built a pioneering forecast of the financial impact of this **Inevitable Policy Response (IPR)**, including a Forecast Policy Scenario:

- How will it affect **the economy**?
- Which **asset classes** will be impacted?
- Which **sectors** are most at risk?

Momentum Based Drivers

Policy



Border Tax Adjustments



GHG reduction policy



Net Zero Targets

Ongoing New climate research

Global warming report, an 'ear-splitting wake-up call' warns UN chief



Uninsurable World




"Climate change could make insurance too expensive for most people"

"Climate change risks outweigh opportunities for P&C (re)insurers"

Impacts on security

The effects of a changing climate are a **national security issue.**

- US Dept. of Defense



Pressure from leading investors and business






BIIP UK investors urge halt to fossil fuel lobbying

Activist shareholders make history in anti-lobby resolution at Origin AGM

Cheaper renewable energy

FINANCIAL TIMES

Europe 'watershed' as green energy set to overpower coal

- 03/06/2019

Regulator influences and warnings on stability

The catastrophic effects of climate change are already visible around the world. We need collective leadership and action across countries, and we need to be ambitious.



Additional, less predictable but equally high impact triggers

Extreme weather events



“Hurricane Dorian Was Worthy of a Category 6 Rating”

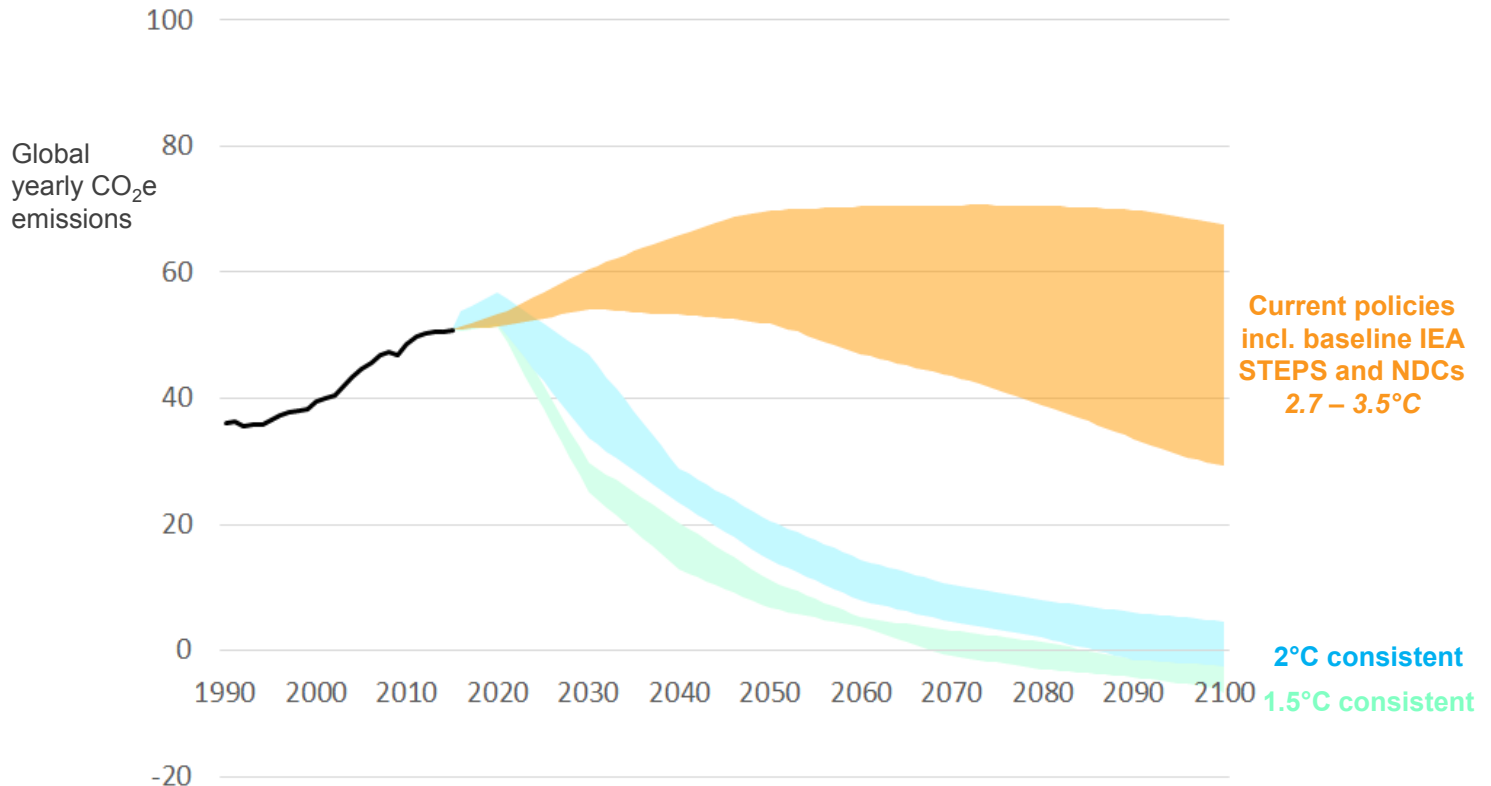
Civil society action & young voters



US Leadership

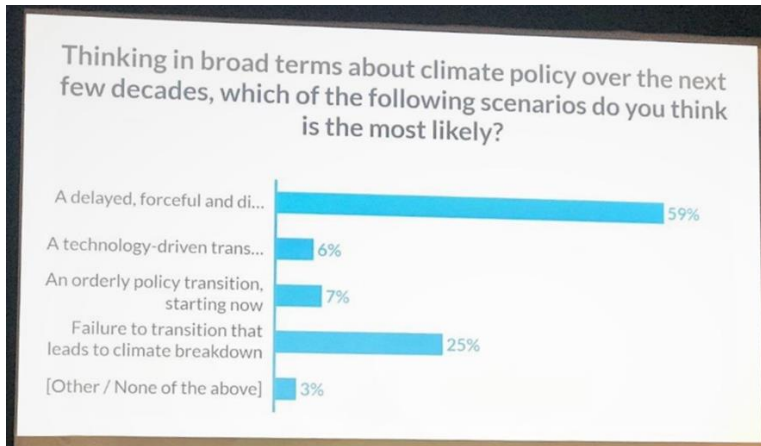


The setting: current policies fail to get even close 2°C let alone the Paris Agreement ambition of well-below 2°C



Source: Climate Action Tracker, Dec 2018 update

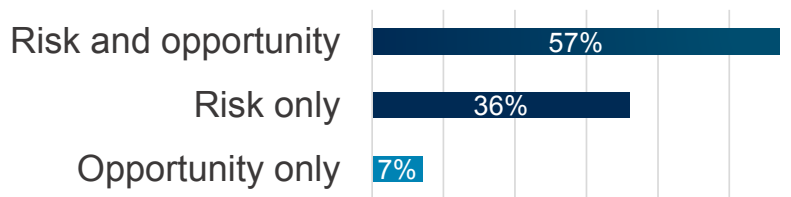
Investors acknowledge that there will be a policy response, and that it will be delayed and disruptive



59% of institutional investors expect a delayed, forceful and disruptive policy response to climate change

Source: BNY Mellon Investment Management and CREATE-Research

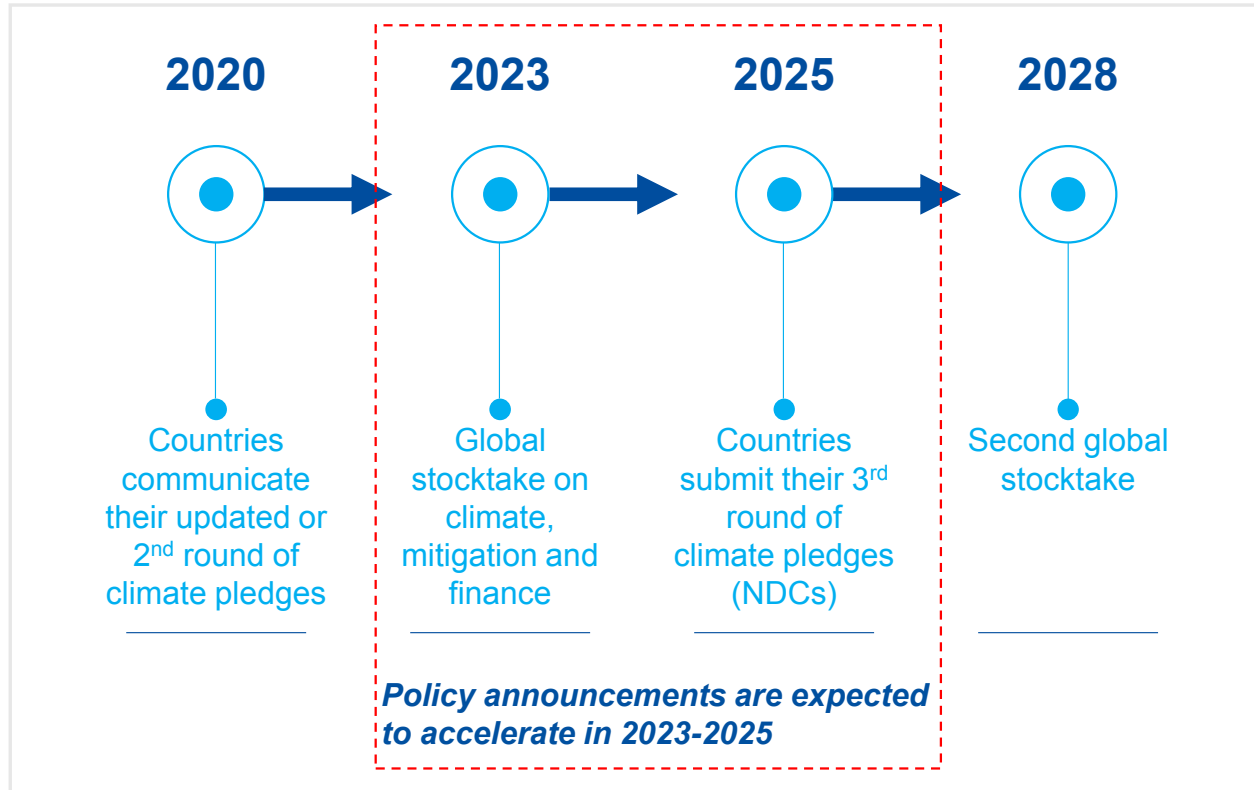
Is climate change a risk or opportunity?













<2% of PRI signatories are “strategic” in their assessment and reporting of climate risk

Source: UN PRI September 2019

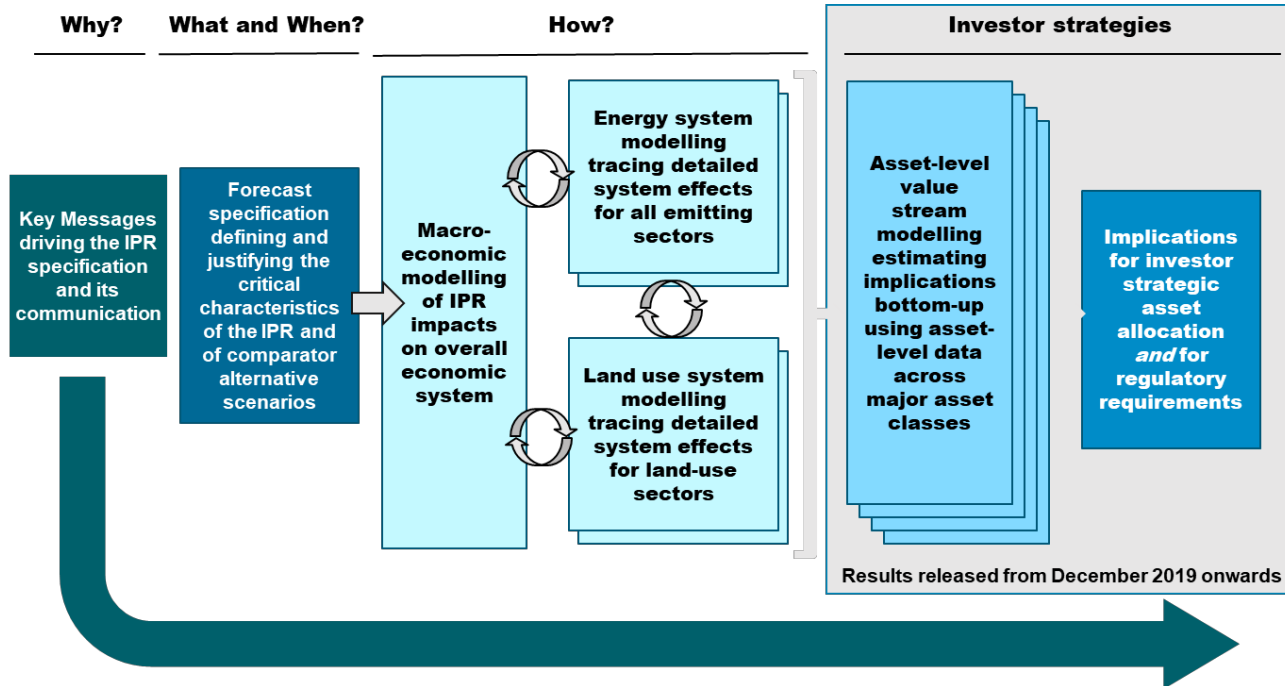
The Paris Agreement's “ratchet mechanism” increases the likelihood that governments will strengthen policy by 2025



The most likely policy levers to secure an accelerated and 'just' transition are starting to emerge

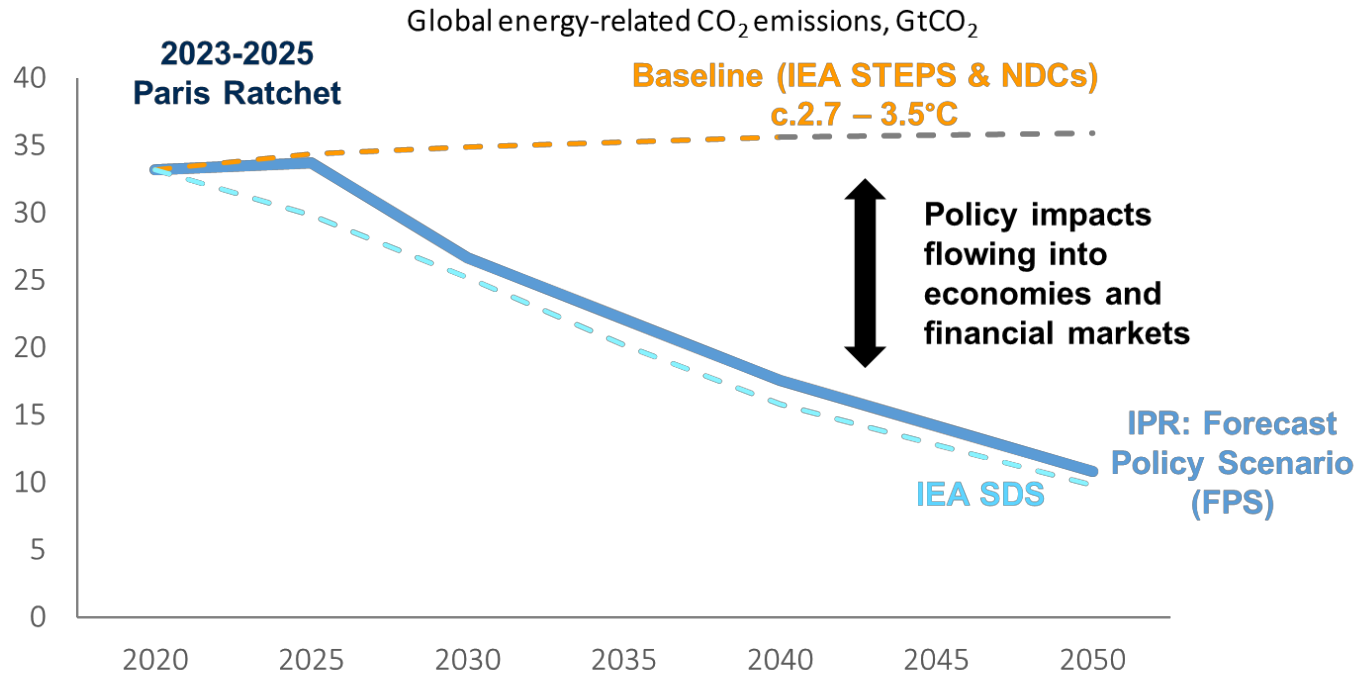
<p>Coal phase-out</p>	<p>ICE sales bans</p>	<p>Carbon pricing</p>	<p>CCS and industry decarbonisation</p>	 <p>Enabling a green economy</p>
 <p>The UK has committed to phase out unabated coal use by 2025, and support for a just transition is starting to emerge</p>	 <p>All new cars to be emissions-free in the Netherlands by 2030, and other countries have announced intentions</p>	 <p>57 carbon pricing initiatives around the world cover 20% of global emissions and discussion of BCAs</p>	 <p>Only two large scale CCS power projects in operation at the end of 2018, and no proven policies ready for ensuring scale-up</p>	
<p>Zero-carbon power</p>	<p>Energy efficiency</p>	<p>Land use-based greenhouse gas removal</p>	<p>Agriculture</p>	 <p>'Just Transition' lens to ensure social and political feasibility</p>
 <p>Nuclear, hydro, solar PV, wind and other renewables represented 36% of electricity generation globally in 2018</p>	 <p>A coalition of 8 European cities have pledged to completely decarbonise their existing building stocks by 2050</p>	 <p>National and bilateral payment systems trialled and planned to support nature-based solutions, including re/afforestation and bioenergy production</p>	 <p>Historic rates of agricultural improvement very high, and large investment in agricultural technologies and infrastructure remains a priority</p>	

Our forecast of an Inevitable Policy Response is based on a robust and strategic analytic process



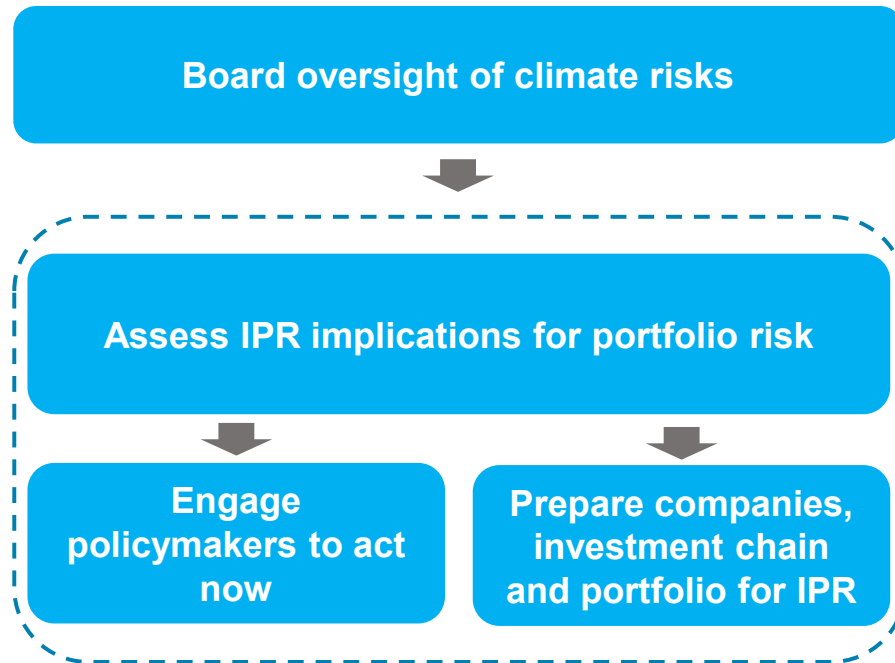
Please see annex for further detail

Our forecast of an Inevitable Policy Response provides an alternative to the IEA as a business planning case for investors, corporates & regulators to consider



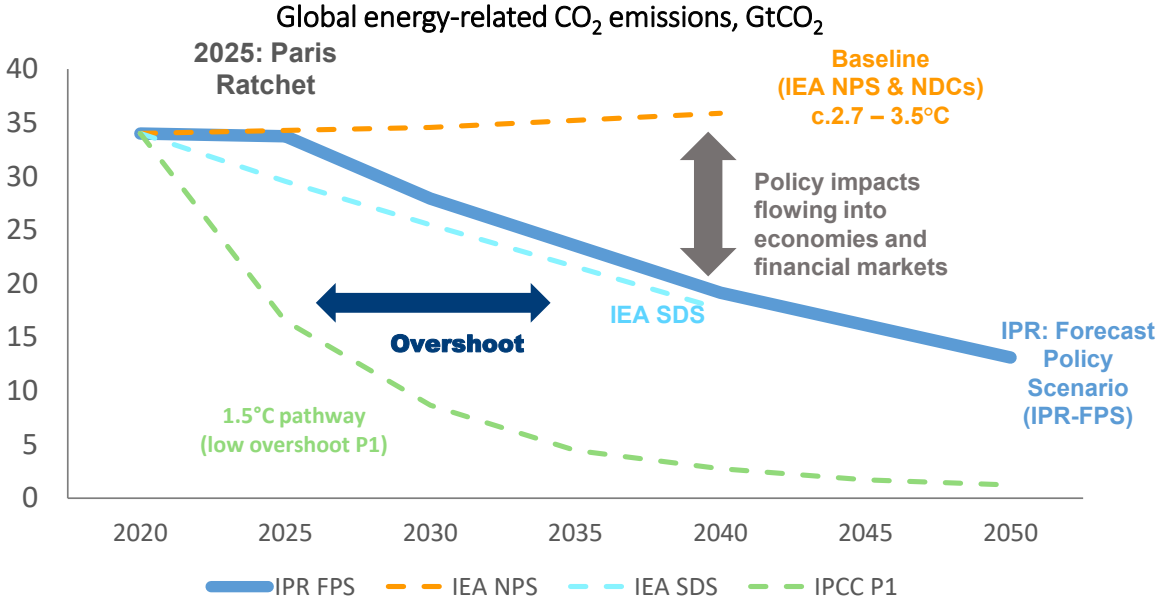
Investors need to act now

- The greater the delay in responding the greater the cost
- Early action is needed to manage portfolio risk and protect value



IPR 2025 is the first step to an eventual 1.5C outcome

Reaching a 1.5 degrees outcome is a far bigger challenge - Further policy action will be needed



PRI's ambition is to limit warming to 1.5°C

- Aiming for a 1.5°C target matters – it is a much better outcome for the world than 2°C.
- Stakeholders should aspire to 1.5°C – and that ideally, they would set targets to reach this goal including a second policy ratchet.
- However, in the interim they should proceed with realistic and transparent forecasts.
- IPR FPS is a realistic start towards 1.5°C – more action will be needed

Without further action, our forecast tells us that we will overshoot the 1.5°C target

Therefore, Policy makers need also to focus R&D spending on key areas of the “Known Unknowns” such as:

- **Faster policy action – ACT NOW**
- Negative Emission technologies
 - Focus on land based options in next decade such as ending deforestation and Afforestation
 - Longer term Direct Air Capture
- More aggressive agricultural practices
 - Dietary change leading to less beef usage
- AI and autonomous vehicles
- Hydrogen and bioenergy
- Consumer preferences
- Low-carbon materials

Forecast Policy Scenario (FPS) Key Results

Headline takeaways for investors

Deep and rapid changes in the energy system

- Oil to peak in 2026-28
- Thermal coal virtually non-existent by 2040
- Renewables generating approximately half of all electricity in 2030

Transport electrified inside 20 years

- ICE sales bans, supported by falling cost of EVs, drive rapid deployment of ultra-low emissions vehicles
- Making up almost 70% of passenger vehicles by 2040

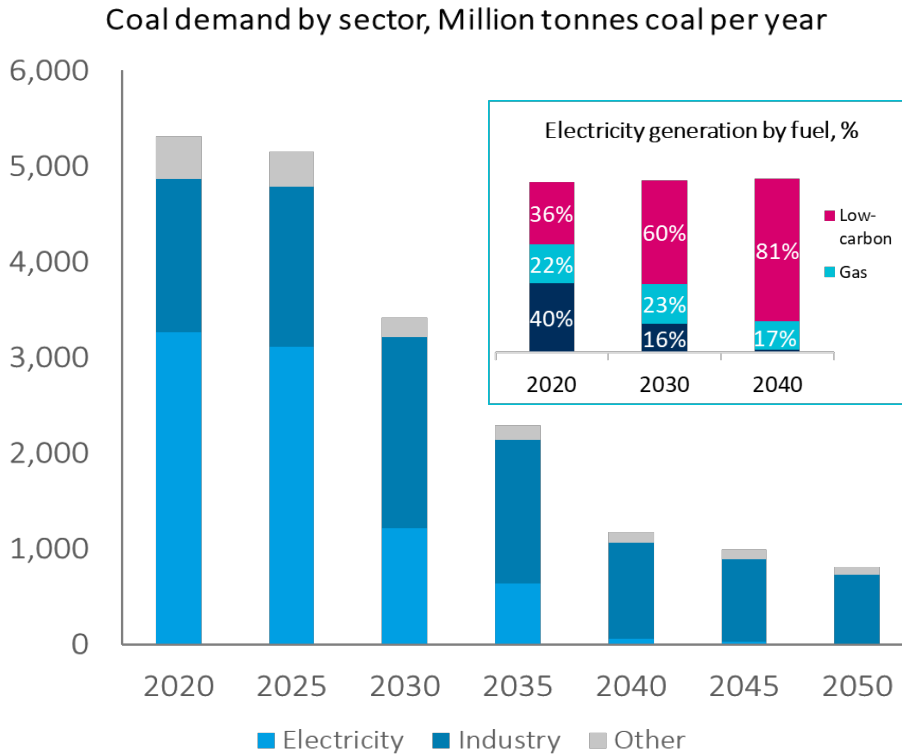
Major changes in land use

- Deforestation virtually eliminated by 2030, with pressures on supply chains
- Large opportunities to invest in nature-based solutions

Rapid reductions in carbon emissions, but not enough to hit 1.5°C

- > 60% fall in global CO₂ emissions by 2050
- New innovative policy and industrial solutions, not yet proven or achieved at scale, are needed to achieve 1.5°C

Coal demand is at its peak and will decline rapidly by 2025

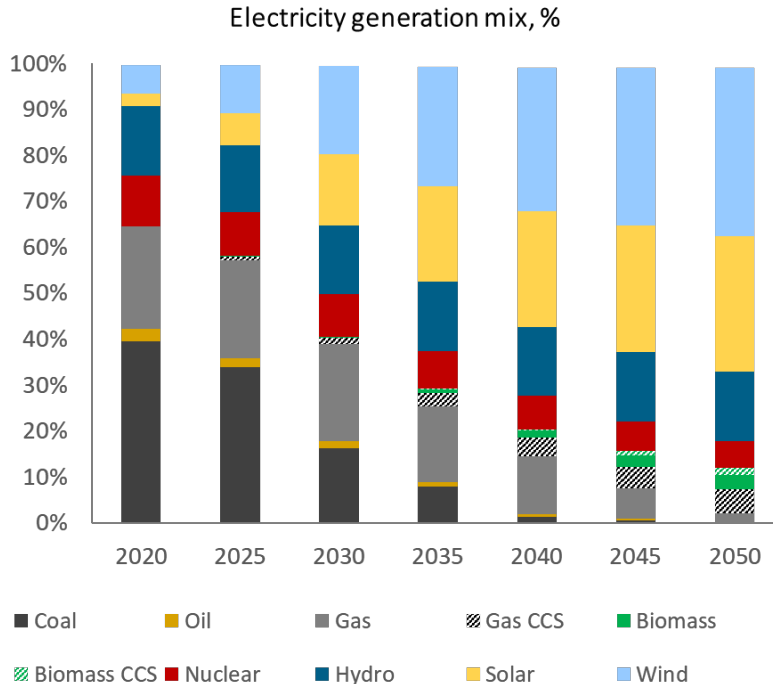


Driven by relative costs and policy, demand for coal for electricity generation declines by 23% per year from 2025 to 2040

- Coal is almost completely phased out of the electricity sector by 2040
- In the 2030s demand for coal in industry decreases significantly
- Electricity, gas and hydrogen replace coal across industry sectors

Note: 'Other' coal use includes energy used in the energy industry, use in agriculture and losses

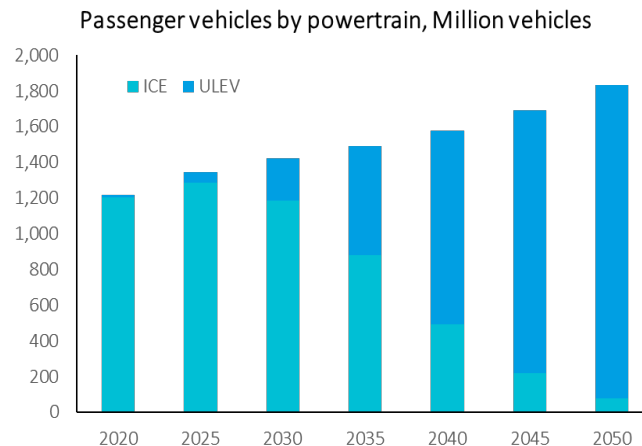
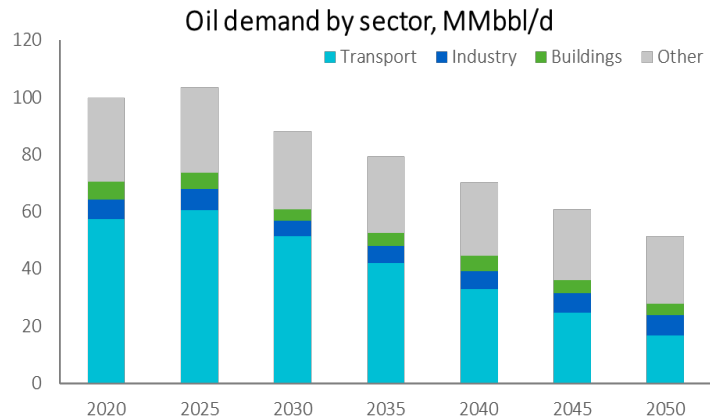
Renewable generation grows quickly and supersedes fossil fuels by 2030



Renewables replace virtually all fossil fuels in electricity generation by 2050

- Solar and wind alone will generate approximately 2/3 of all electricity in 2050
- IPR FPS has 72% renewable generation in 2040, more than in the IEA SDS, IEA STEPS, and BNEF NEO
- Coal is phased out by 2050 while gas retains a minor role.
- Slow development of CCS is a barrier to use of biomass as a negative emissions technology as are land use constraints
- Overall, nuclear does not grow to replace fossil fuels or renewables given cost and societal issues

Oil demand peaks 2026-28 and falls rapidly as transport uses alternative fuels

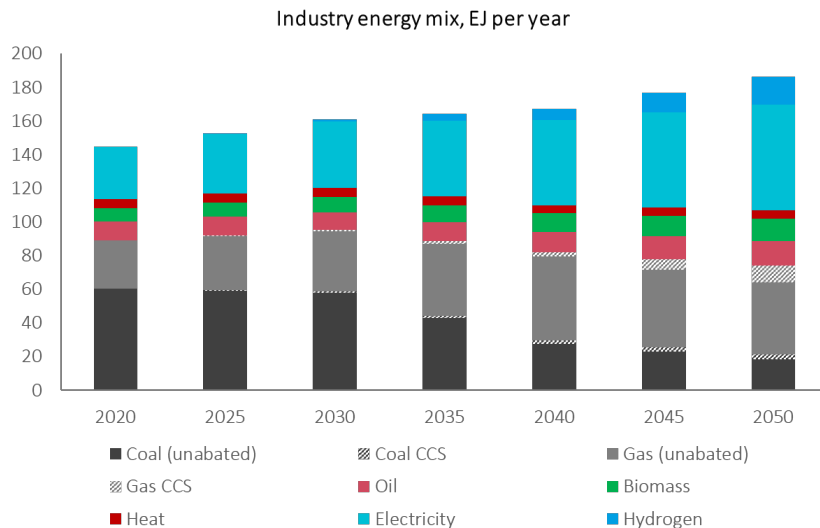


Oil demand peaks between 2026-28 driven by improving ICE efficiency and early uptake of electric vehicles

- Oil demand from transport decreases by around 70%, while total oil demand decreases around 50% 2025-2050
- Road transport oil demand peaks in 2025, while oil demand in aviation and shipping and as a feedstock for petrochemicals remains significant through to 2050

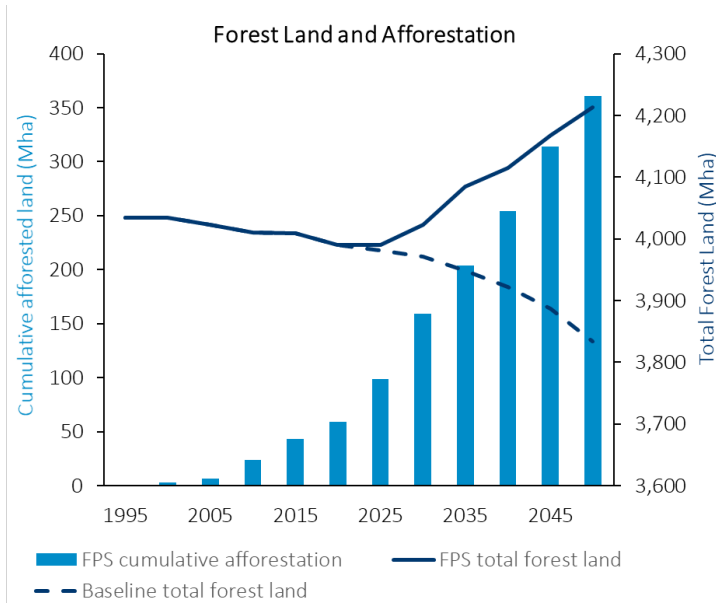
Note: 'Other' oil use includes energy used during oil extraction and refining, feedstock for petrochemicals, and use in agriculture

Electrification, hydrogen and CCS contribute to the progressive decarbonisation of industry



- Coal-to-gas switching – proven, economical and non-disruptive – accelerates as a near-term solution to reducing industrial emissions
- Electrification, hydrogen, and CCS contribute in medium to long term with the carbon price forecasts playing an important role
- Fuel mix changes proceed at a pace consistent with economics of emerging technologies, and long plant lifecycles

Deforestation continues until mitigation policies phase into the land sector, and afforestation and reforestation efforts ramp up substantially



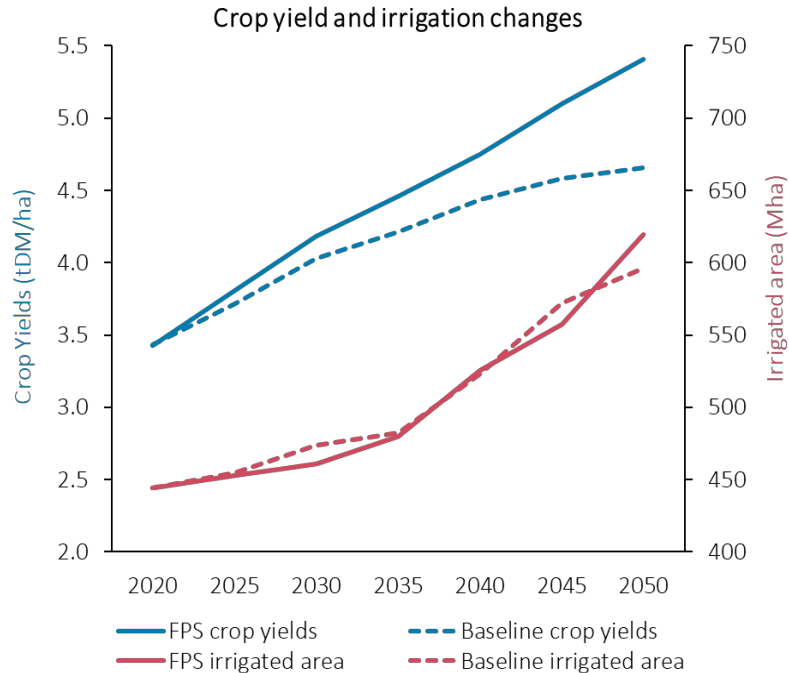
Note: 'Total Forest Land' is defined here as dense, high-carbon stock forest land only

Deforestation practically eliminated by 2030, as domestic climate policies fully implemented, and international payments increasingly introduced

- Rapid re/afforestation to meet feasible NDC land use targets in coming decade
- Re/afforestation is driven by emerging payment systems – national and international – and impact of increasing prices in carbon markets
- World meets the Bonn Challenge of 350 Mha of land restoration, but well after 2030 target
- Re/afforestation occurs largely in tropical regions: Brazil, Latin America, China and Southeast Asia

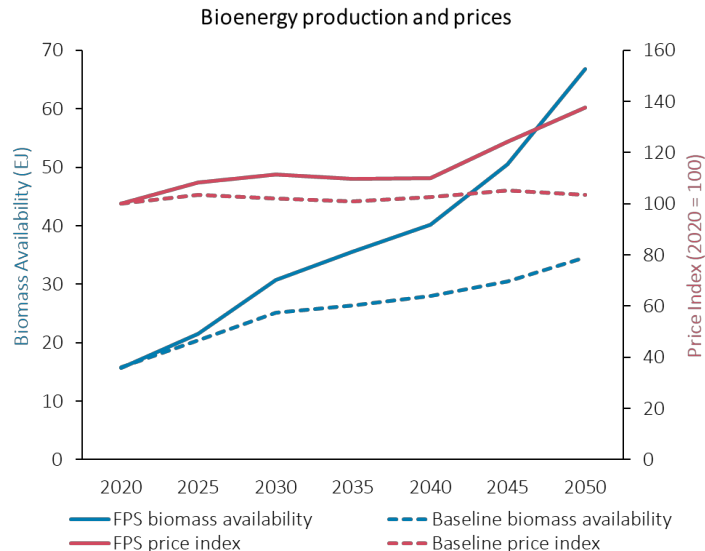
Re/afforestation to 2050 draws almost \$800 billion in offsets financing

Land competition induces substantial investment in yield-enhancing technologies



- Aggregate global productivity increases by 58% between 2020 and 2050
- Much of this is driven by baseline catch-up improvements in developing country agricultural systems (e.g. irrigation)
- Further productivity gains are achieved thanks to policy and price incentives
- Increasing public and private support for R&D and agricultural extension
- Global estimates for yield enhancing investments total more than \$20 trillion from 2015 to 2050

Bioenergy crops represent 65 EJ annually by 2050, with the bulk coming from 2nd generation crops



- Bioenergy crops supply nearly 65 EJ annually by 2050 – consistent with studies showing 100-125 EJ in 2100 of bioenergy as the sustainable limit
- But environmental sustainability and land competition constrain bioenergy production
- Consistent with literature estimates of 100-125 EJ in 2100 of bioenergy as the sustainable limit
- Bioenergy production increases across the globe, although relatively sooner in China, North America and Europe

Portfolio and Equity Market Findings

Key Findings Equity Markets: Disruption at the Sector and Company level

Overall, **risk to financial markets is significant, but appears manageable with the iShares MSCI ACWI ETF fall by a noncyclical 3.1% or \$1.6trn**

This includes downside demand and cost exposure of \$2.1trn (or a 4% fall in share values) offset by about \$0.5trn from green demand creation.

The most disruption is seen at sector and company level, with some big winners and losers

Some primary sectors will be pure losers or winners –mean company valuations in the energy sector fall by 33%

Within other sectors there is large variation across companies, for example, 80% of impacts in the Utilities sector lie between -62% to 41% of current valuation

Many companies likely to succeed in the green upside are not listed in the common indices

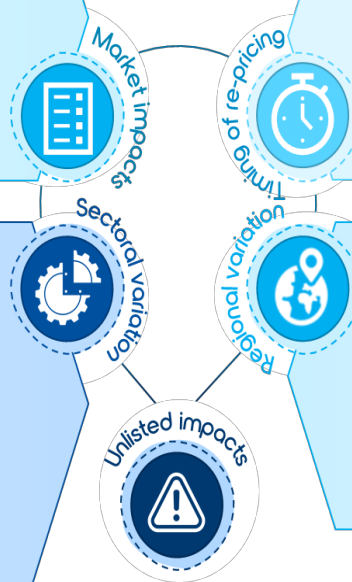
If repricing occurs in 2025, when the policy forecasts start to affect cash flows of companies, **the impact further rises to -4.5%**.

Increased volatility is also likely with a more event-driven price adjustment so the impact could be more significant

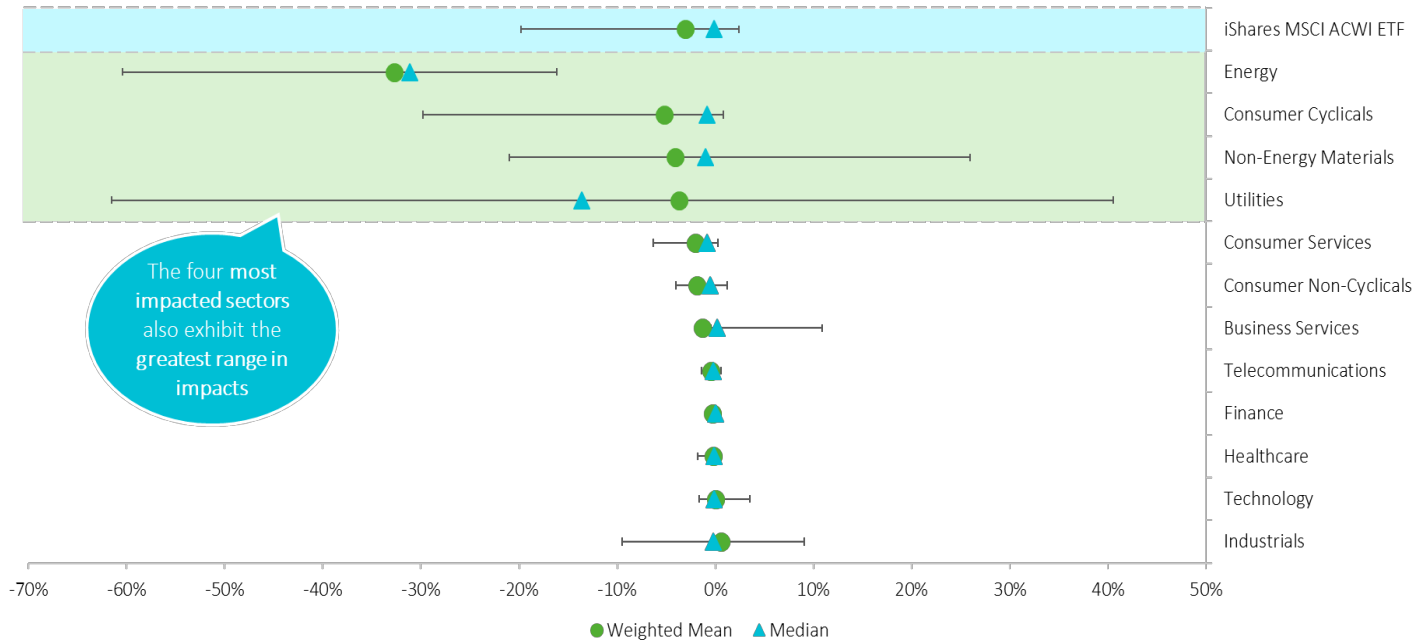
Non-OECD domiciled companies are more negatively affected on average – although in some regions (like China) this may reflect the lack of listed vehicles.

Nevertheless, at a country domicile level there is **significant dispersion of results** – for example, in the United States

Passive investors are therefore unlikely to be as exposed to the upside as the downside of the Inevitable Policy Response.



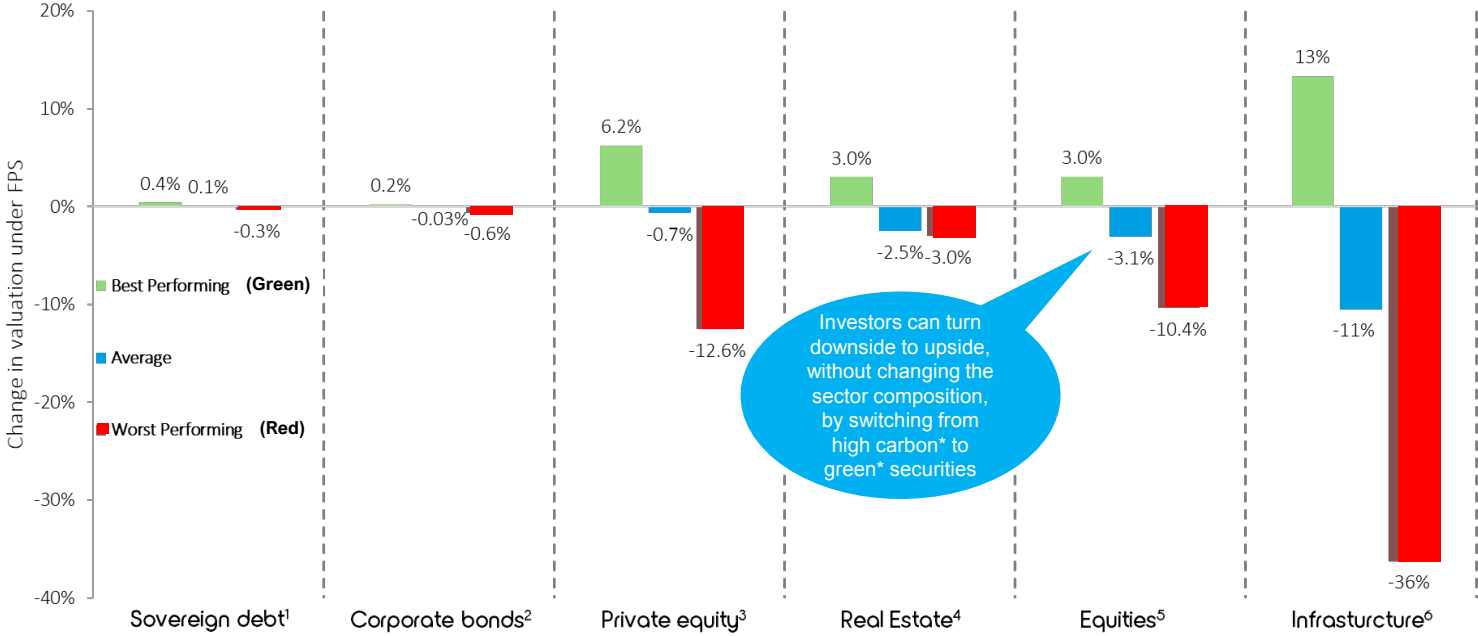
Sectoral: Within-sector variation can be significant, particularly for the four most impacted sectors in the index: Energy, Consumer Cyclicals, Non-Energy Materials and Utilities



Notes: Error bars indicate the 10th and 90th percentiles of impact within each sector. Sectors: RBICS level 1.

Source: Vivid Economics Net Zero Toolkit

Asset Allocation: the big opportunities are by tilting portfolios towards greener options within asset classes – especially in green infrastructure



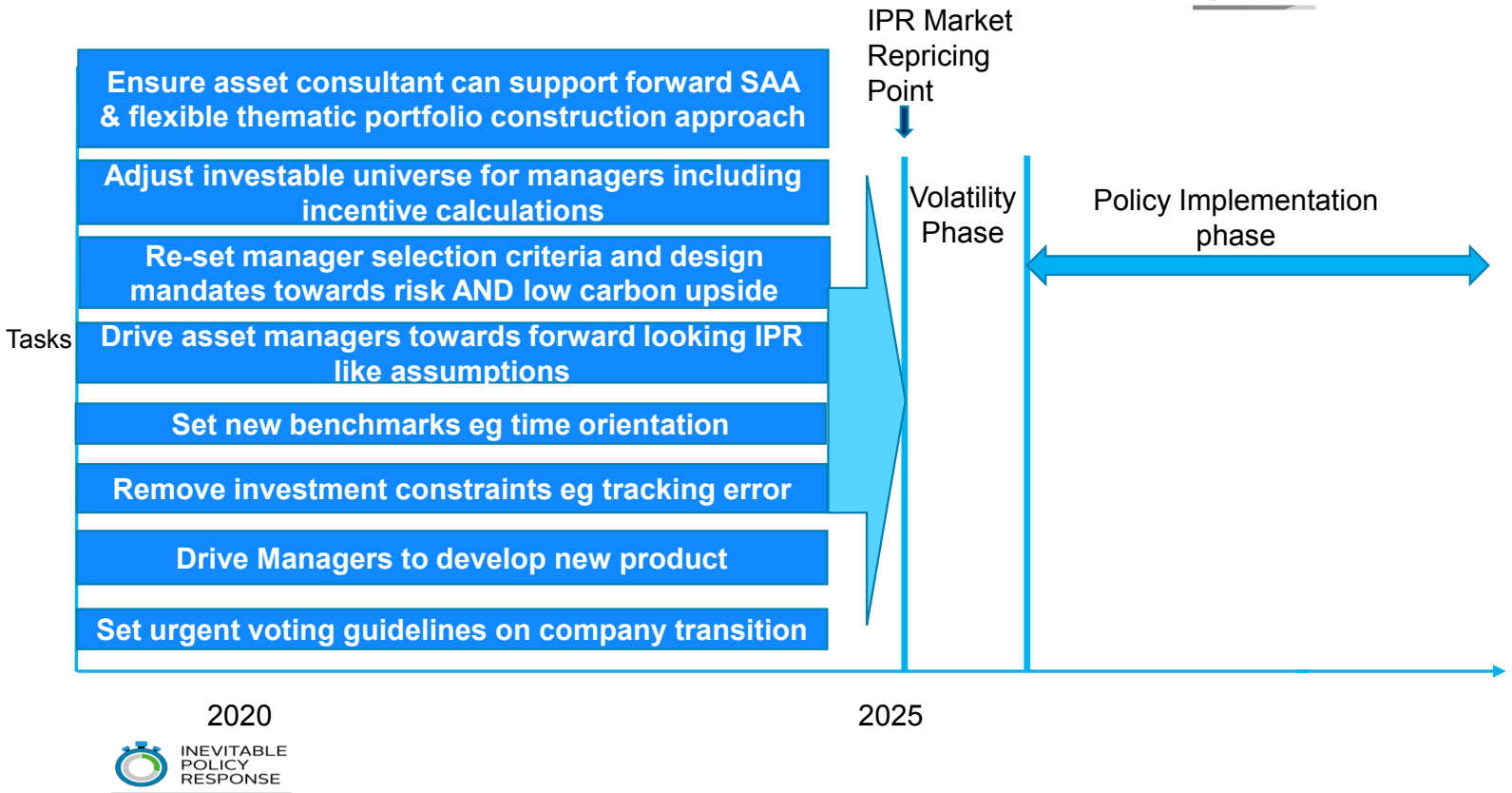
Investors can turn downside to upside, without changing the sector composition, by switching from high carbon* to green* securities

See separate presentation with quantitative results

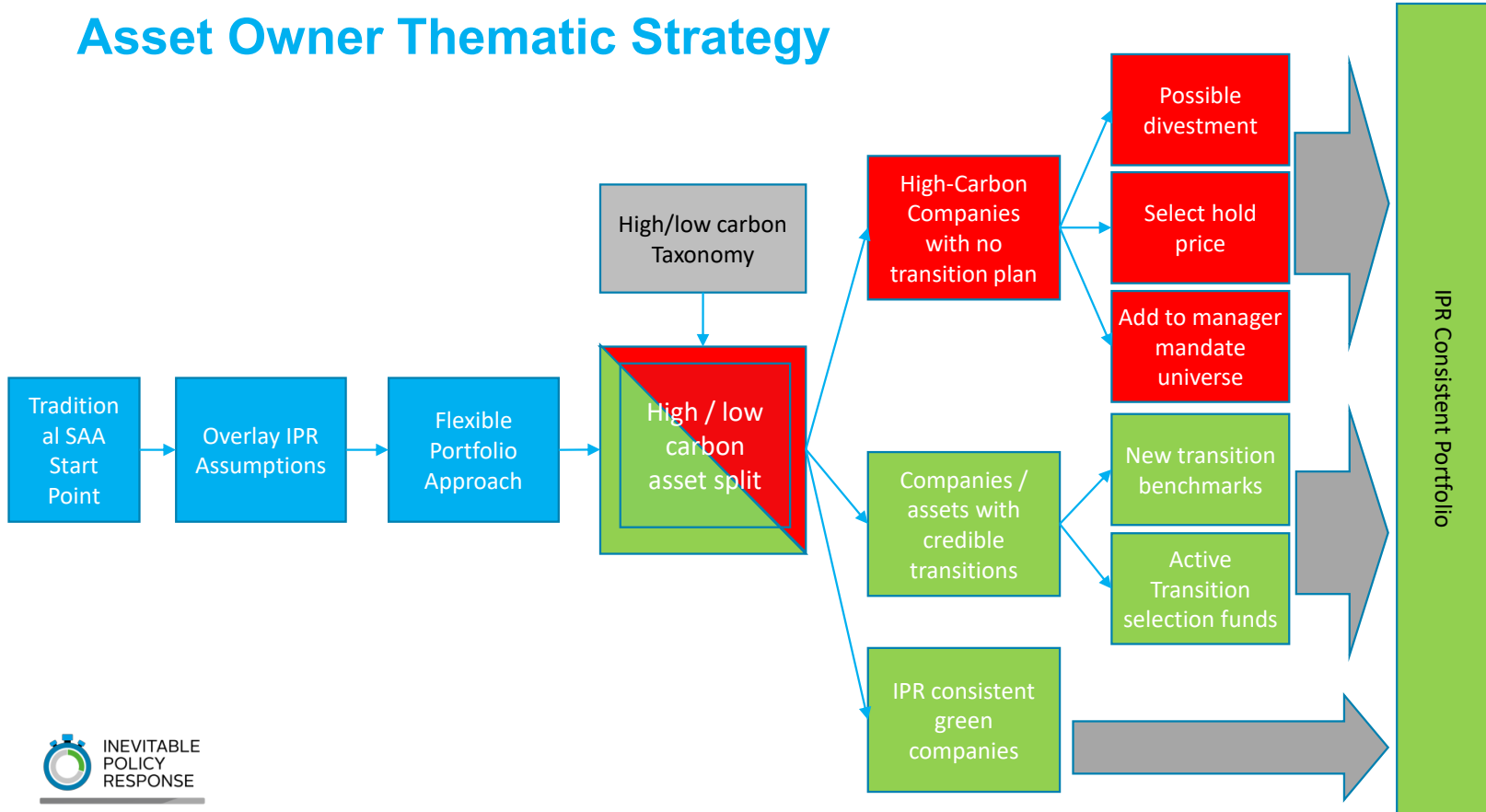
Actions for investors

- Draw on IPR in investor implementation of the TCFD recommendations on forward-looking risk assessment and climate scenario analysis alongside 1.5deg Paris aligned scenarios
- Asset owner actions:
 - Prepare for IPR-FPS as a likely central business case
 - Implement a more flexible and thematic portfolio construction approach that can maximize the opportunities and minimize the risks
 - Incorporate IPR into manager selection, appointment and monitoring
 - Engage service providers on IPR, including in appropriate indices and proxy voting recommendations
 - Continue to advocate and engage for earlier and more ambitious climate action to minimize the disruption from a disorderly transition and from physical impacts resulting from global mean temperatures exceeding 1.5°C
 - Integrate company transition analysis into engagement and portfolio construction
- Passive investors use IPR in stewardship and consider benchmarks informed by IPR
- All investors: draw on IPR to engage exposed sectors to transition

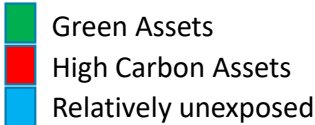
Asset Owner Service Provider Tasks



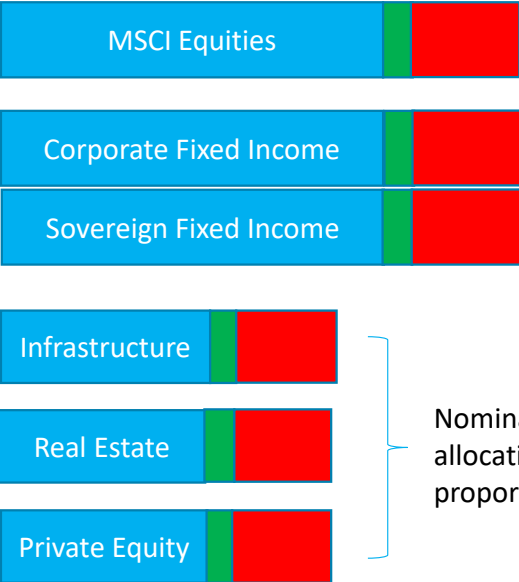
Asset Owner Thematic Strategy



KEY CONCLUSIONS: Asset Allocation and Capital Recycling - illustrative impact

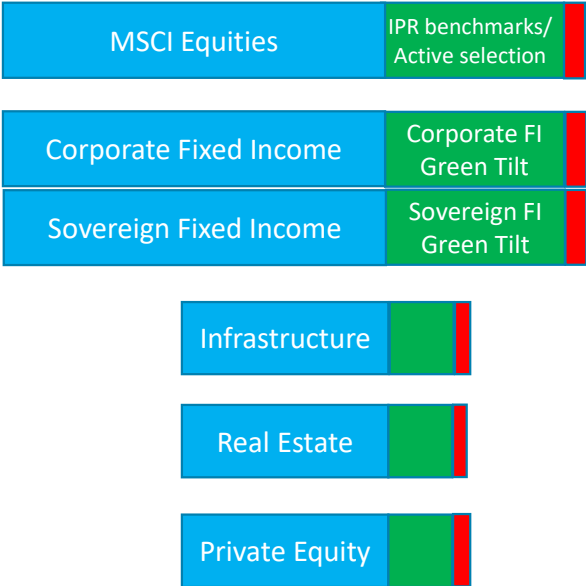


Before



After

{This includes companies in transition}



Nominal allocation proportions

\$\$allocation

Consortium partners



Acknowledgements

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Thank you

Appendix

Our model analyses the impact of climate-related policy and regulatory risks on the financial markets

ADVANTAGES OF OUR MODEL:

- **Transparency** – defining and justifying a realistic outline of future policy response
- **Implications at the company level** – estimating implications at the asset level for the first time
- **Completeness** – more accurately capturing the interaction between impacts of the macro economy, the energy system and the land use system

