The Inevitable Policy Response

Preparing financial markets for climate-related policy/regulatory risks
Consortium partners

Acknowledgements

This project has been commissioned by the PRI and has received support from:
Financial markets are underprepared for climate-related policy risks

In anticipation, PRI, Vivid Economics and ETA are building 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?

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.
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
Growing awareness and momentum on climate issues makes a near-term, forceful policy response more likely.

**Extreme weather events**

"Hurricane Dorian Was Worthy of a Category 6 Rating"

**Impacts on security**

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

- US Dept. of Defense

**Cheaper renewable energy**

FINANCIAL TIMES

Europe 'watershed' as green energy set to overpower coal

JUNE 3, 2019

**New climate research**

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

**Civil society action**

Influence Shifting

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

**Uninsurable World**

Munich RE

“Climate change could make insurance too expensive for most people”

Moody’s INVESTORS SERVICE

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

**Regulators warning 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.

**Leadership shifting capital early**
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.
- <2% of PRI signatories are “strategic” in their assessment and reporting of climate risk.
- 57% of respondents think climate change is both a risk and an opportunity.
- 36% think it is primarily a risk.
- 7% think it is primarily an opportunity.

Source: UN PRI September 2019

Source: BNY Mellon Investment Management and CREATE-Research
The Paris Agreement’s “ratchet mechanism” increases the likelihood that governments will strengthen policy by 2025

2020
- Countries communicate their updated or 2\textsuperscript{nd} round of climate pledges

2023
- Global stocktake on climate, mitigation and finance

2025
- Countries submit their 3\textsuperscript{rd} round of climate pledges (NDCs)

2028
- Second global stocktake

*Policy announcements are expected to accelerate in 2023-2025*
The most likely policy levers to secure an accelerated and ‘just’ transition are starting to emerge

<table>
<thead>
<tr>
<th>Coal phase-out</th>
<th>ICE sales bans</th>
<th>Carbon pricing</th>
<th>CCS and industry decarbonisation</th>
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<tr>
<td>The UK has committed to phase out unabated coal use by 2025, and support for a just transition is starting to emerge</td>
<td>All new cars to be emissions-free in the Netherlands by 2030, and other countries have announced intentions</td>
<td>57 carbon pricing initiatives around the world cover 20% of global emissions and discussion of BCAs</td>
<td>Only two large scale CCS power projects in operation at the end of 2018, and no proven policies ready for ensuring scale-up</td>
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<th>Zero-carbon power</th>
<th>Energy efficiency</th>
<th>Land use-based greenhouse gas removal</th>
<th>Agriculture</th>
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<td>Nuclear, hydro, solar PV, wind and other renewables represented 36% of electricity generation globally in 2018</td>
<td>A coalition of 8 European cities have pledged to completely decarbonise their existing building stocks by 2050</td>
<td>National and bilateral payment systems trialled and planned to support nature-based solutions, including re/afforestation and bioenergy production</td>
<td>Historic rates of agricultural improvement very high, and large investment in agricultural technologies and infrastructure remains a priority</td>
</tr>
</tbody>
</table>
Our forecast of an Inevitable Policy Response is based on a robust and strategic analytic process.
Our forecast of an Inevitable Policy Response provides an alternative to the IEA as a business planning case for investors, corporates & regulators to consider.

Global energy-related CO₂ emissions, GtCO₂

2023-2025 Paris Ratchet
Baseline (IEA STEPS & NDCs) c.2.7 – 3.5°C
Policy impacts flowing into economies and financial markets

IPR: Forecast Policy Scenario (FPS)

IEA SDS
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
Still aspire to the Paris Agreement..
Reaching a 1.5 degrees outcome is a far bigger challenge – but should remain the Aspiration

Global energy-related CO₂ emissions, GtCO₂

2023-2025 Paris Ratchet

Baseline (IEA STEPS & NDCs) c.2.7 – 3.5°C

Policy impacts flowing into economies and financial markets

Temperature overshoot

1.5°C pathway (low overshoot P1)

IEA SDS

IPR: Forecast Policy Scenario (FPS)
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.

But our forecast tells 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 for industry
  - Scale up of CCS enables bioenergy use with CCS (BECCS) and in industry, while we see negligible CCS deployment in fossil-fuel fired electricity generation.
  - 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
Coal demand is at its peak and will decline rapidly by 2025

Driven by relative costs and policy, demand for coal for electricity falls steeply from 2025

- 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

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 74% renewable generation in 2040, more than in the IEA SDS, IEA NPS, 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
- Nuclear doesn’t grow to replace fossil fuels or renewables given cost and societal issues
Oil demand peaks between 2026-28 driven by improving ICE efficiency and early uptake of electric vehicles

- Oil in transport decreases by around 70%, while total oil demand decreases around 40% 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
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
- Electrification, hydrogen, and CCS contribute in medium to long term with the carbon price 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.

Deforestation practically eliminated by 2030, as domestic climate policy targets 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 with large delay

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

Note: ‘Total Forest Land’ is defined here as dense, high-carbon stock forest land only
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)
- 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 supplies 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.

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**Bioenergy production and prices**

- **FPS biomass availability**
- **Baseline biomass availability**
- **FPS price index**
- **Baseline price index**
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
Key equity market findings
Key Equity Market Findings: 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. Passive investors are therefore unlikely to be as exposed to the upside as the downside of the Inevitable Policy Response. 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.
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
Actions for investors

- The analysis highlights the importance of forward-looking climate risk assessment and the limitations of portfolio carbon foot printing in capturing the nuance of impacts across and particularly within sectors.

- Draw on IPR in investor implementation of the TCFD recommendations on forward-looking risk assessment and climate scenario analysis alongside Paris aligned scenarios

- Asset owner actions:
  ◊ Prepare for FPS as a likely central business case
  ◊ At the same time, 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
  ◊ Review equity asset allocation and define mitigation strategies for both passive and active investments.
  ◊ Incorporate IPR into manager selection, appointment and monitoring
  ◊ Engage service providers on IPR, including in appropriate indices and proxy voting recommendations
  ◊ Consider climate as a factor potentially creating alpha.

- Passive investors: draw on IPR in stewardship and consider benchmarks informed by IPR

- All investors: draw on IPR to engage exposed sectors to transition

- Further implications for investor action are set out in the section below
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Thank you
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

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**Value stream models** (asset level)

- Predict revenues and profits
  - Cost & competition model
    - Carbon cost competitiveness
    - Market power and cost pass-through
    - Market share
  - Demand destruction model
    - Change in market size in high-emissions sectors (e.g., O&G)
    - Price impacts
    - Market share
  - Cleantech market model
    - Change in market size in clean sectors (e.g., electric vehicles, renewable energy)
    - Product competitiveness and market share

**Financial implications** (asset level)

- Asset class: Metric
- Listed equity: $\Delta$ market capitalization
- Private equity: asset value
- Corporate debt: $\Delta$ bond yields, credit ratings
- Sovereign debt
- Infrastructure: asset value
- Real estate: asset value
- Commodities: $\Delta$ price

○ **Disclosure** of metrics at asset or portfolio level
○ **Uniform metrics** across business

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Financial release December 2019 onwards