This report was prepared by Vivid Economics and Energy Transition Advisors, who bear sole responsibility for any views expressed, which do not necessarily reflect those of the sponsors or other consortium members. The authors are solely responsible for any errors.
Lessons from Covid-19

- As demonstrated by COVID19, large systemic environmental risks like Climate Change warrant serious investor attention.
- Stimulus packages in the next year may well effect these climate policies.
- Financial impacts under a more forceful IPR response to a major set of climate impacts could be as large and non-cyclical.
THE IPR ELEMENTS

Assumptions and tipping point drivers → IPR Timing Decision → Policy Lever Design → Macro Outputs → Asset Class Valuation Results

2025
The IPR Adoption Model

Do we agree with IPR Drivers and Assumptions?

Do we agree with a 2025 tipping point?

Do we agree with the policies governments will implement?

Macro Outputs

Asset Class Valuation Results

Adjust assumptions / build in-house model

Y Y Y
What is priced into markets today?

• The risk wasn’t priced in in 2015 and Fossil Fuel free index has outperformed MSCI ACWI.

• We use a baseline of IEA STEPS for what is priced into today’s markets – existing government commitments.

• Discounting and acknowledged market behaviours drive short term horizon on transition risk.

• Markets see transition risk as status quo but are already producing unpriced impacts eg: German utilities.
Investors acknowledge that there will be a policy response, and that it will be delayed and disruptive.

Which of the following scenarios is most likely?

- Disorderly policy response
- Climate breakdown / fail to transition
- Technology will save us / “Elon’s got this”
- Orderly transition starting now

Source: UN PRI September 2018
IPR Outline concept

Pre-trigger Phase
(Risk Build Up phase)

Build up of probability

US Election
China 5 yr plan
Global Emissions Stocktake

IPR Market Repricing Point
IPR Policy Announcement Point

Volatility Phase
Policy Implementation phase

2020 Jan 2025 Dec 2030

- US Election
- China 5 yr plan
- Global Emissions Stocktake

Global Emissions Stocktake

Build up of probability

2020 2025 2030
IPR Framework – Tipping Points and Assumptions
Momentum Based Drivers

<table>
<thead>
<tr>
<th>Policy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Border Tax Adjustments</td>
</tr>
<tr>
<td>GHG reduction policy</td>
</tr>
<tr>
<td>Net Zero Targets</td>
</tr>
</tbody>
</table>

| Ongoing New climate research |
| Global warming report, an ‘ear-splitting wake-up call’ warns UN chief |

| 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 |
| - 03/06/2019 |

| Uninsurable World |
| Munich RE |
| “Climate change could make insurance too expensive for most people” |

| Pressure from leading investors and business |
| Moody's |
| “Climate change risks outweigh opportunities for P&C (re)insurers” |

| 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. |

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

Nb: Polls now say a close run race
Any single factor could drive the market repricing point but together they form a powerful case for 2025.

Cumulative Probability of an IPR tipping point by 2025

- Unknown Unknowns
- Major geo-political events (e.g. US Election)
- EU Policy Leadership
- Technology Drivers
- Financial regulators becoming increasingly active
- Investor leadership to capital recycling
- CA100+ Driving Diversification
- Social Unrest / political drivers
- Extreme weather shifts public opinion quickly
- Pro-active INDC policy momentum
- Sectors with few options lobby for available carbon budget for themselves (e.g. aviation)
- Insurance industry withdraws from markets

Any pathway driver alone can drive the IPR tipping point.
Example of how the acceleration and tipping point drivers interact

- **CA100+ Driving Diversification**
- **Technology Drivers**
  - Increased Renewables Competitiveness
  - Increased risk-return
- **Investor leadership to capital recycling**
- **Larger clean companies**
- **More green jobs**
  - Reduced fear of job sacrifices
- **Increased low-carbon green lobbying influence**
- **Decreased high-carbon lobbying influence**

**Greater EU policy ambition**
- Financial regulators becoming increasingly active
- Reduction in US policy barriers
- More confidence in green policy ambition
Interaction of drivers towards tipping point

Most likely tipping point

Green Pressure
- Investor leadership
- CA100+ pressure
- Increased green company lobbying
- Insurance company pressure
- Renewables competitiveness
- Regulator pressure

High-Carbon Pressure
- Vested Status Quo Interest
- Fossil Fuel Lobbying
- Fear of job sacrifices
- Fear of reduced growth
- Fear of big government

Renewables competitiveness
Increased green company lobbying
Insurance company pressure
Regulator pressure
Investor leadership

Fear of job sacrifices
Fear of reduced growth
Fear of big government
Vested Status Quo Interest
Fossil Fuel Lobbying

2020 2025 2030 2035
For Sophisticated Investors, the range of IPR Probability is important.

- Probability of tipping point
- US Election 50-50
- Most likely tipping point

When should we exit exposed sectors?
Once the tipping point is reached – What Policy Levers?
Once governments are forced to act, these are the likely key policies

**Coal phase-outs**
- Early coal phase-out for first mover countries by 2030
- Steady retirement of coal-fired power generation after 2030 in lagging countries

**ICE sales ban**
- Early sales ban for first mover countries by 2035
- Other countries follow suit as automotive industry reaches tipping point

**Carbon pricing**
- US$40-80/tCO₂ prices by 2030 for first movers
- Global convergence accelerated by BCAs to ≥$100/tCO₂ by 2050

**CCS and industry decarbonisation**
- Limited CCS support in power
- Policy incentives primarily for industrial and bioenergy CCS
- Public support for demonstration, and then deployment of hydrogen clusters

**Zero carbon power**
- Significant ramp-up of renewable energy globally
- Policy support for nuclear capacity increase in a small set of countries, nuclear managed out elsewhere

**Energy efficiency**
- Increase in coverage and stringency of performance standards
- Utility obligation programs, financial and behavioral incentives

**Land use-based GHG removal**
- Strong policy support for re/afforestation
- Stronger enforcement of zero deforestation
- Controlled expansion of bioenergy crops

**Agriculture**
- Technical support to increase agricultural productivity
- Increasing public investment in irrigation and AgTech
- Incremental behavioural incentives away from beef
## Carbon pricing – How the world will act

<table>
<thead>
<tr>
<th>Country / region</th>
<th>Forecast Policy Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tier 1</td>
<td>Early, high CO2 pricing</td>
</tr>
<tr>
<td>Western Europe</td>
<td>US$60 by 2030</td>
</tr>
<tr>
<td>Eastern Europe</td>
<td>US$100 by 2040</td>
</tr>
<tr>
<td>Canada</td>
<td>Incentives to accelerate convergence: border carbon adjustments (BCAs), technology transfers, trade tariffs and financial support from the Green Climate Fund</td>
</tr>
<tr>
<td>China</td>
<td></td>
</tr>
<tr>
<td>United States</td>
<td></td>
</tr>
<tr>
<td>Tier 2</td>
<td>Early, medium CO2 pricing</td>
</tr>
<tr>
<td>Australia</td>
<td>US$40 by 2030</td>
</tr>
<tr>
<td>India</td>
<td>Tier 2 to converge to Tier 1 by 2040</td>
</tr>
<tr>
<td>Japan</td>
<td></td>
</tr>
<tr>
<td>South Korea</td>
<td></td>
</tr>
<tr>
<td>Mexico</td>
<td></td>
</tr>
<tr>
<td>Tier 3</td>
<td>Early, low CO2 pricing</td>
</tr>
<tr>
<td>Central and South America</td>
<td>US$25 by 2035</td>
</tr>
<tr>
<td>Other developing Asia</td>
<td>Tier 3 to converge to Tier 1 by 2050</td>
</tr>
<tr>
<td>Former Soviet Union</td>
<td></td>
</tr>
<tr>
<td>Middle East</td>
<td></td>
</tr>
<tr>
<td>Africa</td>
<td></td>
</tr>
</tbody>
</table>

### Countries with carbon pricing mechanisms already in place, who have started their energy transition and have high levels of climate ambition:

- Tier 1 countries
- Western Europe
- Eastern Europe
- Canada
- China
- United States

### Countries with emerging carbon pricing initiatives, for which international power plays are expected to play a key role, or which are likely to receive support from the EU:

- Tier 2 countries
- Australia
- India
- Japan
- South Korea
- Mexico

### Countries which will give priority to socioeconomic development and might start with limited ambition:

- Tier 3 countries
- Central and South America
- Other developing Asia
- Former Soviet Union
- Middle East
- Africa
What macro outcomes result?
Major macro outcomes

Deep and rapid changes in the energy system
- Oil to peak in 2026-28
- Thermal coal virtually non-existent by 2040
- Solar and wind 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
Reaching a 1.5 degrees outcome is a far bigger challenge – but should remain the Aspiration.
Achieving the 1.5°C target will require accelerated and substantial effort across multiple emerging solutions to go further than IPR-FPS.

<table>
<thead>
<tr>
<th>Today</th>
<th>2030 –2050</th>
<th>Post 2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faster investor and policy action <strong>today</strong></td>
<td><strong>NEGATIVE EMISSIONS TECHNOLOGIES</strong></td>
<td></td>
</tr>
<tr>
<td><strong>ACT NOW</strong> to move more smoothly and cost-effectively to 1.5°C</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Circular economy</td>
<td>The agricultural revolution</td>
<td></td>
</tr>
<tr>
<td>Bioeconomy</td>
<td>Hydrogen economy</td>
<td></td>
</tr>
<tr>
<td>Consumer preferences, such as dietary shifts</td>
<td>AI revolution / future tech</td>
<td></td>
</tr>
<tr>
<td>Last resort measures</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Asset Valuation Results
THE IPR ELEMENTS AND UNDERPINNING ASSUMPTIONS

Uncertain but high impact drivers
- Trump
- China 5 year plan
- Civil society pressure
- Extreme weather influence

High probability Momentum Based Drivers
- Technology Costs
- Investor engagement pressure
- Regulator action
- Continued pressure from young voters

IPR Underpinnings and limits of action
- No forced recessions (pre Covid 19)
- Just transition
- Technological readiness
- Behavioural and societal momentum
- Institutional Readiness

Policy Lever Design
- Carbon Pricing
- Performance standards
- Direct sector incentives
- Limited CCS support
- Forestry asset support
- iCE bans

Macro Outputs (pre covid19)
- Oil demand peaking 2027
- Coal obsolete by 2030 in most advanced economies
- Flat GDP
- End of deforestation by 2030
- Limited CCS deployment
- Some hydrogen in industry
- Shift from meat in 2030s

Valuation Methodology
- Cost shock
- Demand creation
- Demand destruction
- Market competition

Asset Class Results

INEVITABLE POLICY RESPONSE

#PRIForum
IPR Asset Valuation Methodology – additional downside unmodelled risks

Risk until transition tipping point

- Agricultural system impacts
- Upstream supply chain feedback loops
- Physical Impacts
- Financial Sector risk (direct plus contagion)
- Bottom Up company level analysis based on policy implications and resulting competitiveness for real economy sectors.

Not in Scope

IPR current scope
The value streams capture the dynamics of the transition, which affects production costs directly through carbon pricing and indirectly through demand changes.

The demand destruction value stream captures the impact of the contraction in demand for high emissions products due to climate policy (such as ICEs and fossil fuels). These impacts will depend on a company’s sensitivity to falling commodity prices and margins, which will be tied to production horizons and cost structures.

The demand creation value stream captures the effects of increasing demand for low emissions products or inputs (such as EVs, copper and renewable energy equipment). These impacts will depend on a company’s current and future share of green markets, and the extent of overall market growth.

Cost and competition captures the carbon costs companies face directly from Scope 1 emissions, and indirectly through power prices. Impacts will depend on a company’s emissions intensity, abatement opportunities and capacity to pass through costs to consumers, relative to competitors.*

Notes: * The cost pass through and competition elements also apply to costs from demand destruction and demand creation models. Source: Vivid Economics
Equity impacts 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.

The four most impacted sectors also exhibit the greatest range in impacts.

Notes: Error bars indicate the 10th and 90th percentiles of impact within each sector. Sectors: RBICS level 1. Source: Vivid Economics Net Zero Toolkit.

NB based on business models as at today.
Quantitative Results: the big opportunities are by tilting portfolios towards greener options within asset classes – especially in green infrastructure.

See separate presentation with quantitative results.
What should investors do?
Investor Actions

- IPR Market Repricing Point
- Volatility Phase
- Policy Implementation phase

Reduce Exposures
Asset Owner IPR Mitigation Tasks

Tasks:
- Intensify policy engagement
- Re-design external mandates
- Re-allocate thematically
- Set new benchmarks
- Engage with service providers
- Limit use of tracking error
- Managers develop new product
- New screens

IPR Market Repricing Point
Volatility Phase
IPR Policy Agreement Point
Policy Implementation phase

2020  2025  2030
Engagement or Portfolio construction strategy?

• The two pillars of climate mitigation strategy will become intertwined in some asset classes especially public markets.

• An engagement philosophy is to engage companies to make their strategies reflect the energy transition. This does not require active portfolio reconstruction as the risk is transferred to the company to manage if it can be effective before the tipping point.

• For some asset owners, capital recycling into low carbon assets themselves might seem more attractive than betting on high carbon companies acting fast enough, particularly with only a short time to 2025 to see real transition and with few having shown urgency.

• Rewarding and incentivizing companies to create credible transition strategies. Using forward looking company plans to assess valuation will become key.

The focus of this paper is on portfolio action.
KEY CONCLUSIONS: Asset Allocation and Capital Recycling - illustrative impact

Before

- MSCI Equities
- Corporate Fixed Income
- Sovereign Fixed Income
- Infrastructure
- Real Estate
- Private Equity

Nominal allocation proportions

Re-allocate and Recycle

MSCI Equities
Corporate Fixed Income
Sovereign Fixed Income
Infrastructure
Real Estate
Private Equity

$ allocation

After

{This includes companies in transition}

- MSCI Equities
  - IPR benchmarks/Active selection
- Corporate Fixed Income
  - Corporate FI Green Tilt
- Sovereign Fixed Income
  - Sovereign FI Green Tilt
- Infrastructure
- Real Estate
- Private Equity

Green Assets
High Carbon Assets
Relatively unexposed
## Traditional SAA v Total Portfolio Approach / Flexible Constructions

<table>
<thead>
<tr>
<th>Traditional SAA</th>
<th>Total Portfolio Approach/Flexible Constructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well established but increasingly seen as inadequate for modern markets and themes</td>
<td>Requires more judgement, more detailed risk analysis, more thematic, e.g. carbon transition</td>
</tr>
<tr>
<td>Historical data used mostly, can look forward</td>
<td>Forward projections used</td>
</tr>
<tr>
<td>“Safe” space for investment consultants</td>
<td>Mercer / Towers advocates new approaches</td>
</tr>
<tr>
<td>Low career and reputational risk for CIOs</td>
<td>High reputation and career risk but higher reward if correct</td>
</tr>
<tr>
<td>May miss the carbon transition completely</td>
<td>Can be based around themes like IPR</td>
</tr>
<tr>
<td>Long cycles for re-iteration</td>
<td>Far more dynamic and real time</td>
</tr>
<tr>
<td>Requires little change</td>
<td>Requires significant change – new capacity, new governance decisions</td>
</tr>
<tr>
<td>Portfolio plays “catch up” on new opportunities</td>
<td>Portfolio anticipates and maximises new opportunities e.g. natural assets, transition bonds etc</td>
</tr>
<tr>
<td>Risk = volatility</td>
<td>Risk defined more broadly and managed in far more holistic manner</td>
</tr>
</tbody>
</table>
# Maximising Thematic Climate risk approaches across asset classes

<table>
<thead>
<tr>
<th>Asset Class</th>
<th>Consideration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equities</td>
<td>New benchmarks around IPR. Consider increase in active allocation. Engage with asset managers and companies.</td>
</tr>
<tr>
<td>Fixed Income</td>
<td>Active position on corporate debt, New green bond indices. Transition bonds. Identify worst sovereign risks. Engage heavily with ratings agencies</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>Allocate to value add buckets</td>
</tr>
<tr>
<td>Private Equity</td>
<td>Creative deals, delist companies for transition, bring companies to market</td>
</tr>
<tr>
<td>Real Estate</td>
<td>Driver clean REITs, tilt unlisted towards green.</td>
</tr>
<tr>
<td>Real Assets</td>
<td>Forestry, nature based assets a huge opportunity</td>
</tr>
</tbody>
</table>

Note: Seeking thematic exposure to agriculture changes essential across all asset classes
# Capital Recycling – how far should investors go?

<table>
<thead>
<tr>
<th>Equity</th>
<th>Very Active – High Capacity Required</th>
<th>Partially Active</th>
</tr>
</thead>
</table>
| Equities | • Ignore tracking error  
• Reduce equity allocation considerably  
• Screen out energy stocks entirely  
• Screen out negative return stocks  
• Reallocate significant passive equities to active mandates with a transition theme.  
• Re-allocate high carbon equities to low-carbon assets in alternatives.  
• Lower targets for sector and regional diversity | • Maintain some tracking error against broad index  
• Reweighting of exposed companies  
• Smaller reduction in equities  
• Screen out 75th or 90th percentile worse expected performers in all sectors  
• Reallocate partially to alternative asset classes  
• Retain some sector diversity  
• Retain some regional diversity |
| Fixed Income | Same as equities for corporate debt. Screen out high carbon countries from sovereign debt | Some screening |
| Infrastructure | Major reallocation to value add buckets. Lower infrastructure index exposure. Engage with asset managers on clean indices | Re-allocate within existing SAA ranges |
| Real Estate | Make whole real estate allocation low carbon and increase allocation. Tilt REITs away from exposures. | Set guidance for real estate acquisition |
| Private Equity | Structure PE mandates around IPR. Seek large creative deals to take advantage of possible restructuring of some large companies. | Engage with General Partners |
Asset Owners recycling capital across the Investment Chain

Asset Owner IPR adoption

New Thematic Portfolio Construction Design

Restructure mandates for external asset managers

Internal investment teams restructure portfolio

Managers build new product

Recycle Capital

Engage exposed companies to use IPR as base case

Engage with service providers

Index Providers

Engagement Providers

Proxy advisers

Investment Consultants

Ratings Agencies

New Thematic Portfolio Construction Design

Board

Exec Team or outsourced fiduciary

Operating Fiduciary
IPR Early Adoption – what does it mean?

1. Feedback on IPR assumptions
2. Public acknowledgement and support for the IPR framework and concepts
3. Full or partial Implementation of IPR through engagement and / or portfolio constructions
4. Further feedback on implementation barriers
Company outputs from the Forecast Policy Scenario modelling
Outcomes for companies are driven by the IPR Forecast Policy levers*, particularly the coal and ICE phase-out, carbon pricing and zero-carbon power

<table>
<thead>
<tr>
<th>Company (anonymised)</th>
<th>Description</th>
<th>Coal phase-out</th>
<th>ICE sales bans</th>
<th>Carbon pricing</th>
<th>CCS and industry decarbonisation</th>
<th>Zero-carbon power</th>
<th>Energy efficiency</th>
<th>Land use-based greenhouse gas removal</th>
<th>Agriculture</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Utility (primarily renewable generation)</td>
<td>✔️ (✔️)</td>
<td>✔️ (✔️)</td>
<td>✔️ (✔️)</td>
<td>✔️ (✔️)</td>
<td>✔️ (✔️)</td>
<td>✔️ (✔️)</td>
<td>✔️ (✔️)</td>
<td>✔️ (✔️)</td>
</tr>
<tr>
<td>B</td>
<td>Utility (primarily coal generation)</td>
<td>✔️ (✔️)</td>
<td>✔️ (✔️)</td>
<td>✔️ (✔️)</td>
<td>✔️ (✔️)</td>
<td>✔️ (✔️)</td>
<td>✔️ (✔️)</td>
<td>✔️ (✔️)</td>
<td>✔️ (✔️)</td>
</tr>
<tr>
<td>C</td>
<td>Integrated Oil &amp; Gas</td>
<td>✔️ (✔️)</td>
<td>✔️ (✔️)</td>
<td>✔️ (✔️)</td>
<td>✔️ (✔️)</td>
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<td>✔️ (✔️)</td>
</tr>
</tbody>
</table>

Note: Further information on the IPR Forecast Policy Levers can be found on the PRI website.
Source: Vivid Economics analysis
The value streams capture the dynamics of the transition, which affects production costs directly through carbon pricing and indirectly through demand changes.

The demand destruction value stream captures the impact of the contraction in demand for high emissions products due to climate policy (such as ICEs and fossil fuels).

These impacts will depend on a company’s sensitivity to falling commodity prices and margins, which will be tied to production horizons and cost structures.

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Cost and competition captures the carbon costs companies face directly from Scope 1 emissions, and indirectly through power prices.

Impacts will depend on a company’s emissions intensity, abatement opportunities and capacity to pass through costs to consumers, relative to competitors.*

Notes: * The cost pass through and competition elements also apply to costs from demand destruction and demand creation models. Source: Vivid Economics
Utilities with more renewable generation gain at the expense of emissions intensive fossil fuel generators, and oil & gas suffer predominantly from falling demand

<table>
<thead>
<tr>
<th>Company (anonymised)</th>
<th>Description</th>
<th>Company emissions intensity / market intensity*</th>
<th>Current valuation</th>
<th>Value streams</th>
<th>Total FPS impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Utility (primarily renewable generation)</td>
<td>0.31</td>
<td>100%</td>
<td>-0.1%</td>
<td>0.4%</td>
</tr>
<tr>
<td>B</td>
<td>Utility (primarily coal generation)</td>
<td>3.71</td>
<td>100%</td>
<td>0.0%</td>
<td>2.7%</td>
</tr>
<tr>
<td>C</td>
<td>Integrated Oil &amp; Gas</td>
<td>0.39</td>
<td>100%</td>
<td>-27.2%</td>
<td>3.2%</td>
</tr>
</tbody>
</table>

Note: * This is the emissions intensity (Scope 1 + Scope 2) of the company divided by the average emissions intensity of the market.
Source: Vivid Economics analysis
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