



An investor initiative in partnership with UNEP Finance Initiative and UN Global Compact

The Inevitable Policy Response 2021

Balancing Forecasting and Aligning – For Asset Managers

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PRI commissioned the Inevitable Policy Response in 2018 to advance the industry's knowledge of climate transition risk, and to support investors' efforts to incorporate climate risk into their portfolio assessments.



A research partnership led by Energy Transition Advisers and Vivid Economics conducts the initiative's policy research and scenario modelling and includes 2Dii, Carbon Tracker Initiative, Climate Bonds Initiative, Planet Tracker and Quinbrook Infrastructure Partners.

The consortium was given the mandate to bring leading analytic tools and an independent perspective to assess the drivers of likely policy action, and the implications on the market.



Who supports the Inevitable Policy Response ?

Strategic partners consisting of leading financial institutions have joined the IPR in 2021 to provide more in-depth industry input, to further strengthen its relevance to the financial industry.

BLACKROCK

FitchRatings

nuveen
A TIAA Company

 **BNP PARIBAS**

Goldman Sachs
Asset Management

Core philanthropic support since IPR began in 2018. 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.

GORDON AND BETTY
MOORE
FOUNDATION

THE **FINANCE** HUB

 **climateworks**
FOUNDATION

How the IPR supports Asset Managers

- Provide clarity around “climate scenario” choices
- Shed insight into 1.5 degree alignment vs. maximising returns
- Detail the economic and sector-level implications
- Offer insight into product and portfolio challenges
- Provide guidance towards engagement and stewardship issues

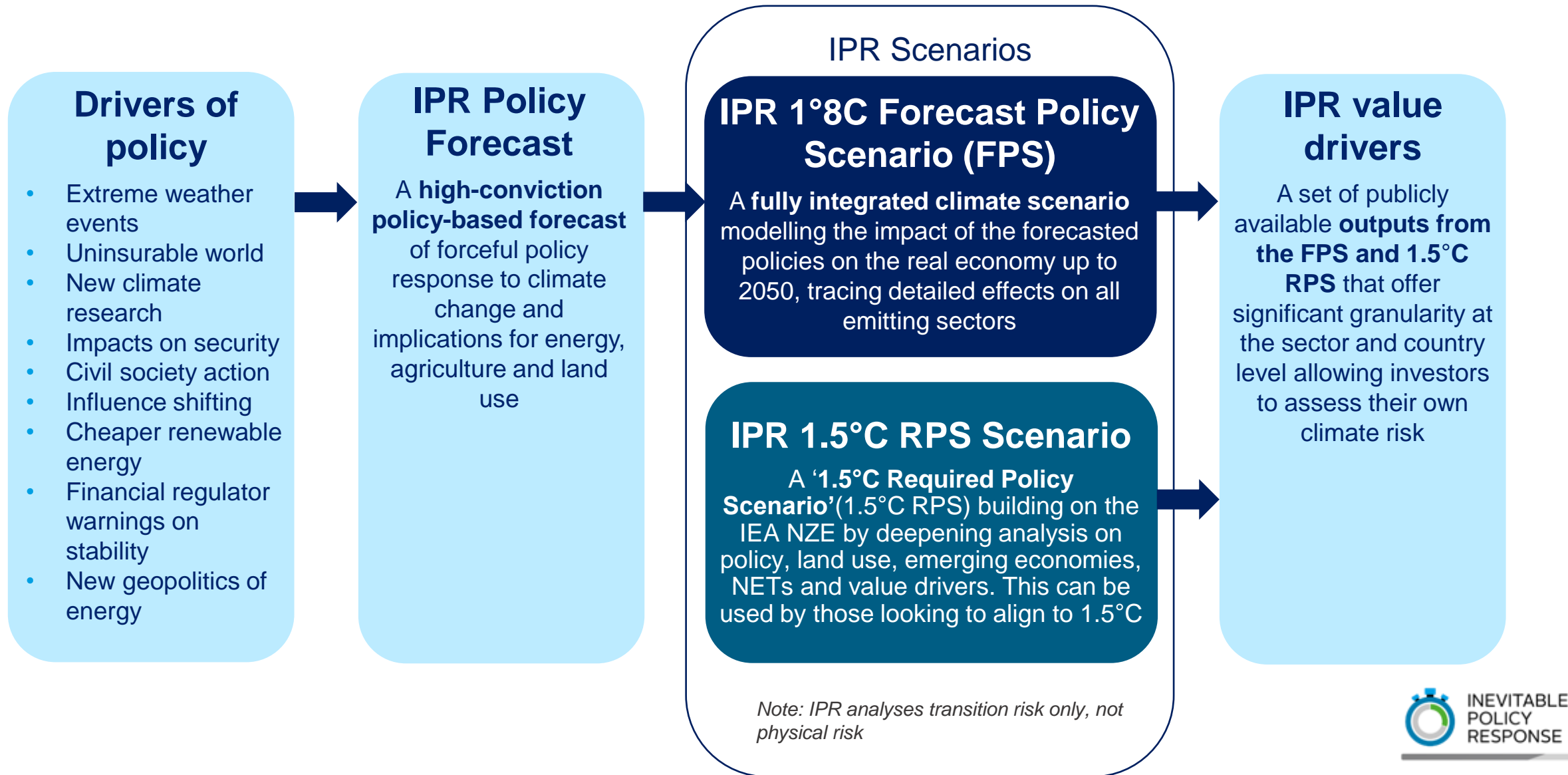
All IPR resources are publicly available on the PRI website at:

<https://www.unpri.org/sustainability-issues/climate-change/inevitable-policy-response>

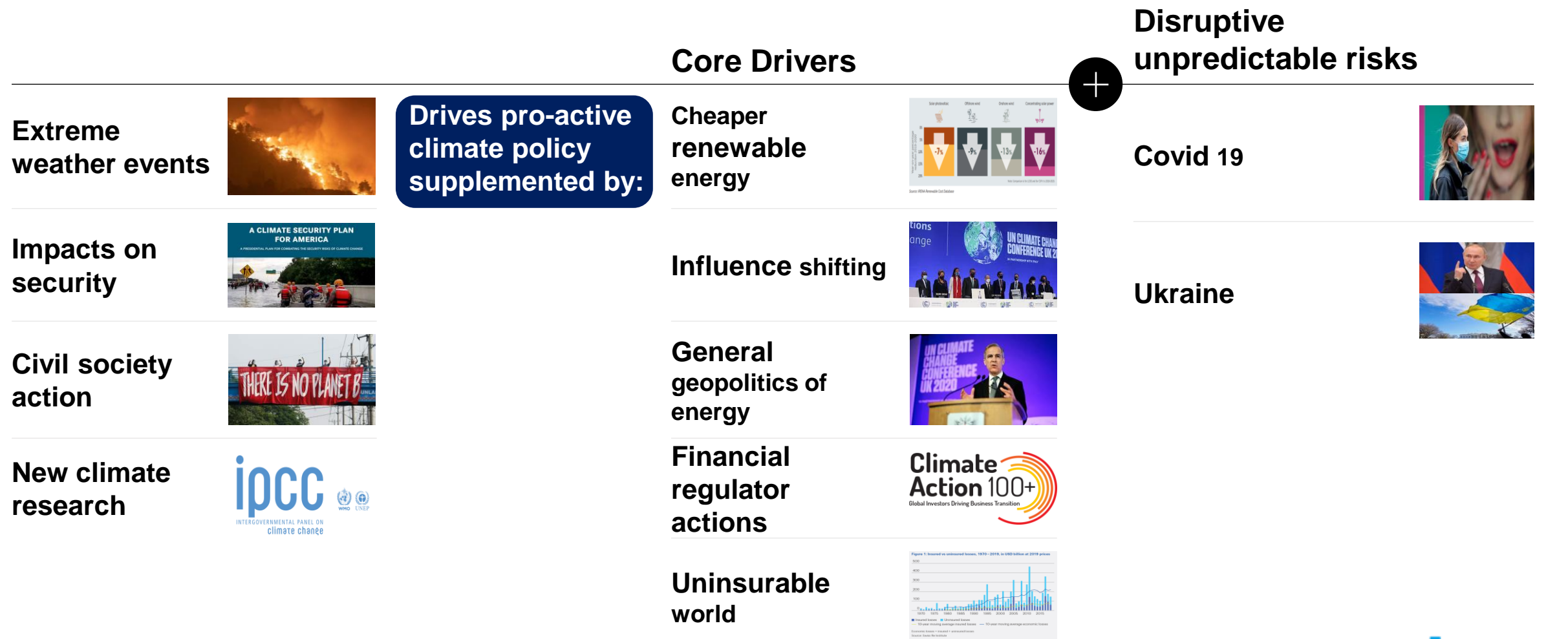
The pressure on institutional investors is at an all time high



The structure of the IPR framework



IPR Policy Forecast Drivers Process



Russia Ukraine War- Implications for IPR Forecasts

For IPR Forecasts we see four overarching themes at this stage:

- 1) Reinforcement of medium (3-5 Years?) and long-term term IPR renewable energy and Green Hydrogen policies and sector forecasts
- 2) Short term (1-2 years) energy supply crisis for EU with many uncertainties and sourcing of Fossil Fuel supplies outside of Russia
- 3) For the IPR 1.8°C Forecast Policy Scenario this means that the fossil fuel sector supply dynamics will need reassessing eg split between piped natural gas and LNG, geography of origin etc
- 4) But we do not see any divergence from trend in demand side sectors, if anything an eventual acceleration towards more green outcomes

Note that one potential outcome is an “all of the above” where fossil fuels remain longer in the system as security back up (low-capacity utilisation) and the cost is borne in effect as an energy security cost.

Investor Implications for the new geo-politics

- Strong reinforcement of IPR medium term renewables forecasts with good upside – implications for renewable infrastructure and transitioning companies
- Russian exposed debt, sovereign and corporate, requires urgent analysis whilst ratings agencies calculate impact
- Net Zero aligners will miss out on fossil fuel short term boom
- Net Zero alignment even lower probability
- No divergence from trend in demand side sectors, if anything, an acceleration towards more green outcomes.
- Non aligners need to beware Capex expansion will be justified in the short term but will increase stranded asset risk
- Engagement - will O&G companies use windfall for transition?

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** policy forecast
- 9-10 indicates **increasing evidence for acceleration** in policy forecast

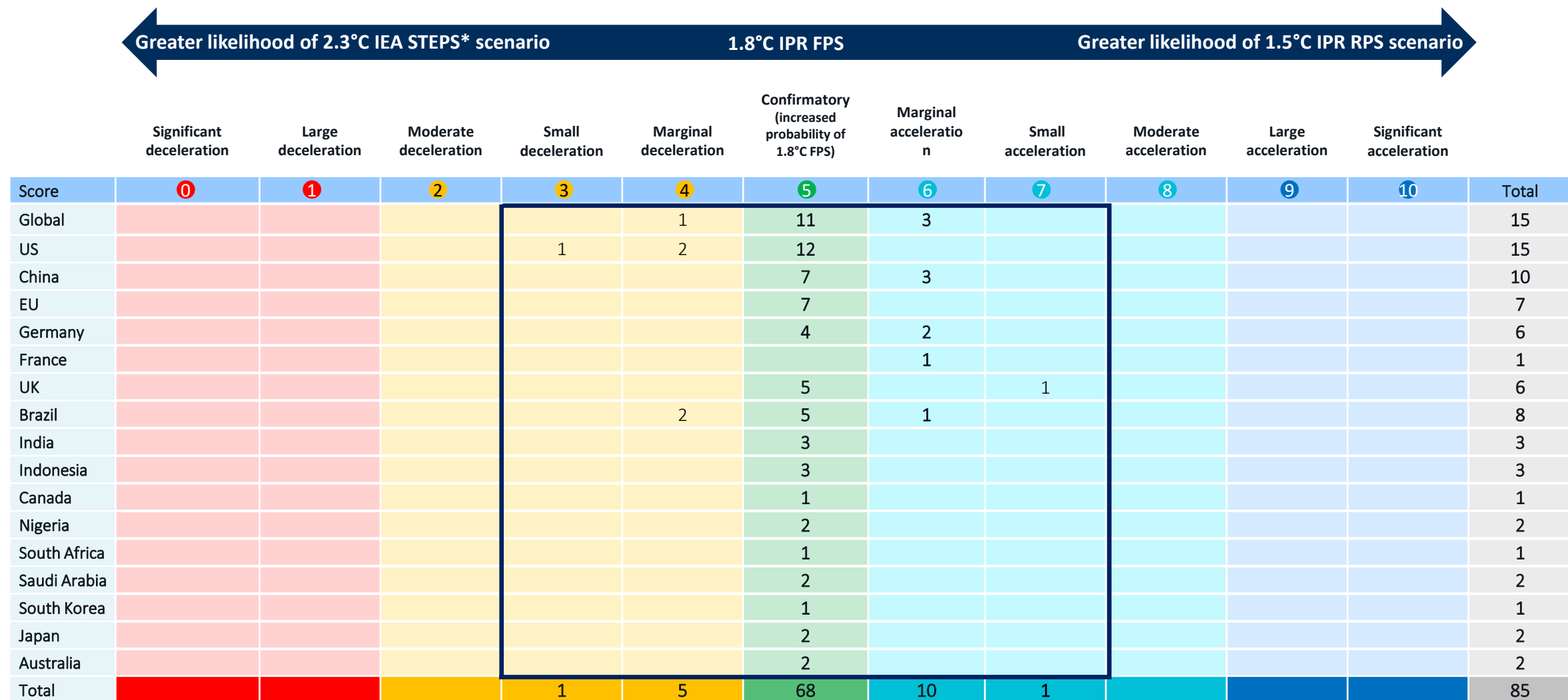
A similar 10-point scale is applied to energy/land technology developments

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	Confirmatory (reinforces and increases probability of 1.8°C FPS)	Does not change 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



* 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

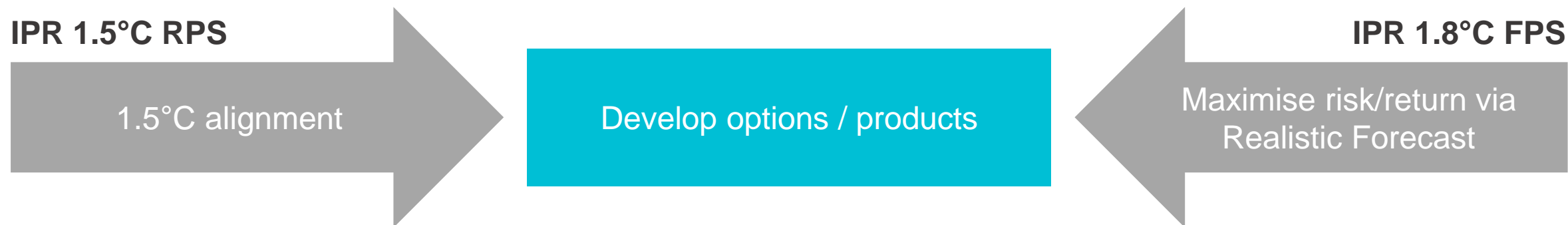
Between COP 26 and June 2022, majority of energy/land policy & technology developments mostly show confirmation of IPR Forecasts



i. This assessment covers the period from COP 26 to mid-June 2022

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

Climate transition presents challenges and investment opportunities for Asset Managers



Likely outcomes:

- Reduce emissions at the portfolio level
- Questionable impact in real world without re-allocation of capital to low carbon assets
- Return loss if RPS 1.5 policies do not materialise
- Possible unintended consequences of divestment

Desired and likely outcome:

- Reduce emissions at the portfolio level but less than RPS
- Maximisation of risk and return
- Real world emission reduction aligning with policy materialisation

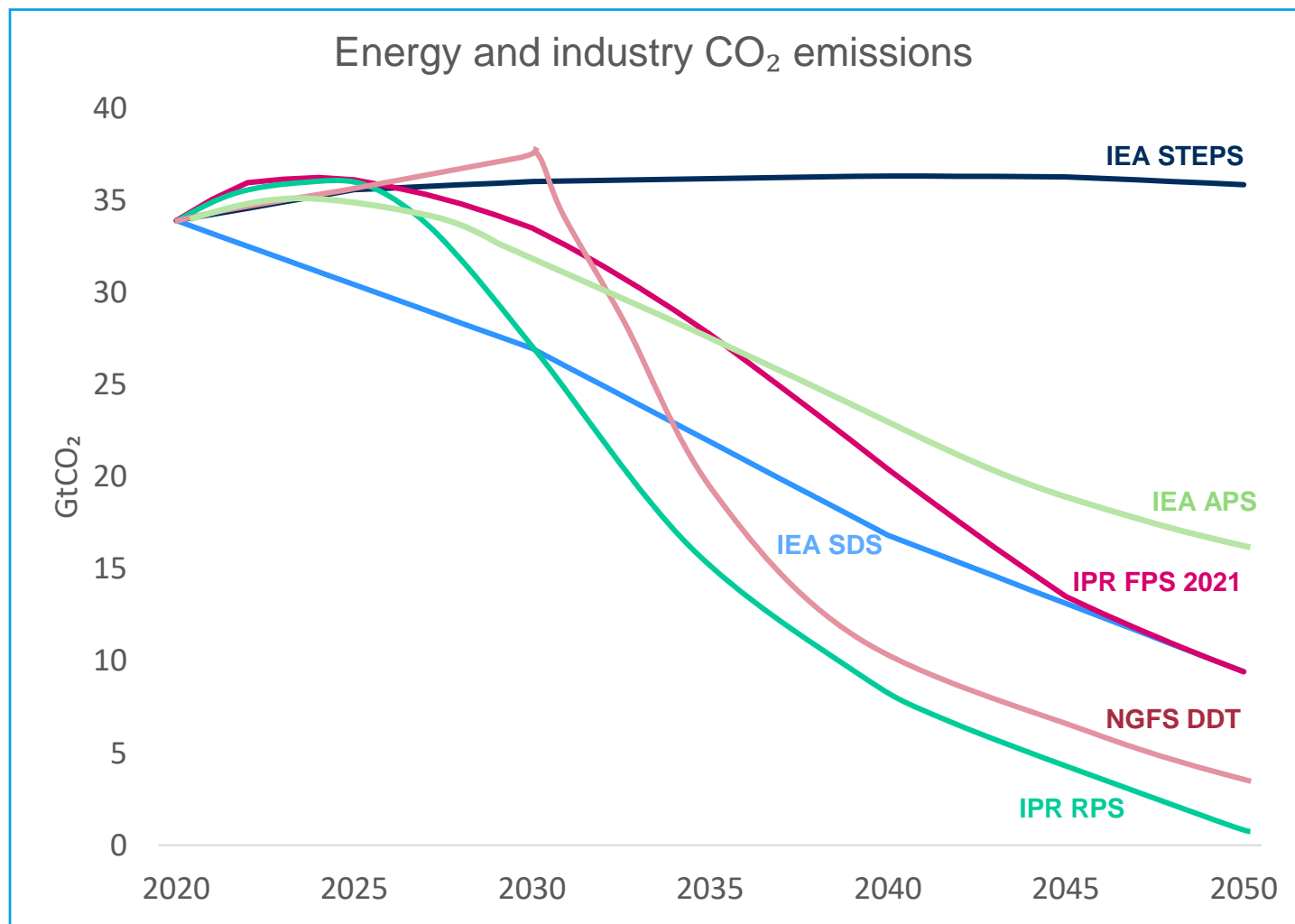
IPR Value Add

Characteristics of Scenarios	IPR	Most “aligned” Scenarios
A high conviction policy-based forecast with realistic constraints	<input checked="" type="checkbox"/>	
Transparent	<input checked="" type="checkbox"/>	
Applicable to TCFD reporting	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Complete forecast includes macroeconomic, energy and land use models	<input checked="" type="checkbox"/>	
Covers all regions of the world	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Fully integrating land-use	<input checked="" type="checkbox"/>	
Built for investors with investor input	<input checked="" type="checkbox"/>	
Usable for stress testing	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Policy methodology for the IPR 1.8C FPS 2021 vs 1.5C RPS

Key Differences	1.8°C FPS	1.5°C RPS
Carbon Prices	Forecasted timeframe, varying by region	Similar to FPS: Extremely rapid transition required for RPS will be challenging to achieve through carbon pricing mechanisms, beyond what is already expected in the IPR FPS 2021
Policy Drivers	Based on realistic forecasts, within political reality as well as technology and consumer changes	More interventionist top down policies: Performance standards (bans) and/or more direct subsidies
Announcements	By 2025 Paris Ratchet	ASAP; by 2023 Paris Stocktake
Implementation	In line with political reality	Immediately upon announcement

Scenario market in terms of emissions outcomes in energy related sectors

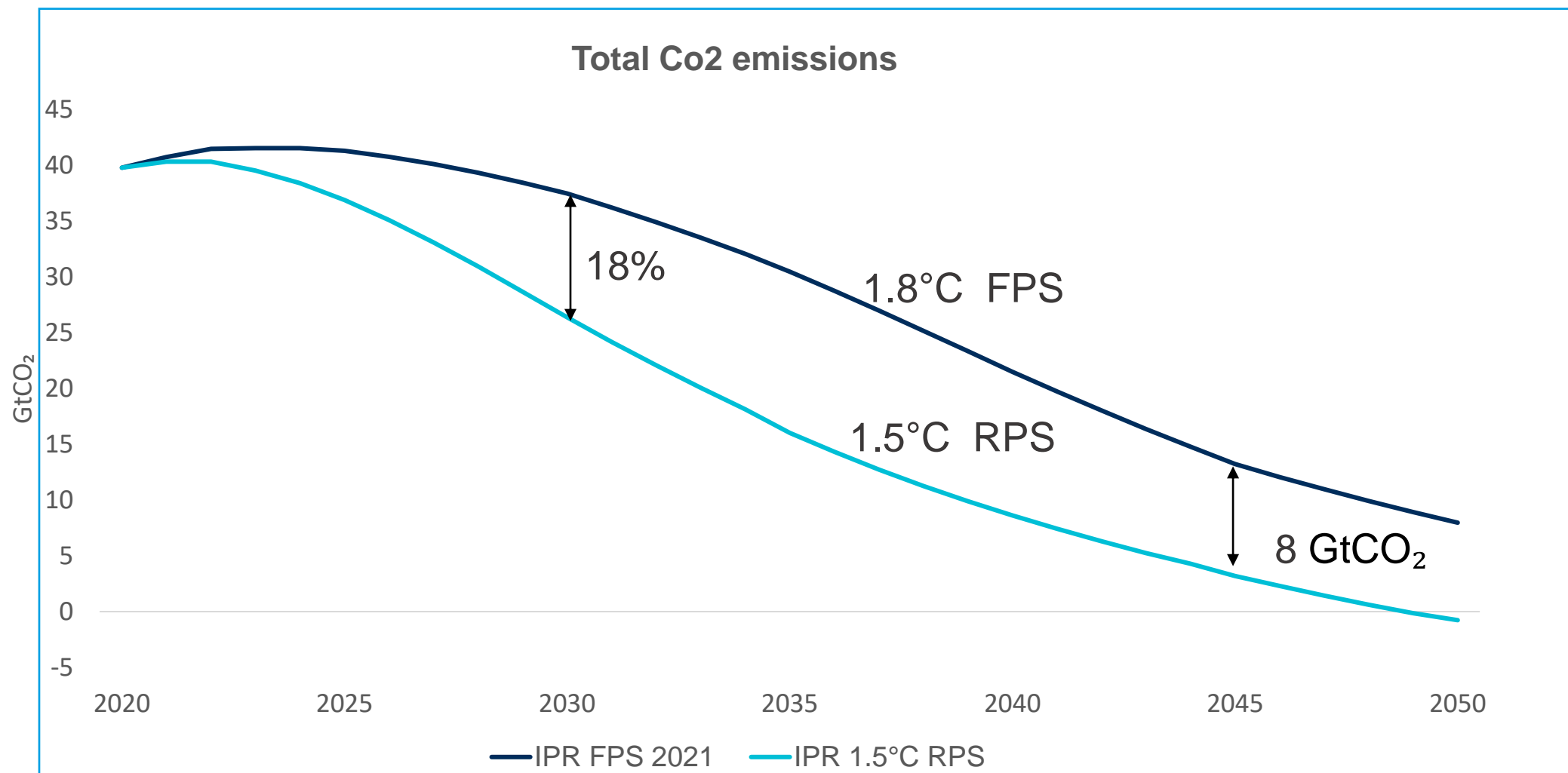


- Note strong COVID bounce backs for both IPR FPS and IPR RPS
- Delay on NGFS DDT (Disorderly Delayed Transition) is beyond IPR inflection point
- Neither IEA nor NGFS include full land use emissions or sequestration potential

* Data on IEA CO₂ pathways are published in 5-year intervals ** IPR FPS 2019 was modelled in 5-year increments

Note: IEA scenario data based on May 2021 Net Zero Emissions report; in WEO2021, IEA APC is renamed Announced Pledges Scenario (APS), with a slightly modified emissions pathway

Forecasted scenario ambitious but still leaves 30% (8 GtCO₂) gap, relative to IPR 1.5°C Required Policy Scenario, primarily due to timing of policy implementation



Policies with the greatest 2020-2050 Gt reduction between IPR 1.5°C RPS and IPR 1.8°C FPS 2021

Rank	Policy	Country	IPR 1.5°C RPS vs IPR 1.8°C FPS (2021 Gt reduction)
1	Coal phase out	China	40.0
2	End deforestation and NBS	Sub-Saharan Africa, South East Asia and Latin America	19.0
3	100% clean industry	China	19.0
4	Coal phase out	India	14.1
5	100% clean industry	India	8.3
6	100% clean industry	MENA	7.2
7	100% clean power	MENA	6.7
8	Fossil vehicle phase out	China	6.3
9	Coal phase out	Indonesia	5.4
10	100% clean industry	South East Asia	5.2

Note: Emissions reduction are approximate and include come additional sector-specific CO₂ reduction such as energy efficiency

Example of differences between 1.8°C FPS and 1.5°C RPS in key sector – Unabated Coal

Phase out of existing unabated coal

	Timeline									annual reduction*	
	2020	2025	2030	2035	2040	2045	2050	2055	2060	RPS	FPS
AU			RPS		FPS					10%	5%
BRA				RPS		FPS				7%	4%
CAN		RPS	FPS							20%	10%
CHI				RPS		FPS				7%	4%
CSA				RPS		FPS				7%	4%
EEU			RPS		FPS					10%	5%
EURA						RPS			FPS	4%	3%
GCC						RPS			FPS	4%	3%
IND						RPS			FPS	4%	3%
INDO						RPS			FPS	4%	3%
JAP				RPS		FPS				7%	4%
MENA						RPS			FPS	4%	3%
RU						RPS			FPS	4%	3%
SA						RPS			FPS	4%	3%
SAF				RPS	FPS					7%	5%
SEAO						RPS			FPS	4%	3%
SK				RPS		FPS				7%	4%
SSA						RPS			FPS	4%	3%
UK	Both									20%	20%
USA			RPS	FPS						10%	7%
WEU			RPS		FPS					10%	5%

* reduction in coal generation as a share of 2020 levels

Example of differences between 1.8°C FPS & 1.5°C RPS in key issue – Deforestation

End of deforestation

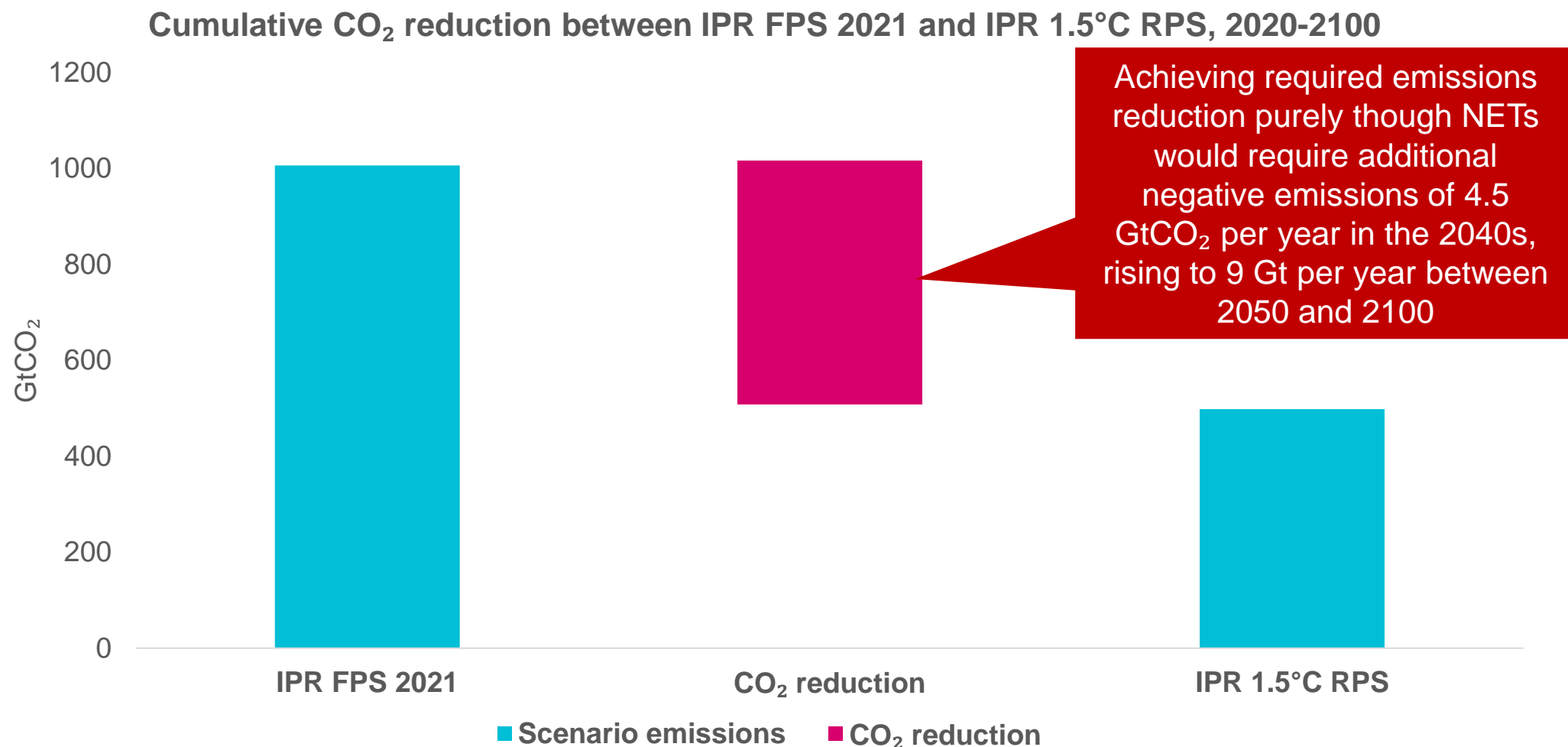
	Change in forest cover 2020-2050 (m ha)			Change in forest cover 2020-2050 (m ha)	
	2020	2025	2030	IPR FPS 2021	IPR 1.5C RPS
AU		FPSRPS		3	3
BRA		RPS	FPS	12	16
CAN	FPSRPS			1	1
CHI		RPS	FPS	92	92
CSA		RPS	FPS	10	14
EEU		FPSRPS		4	4
EURA		RPS	FPS	1	2
GCC	FPSRPS			0	0
IND		RPS	FPS	13	13
INDO		RPS	FPS	2	6
JAP	FPSRPS			0	0
MENA		RPS	FPS	-1	1
RU		RPS	FPS	1	2
SA	FPSRPS			0	0
SAF		RPS	FPS	0	1
SEAO		RPS	FPS	3	11
SK	FPSRPS			0	0
SSA		RPS	FPS	0	15
UK	FPSRPS			1	1
USA		FPSRPS		17	17
WEU		RPS	FPS	11	12

Deforestation of natural forest halted through strong and effective command and control policy

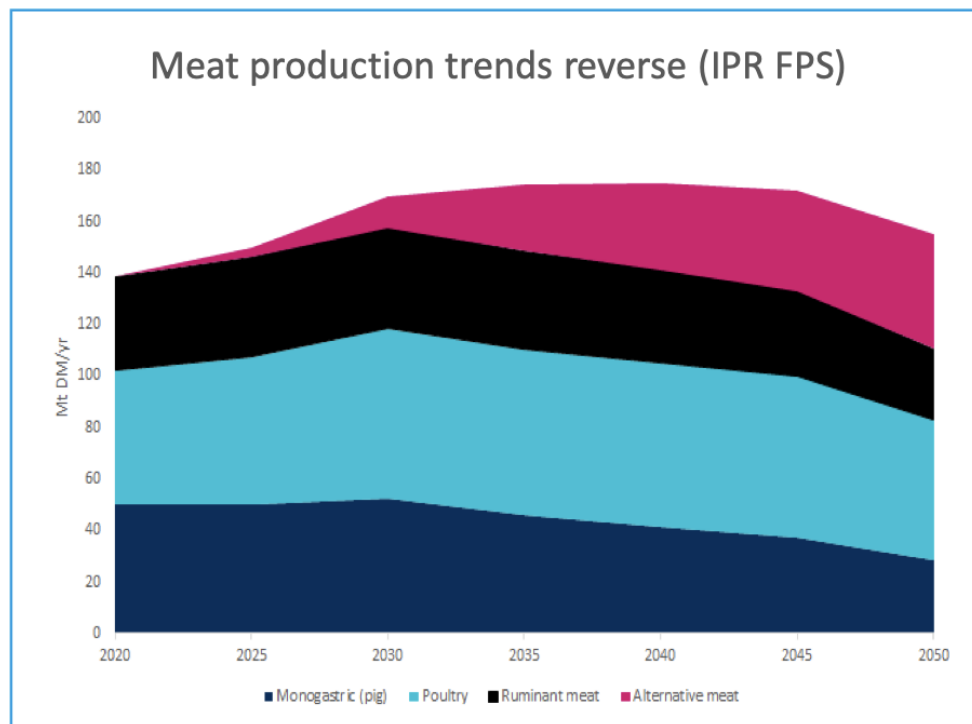
Countries/regions like CAN, GCC, JAP, SA, SK, UK have virtually zero net deforestation

Carbon pricing and NDC commitments combine to stop net deforestation by 2030. Biggest changes need to occur in BRZ, CSA, INDO, SEAO, SSA

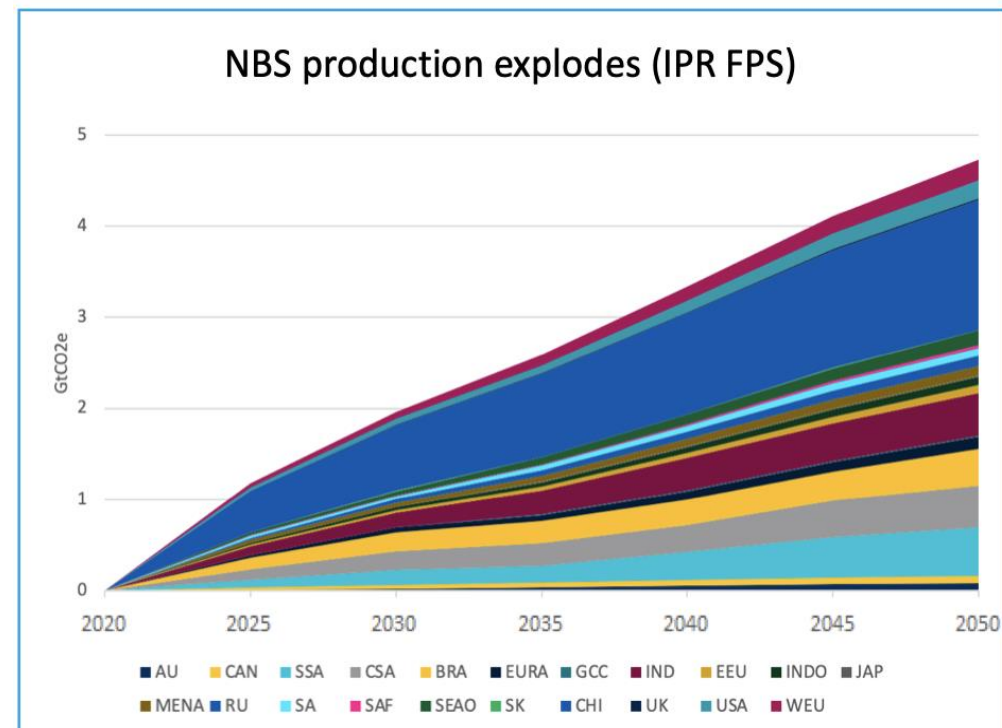
Achieving 1.5°C with less aggressive action on fossil CO₂ emissions would require substantially more negative emissions technologies (NETs)



Twin forces in the food & ag revolution – decline in ruminant meat and emergence of Nature-based Solutions (NbS) as CO2 removal strategies



- **30% decline in ruminant meat from 2030 to 2050** due to shifts in consumer behavior and some policy support for health and environmental reasons
- **Alternative meat reaches 28% market share by 2050**, as taste/price parity is achieved in all markets

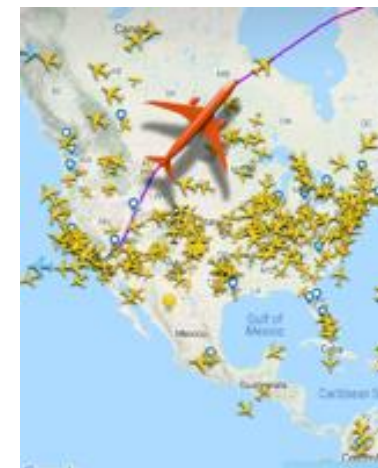


- **Demand for verifiable sequestration drives carbon markets (voluntary, followed by regulatory), supporting an explosion in commercial NbS solutions**
- **Greatest sequestration expected in China (1.4 Gt), India (0.5 Gt), Sub-Saharan Africa (0.5 Gt), and Brazil (0.4 Gt)**

The Value Drivers Database Explained

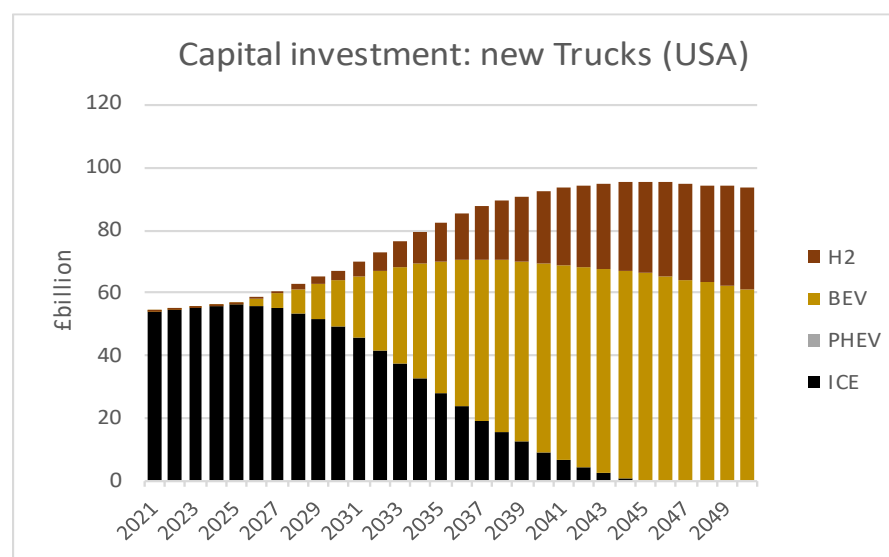
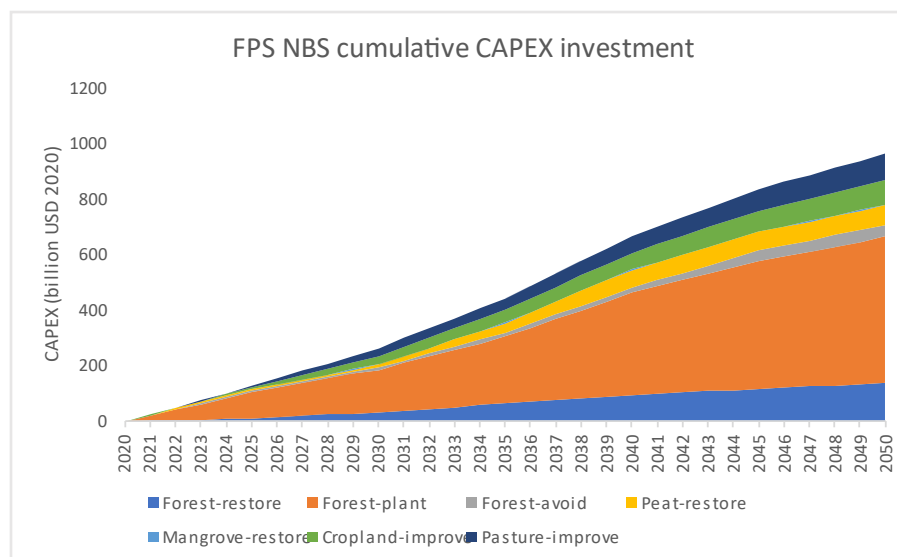
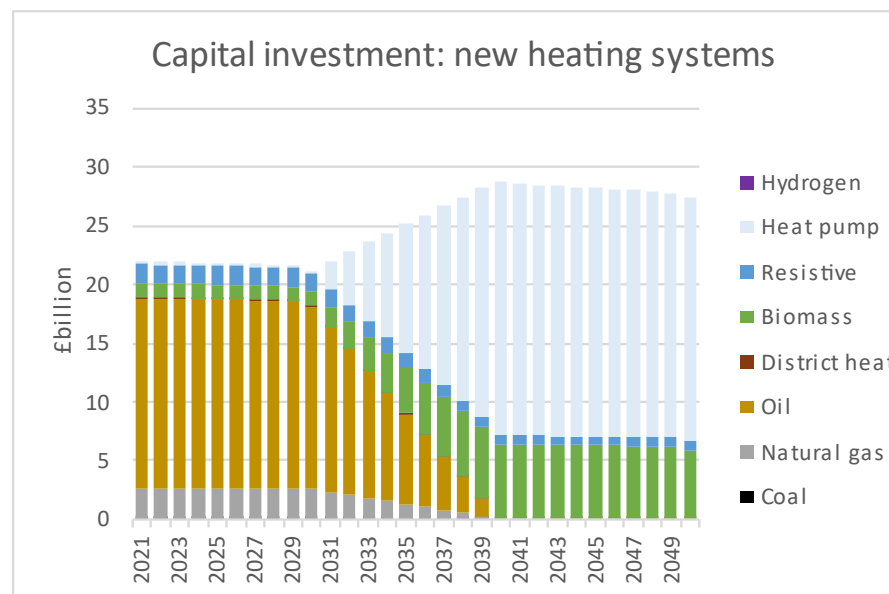
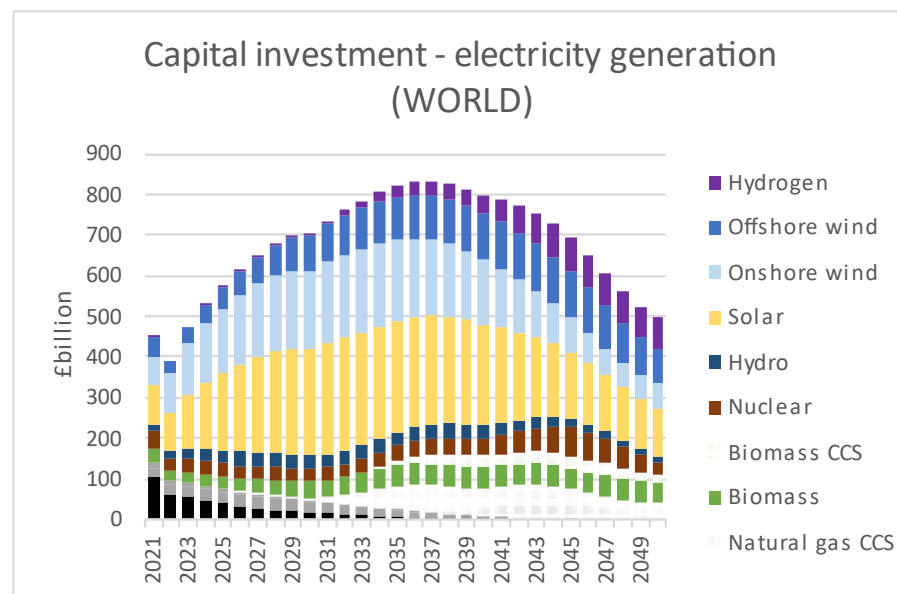
The IPR Value Drivers Database is the largest and most comprehensive in the world enabling direct input into investor valuation models

- Data summary:
 - All major jurisdictions covered
 - Annualised data
 - Emissions by GHG type
 - Investment by technology type by jurisdiction by sector
 - Power Demand by fuel type by jurisdiction
 - All major sectors covered
 - Huge Land Use component
 - Price data derived
 - Macro-economic assumptions
- Designed in collaboration with IPR Strategic Partners and Research Consortium Partners
- Will facilitate opportunity to build new wave of product
- Hundreds of thousands of data points



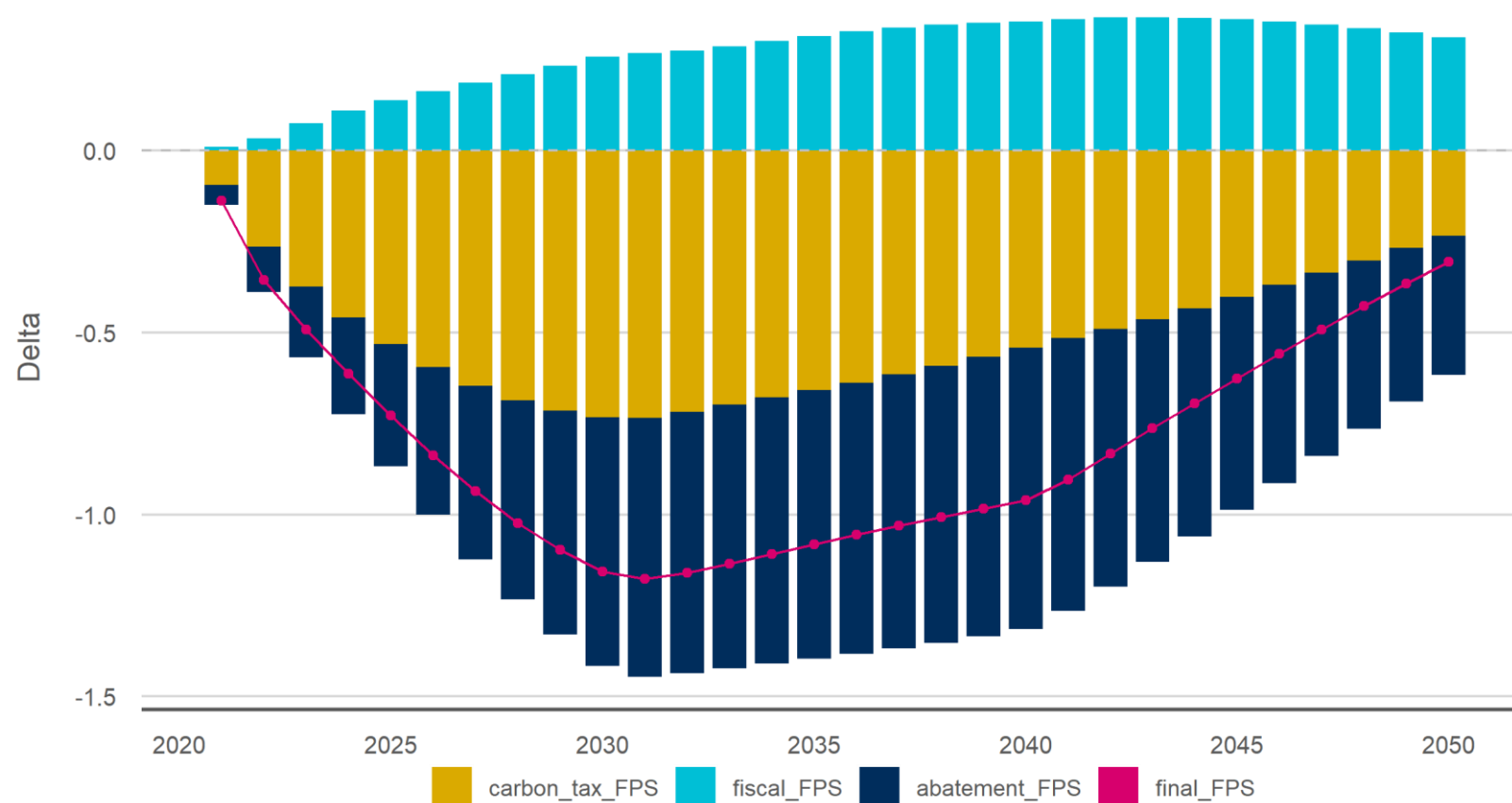
- **Jurisdiction:** 21 world regions including 12 G20 countries
- **Countries:** Australia, Brazil, Canada, China, India, Indonesia, Japan, Russia, South Africa, South Korea, United Kingdom, United States
- **Composite regions:** Central and South America, Eastern Europe, Eurasia, Gulf co-operation Council; Middle East and North Africa, South Asia, South East Asia and Oceania, Sub-Saharan Africa, Western Europe

IPR FPS 2021 – examples of broad capital shift opportunities



GDP impact: Global

World: Gross Domestic Product (GDP)

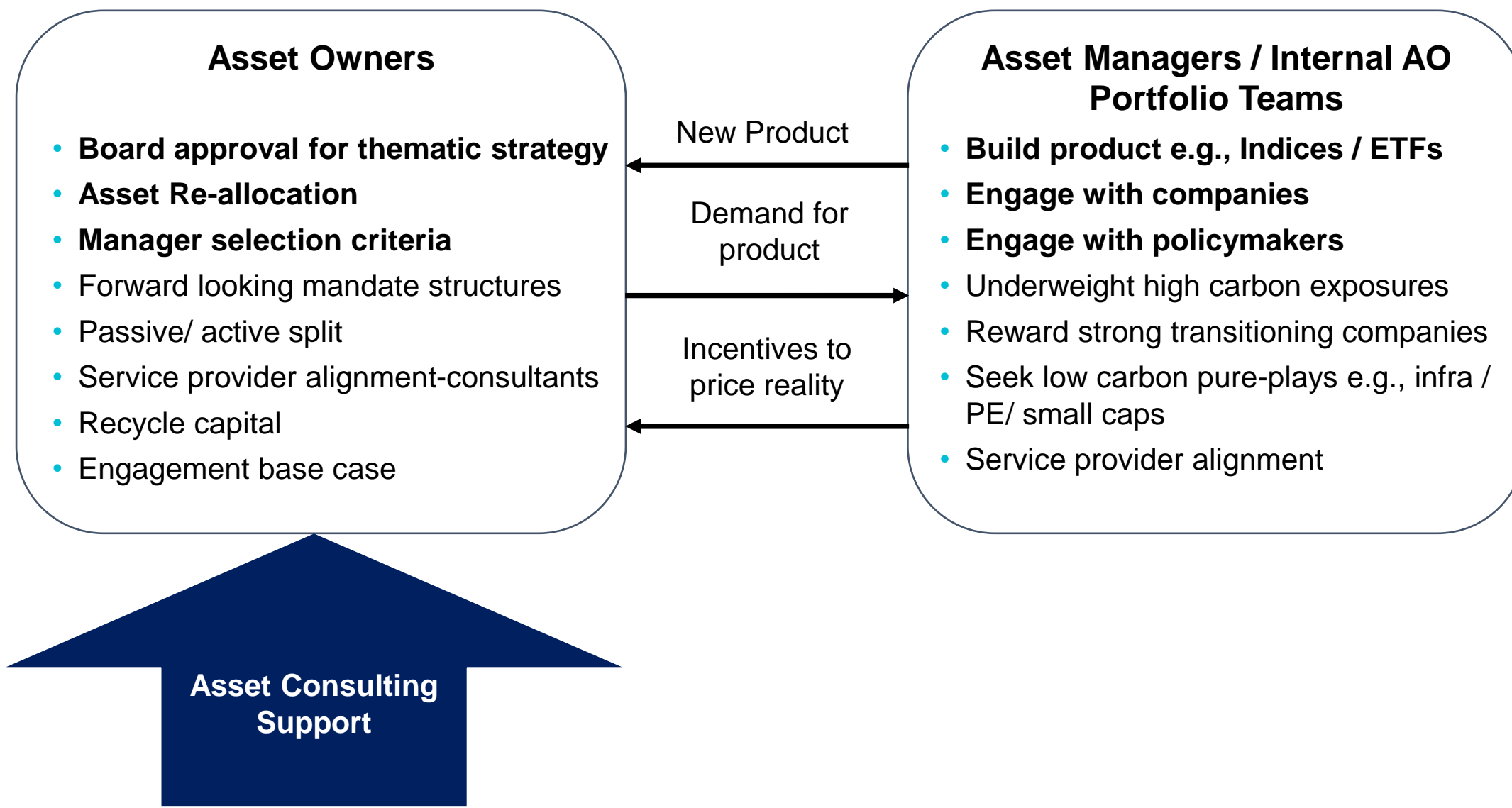


- The majority of negative final impacts are significantly mitigated by 2050 (see the pink line)
- The next 10 years appear to be crucial to cut emissions but also for economic cost to erupt
- FPS's carbon tax and abatement shocks could have a mild impact in the global economy by 2030 (less than 1.5%)
- This is partly offset by carbon revenue recycling back into the economy (through a combination of debt repayment, transfers, or government investments)

Source: NIGEM based on IPR inputs

Note: Delta is calculated as the relative % difference compared to the baseline scenario ; no physical impacts are included in this analysis.

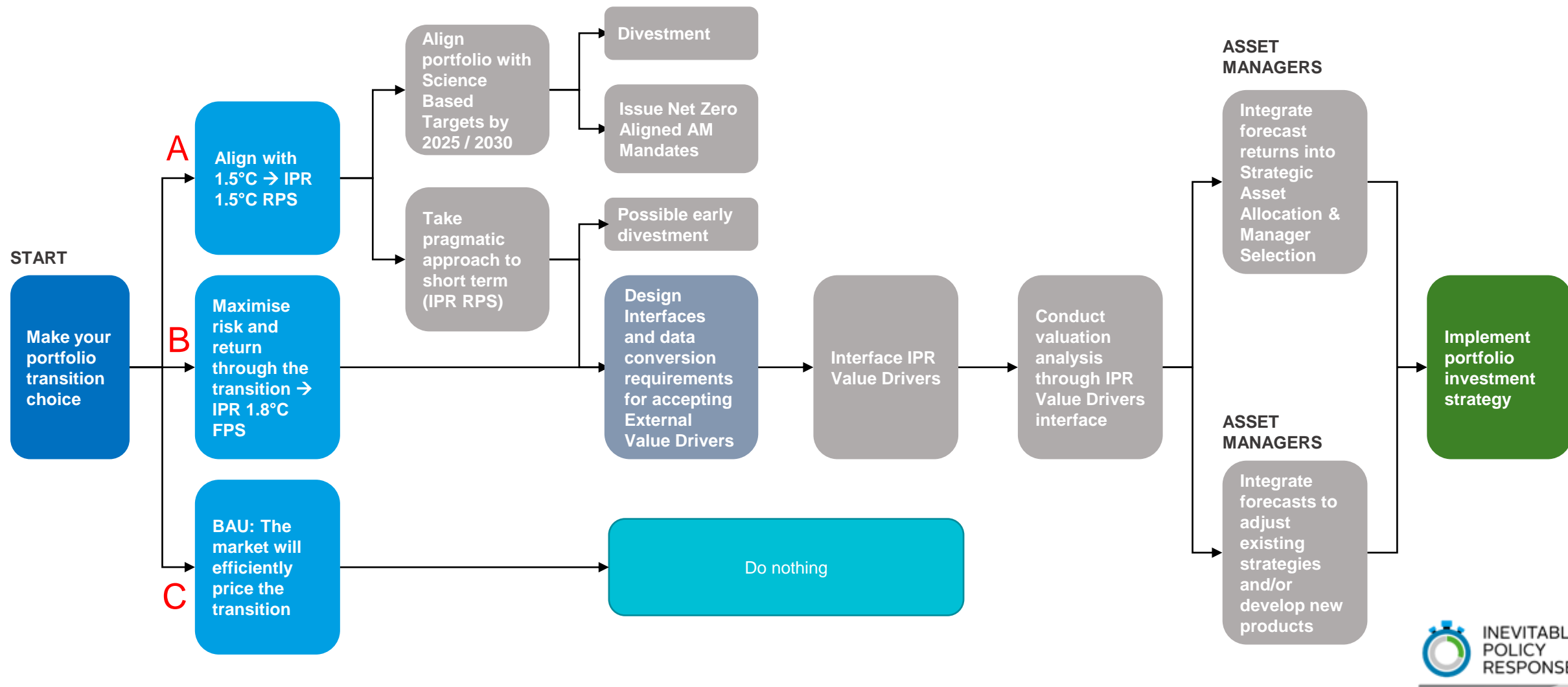
Dynamics of the investment chain



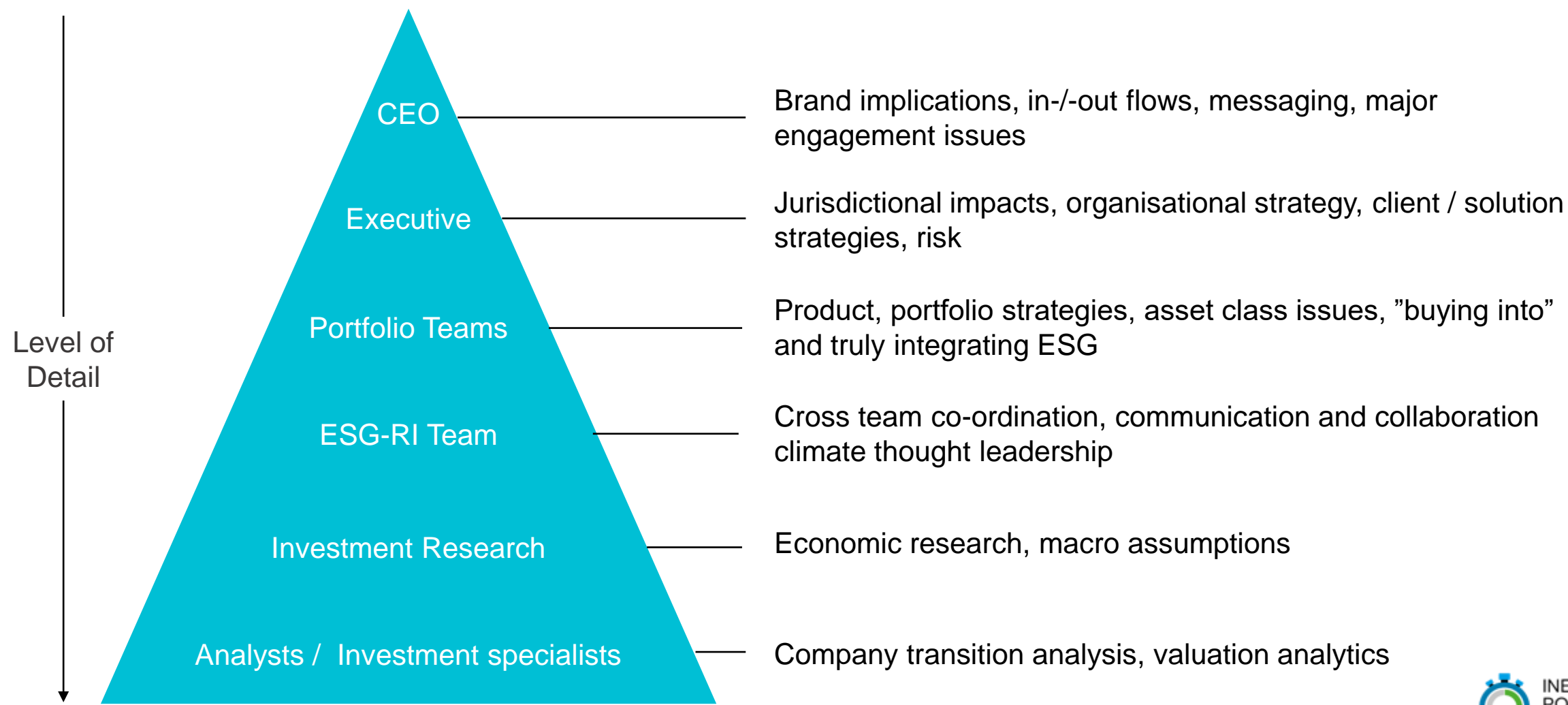
Key role of service providers

- **Investment Consultants / OCIOs:**
 - Asset Owners should assess their investment consultants' climate capacity
 - Investment consultants are critical to developing strategies for climate transition
 - Barriers: perception of “risky advice” and going against traditional SAA approaches
- **Ratings Agencies** – Can integrate IPR into ratings analysis ([Fitch](#) already doing so)
- **Data providers** – Can build new offerings integrating IPR public data
- **Index Providers** – Can create new benchmarks and semi-passive product
- **Proxy advisers** – Can make voting recommendation based on IPR realism

IPR Climate transition integration



Climate transition presents asset managers with fundamental organisational challenges



Asset Manager issues between Net Zero, a realistic forecast and execution

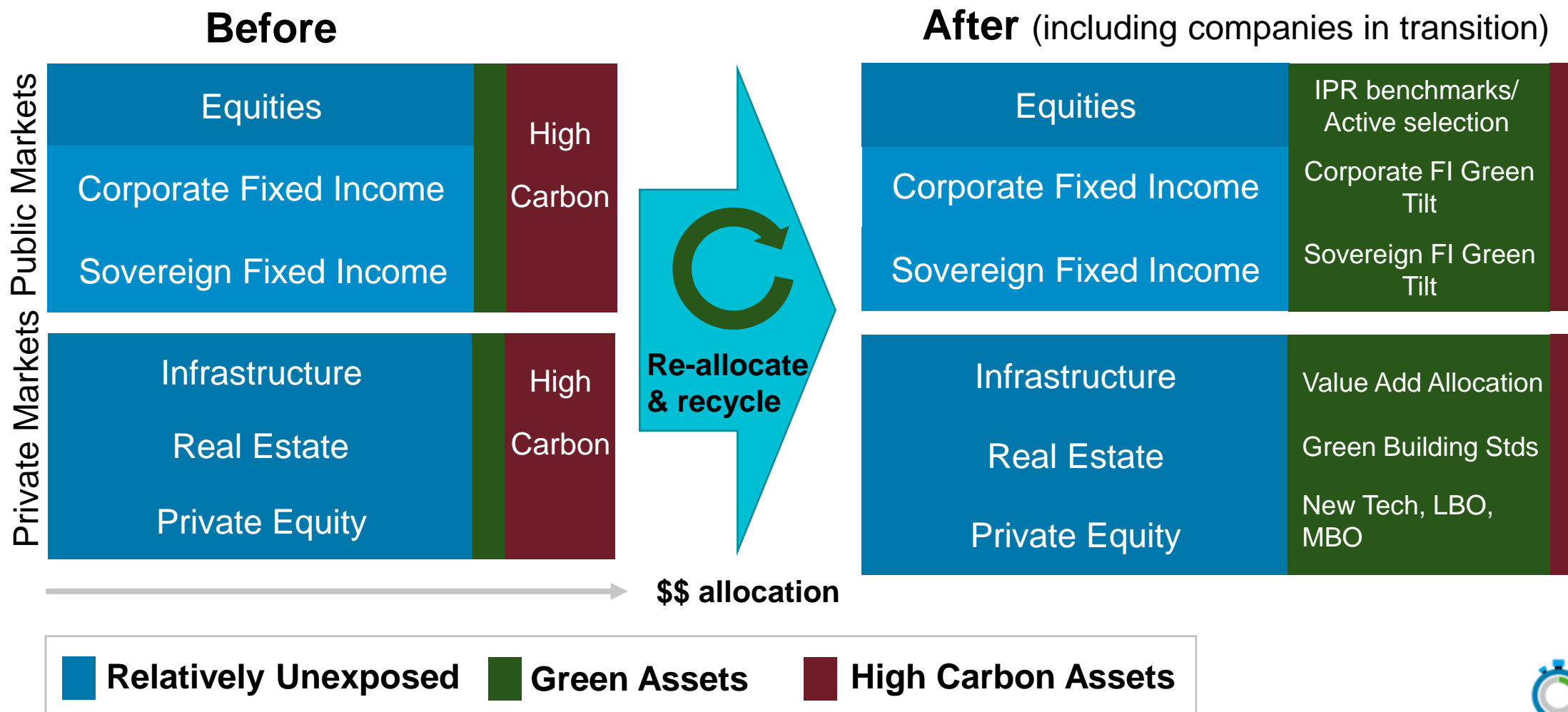
- Clients choose mandates and benchmarks – its not your fault!
- If engagement only, how serious are you prepared to get?
- Do active managers really want to divest to meet short term targets?
- Which companies have the best transition plans such that they emerge stronger? Little time to transition to Net Zero for exposed companies!
- Can you renegotiate incentives that allow you to position a low carbon portfolio early, even risking short term underperformance?

Climate transition theme demands sector and asset class matrix analysis

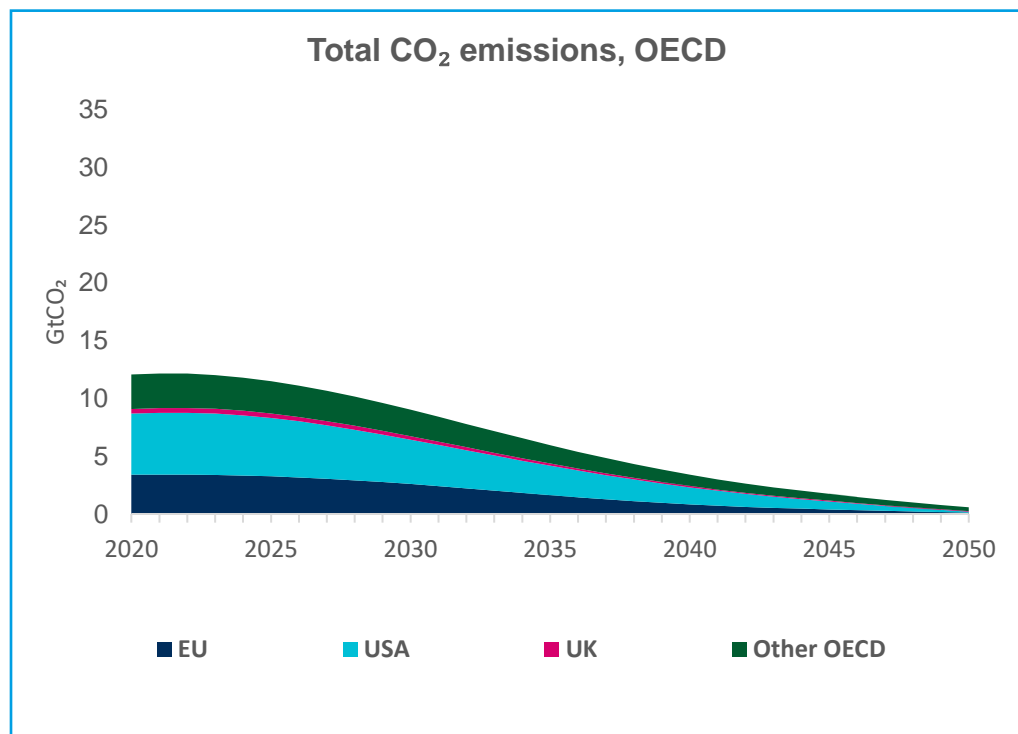
	IT	Health	Consumer Discretionary	Financials	Comms services	Industrials	Energy	Real Estate	Utilities	Materials
Public Markets					Equities Corporate Fixed Income Sovereign Fixed Income					
Private Markets					Infrastructure Real Estate Private Equity					
	IT	Health	Consumer Discretionary	Financials	Comms services	Industrials	Energy	Real Estate	Utilities	Materials

Note: Not market cap weighted and not all sectors have presence in each asset class

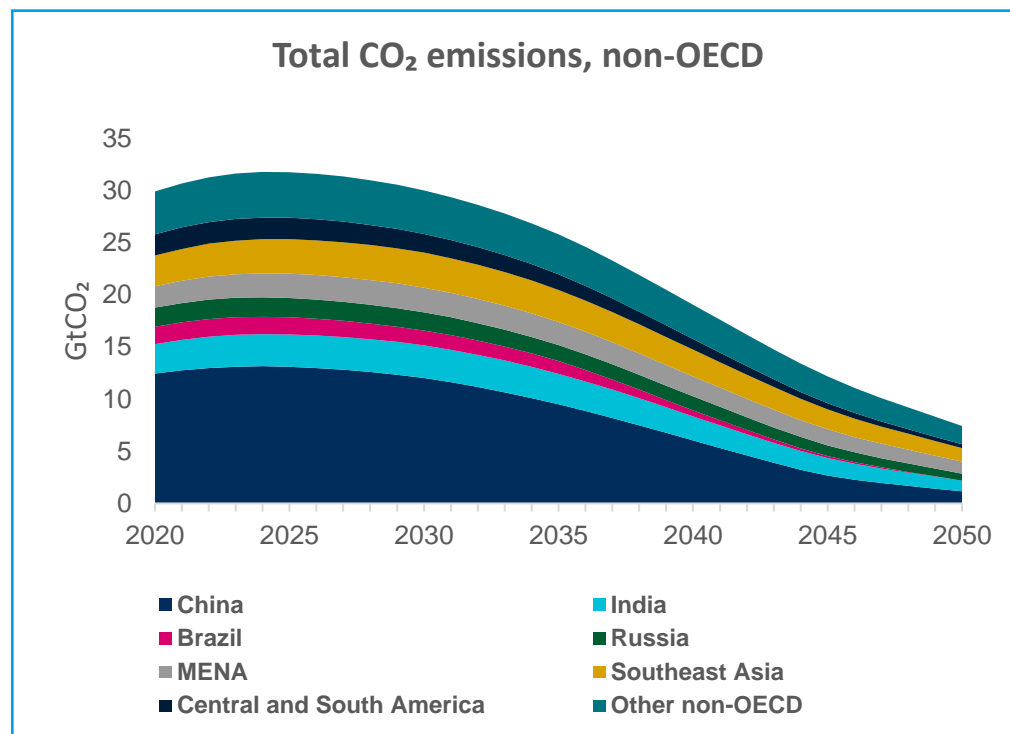
The portfolio carbon switch by asset class



Asset Allocation – do we have barriers to investing in emerging markets where the decarbonization opportunities are?



- Note this is only in terms of scope 1 & 2 emissions as OECD “export” emissions to emerging markets through supply chains



- Non-OECD needs substantial investment from OECD to transition
- Potential Sovereign Debt Implications

Key philosophies challenged by the climate transition

- **Fiduciary duty**
 - Restriction on ignoring risk adjusted return maximisation?
 - Licence to act proactively on climate strategy
- **Agency responsibility**
 - Who is responsible for establishing a climate strategy?

Some may consider others such as EMH (Efficient Market Hypothesis) or MPT(Markowitz)

Human issues for asset managers to manage and consider

- Culture
- Behaviours
- Incentives
- Career Risk

Informational barriers to taking action on climate change:

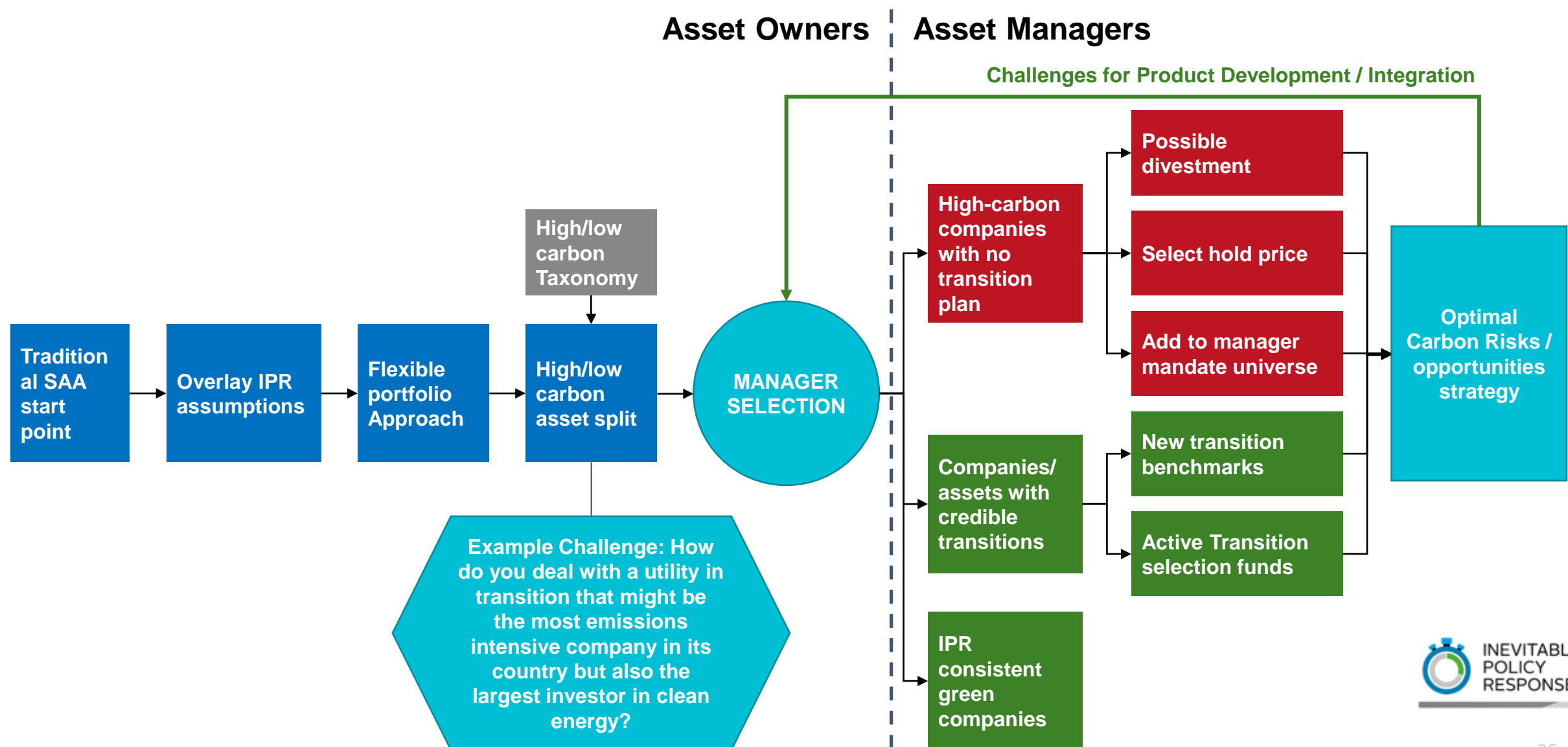
- Data, tools, metrics, scientific evidence, knowledge



Behavioural barriers to taking action on climate change:

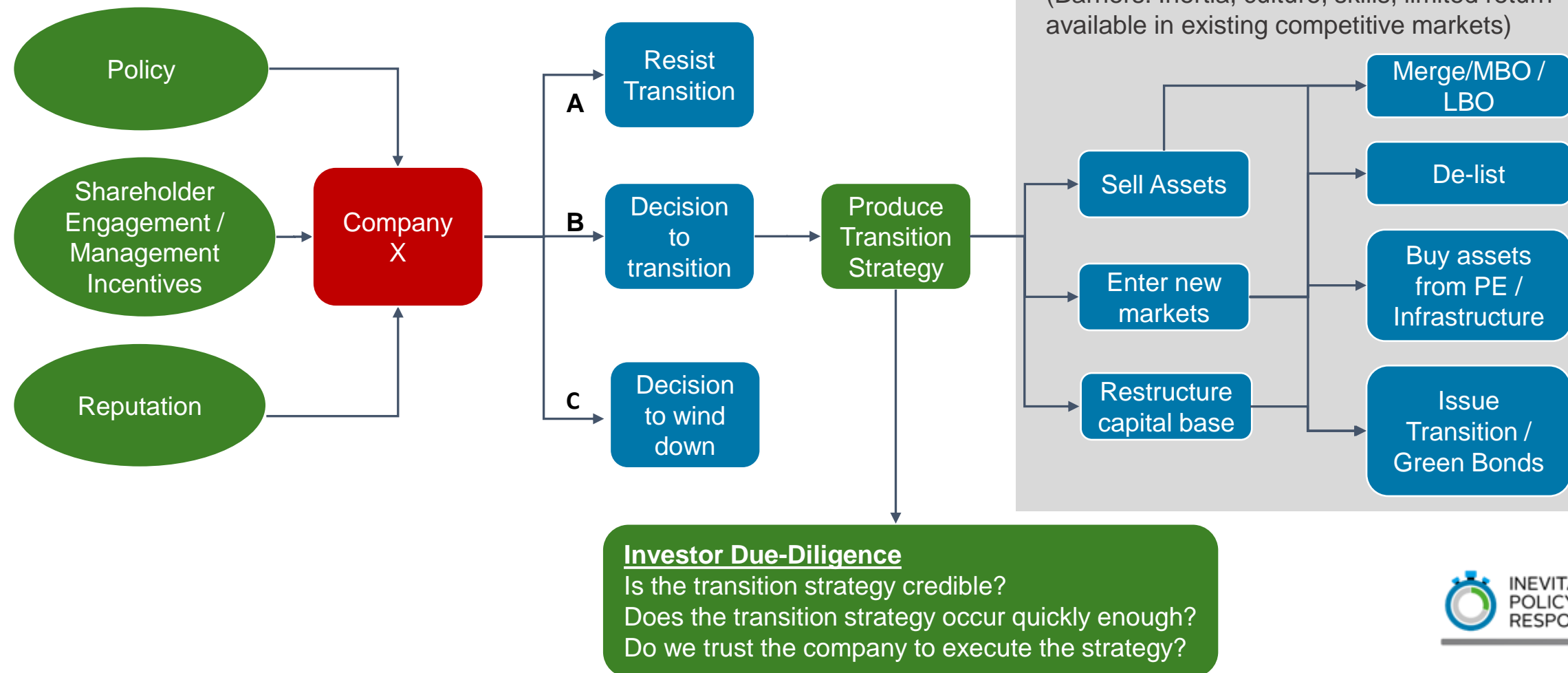
- Cognitive biases, psychological underpinnings

Whole system view - from asset allocation to company analysis and stock selection



The implications of company transition challenge

Drivers of Transition



Using IPR 1.8°C FPS 2021

Opportunities matrix in key sectors

Opportunities	Equities	Debt	Private Capital	Infrastructure & Energy	Real Assets / NBS
CCS (carbon capture & storage)	Through Oil, Gas, Industrials	Unlisted FF inc coal, sovereign debt, municipal debt	Commercializing technologies	Retrofit for unlisted coal	As part of BECCS (Bioenergy w/CCS) development
EV	Leading auto transitioners	Leading auto transitioners	Batteries, smart car, smart charging	Charging infra, smart grid	N/A
Renewables	For listed utilities	For unlisted utilities	New technologies, smart grid, balancing	New builds	N/A
Hydrogen	Listed utilities/ Industrials 2030s	Early, late-stage debt & transition debt	Development stage PE through to commercialization	N/A	N/A
Clean Industrials	Leading low carbon industrials	Leading low carbon industrials	New technology	N/A	N/A

Note: This does not suggest that all opportunities have only positive environmental or social impact

Opportunities matrix in land use, the 'Elephant' in emissions abatement

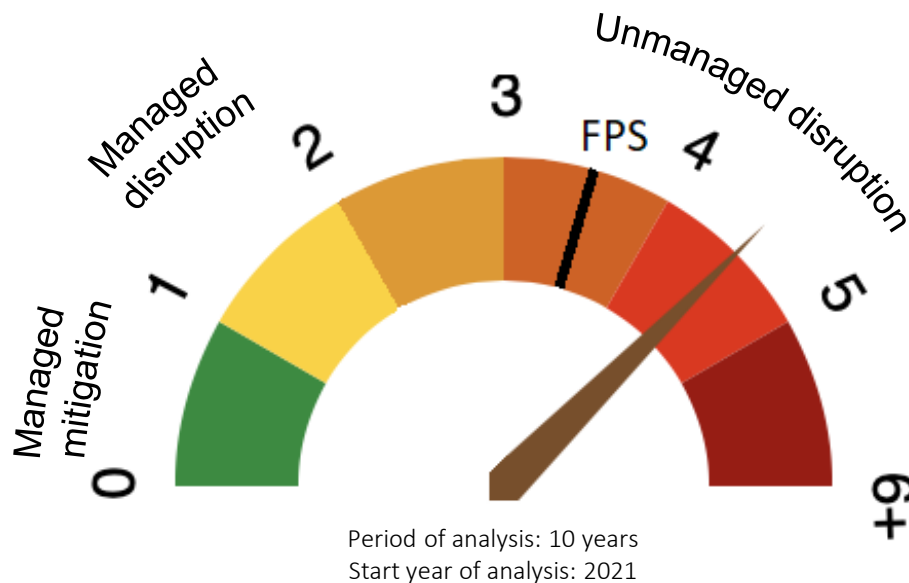
Opportunities	Equities	Debt	Private Capital	Infrastructure & Energy	Real Assets / NbS
Forest Conservation and Reforestation	<ul style="list-style-type: none"> Food & Ag transitioning away from meat & industrial ag 	<ul style="list-style-type: none"> Food & Ag transitioning away from meat & industrial ag Reforestation / afforestation 	<ul style="list-style-type: none"> Technology supporting scaling of conservation and reforestation 	Forest conservation & reforestation within infra and energy projects	<ul style="list-style-type: none"> Forestry asset class with high sustainability performance Opportunities to invest in carbon markets integrated with forestry investment
Improved Land Management	<ul style="list-style-type: none"> Timberland REITS Agribusiness companies 	<ul style="list-style-type: none"> Timberland REITS financing Agribusiness companies financing 	<ul style="list-style-type: none"> Ag Tech: support scaling of improved land management and soil carbon management Circular bioeconomy technologies (e.g. mass timber) replacing cement, steel, and plastics 	N/A	<ul style="list-style-type: none"> Forestry asset class with high sustainability performance Regenerative high sustainability performance agriculture Forest and soil carbon markets integrated with forestry and agricultural investment
Food Production Innovation & Technology	Alt. protein directly or via incumbents investing in such at scale	Commercialisation	Alt. protein for human and animal consumption	N/A	Reallocate unused pasture and grazing land toward climate-positive forestry and climate-positive agriculture

Note: Examples of specific land-use opportunities also found in [Capital for Climate](#), a partner grantee

PACTA Transition Disruption Metric

Visual representation of the TDM*

- If we align with 1.5 deg and we underperform, what happens?



- **Full mitigation (0):** The portfolio is ahead of the FPS scenario pathway.
- **Managed mitigation (from 0 to 1):** Residual disruption consistent with the effort in years 1 to 5. Over 1, suggests that the portfolio needs to accelerate the transition relative to its current capital stock evolution projections, but this acceleration is in line with historical growth rates of the sector.
- **Managed disruption (1 to 2):** is in line with the FPS acceleration which involves some disruption that is still manageable.
- **Unmanaged or high disruption (over 2):** An unmanaged or high disruption suggests the portfolio is already lagging the FPS scenario benchmark and will involve significant unmanaged disruption over the next decade if / when the FPS scenario materializes.

See: <https://2degrees-investing.org/resource/pacta/>

* This visual representation should be considered as an example given that the metric is under construction and may have slight variations.

Using IPR 1.5°C RPS 2021

Aggressive emission reductions required under IPR 1.5°C RPS target one third reduction by 2030

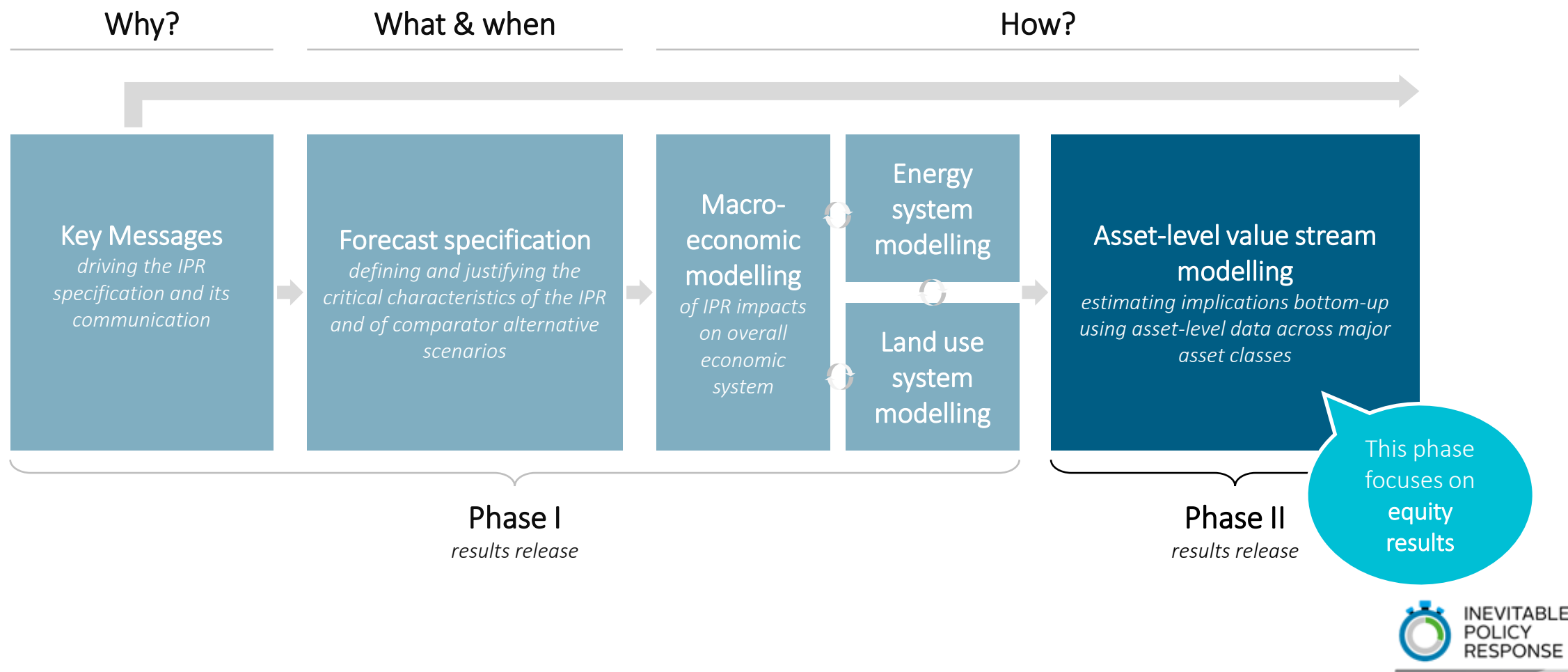


Year	Changes required from 2020 under IPR 1.5°C RPS	
	Energy	Energy and land
2020	Base Year	Base Year
2025	-1%	-7%
2030	-27%	-33%
2035	-53%	-57%
2040	-73%	-76%
2045	-88%	-91%
2050	-96%	-102%

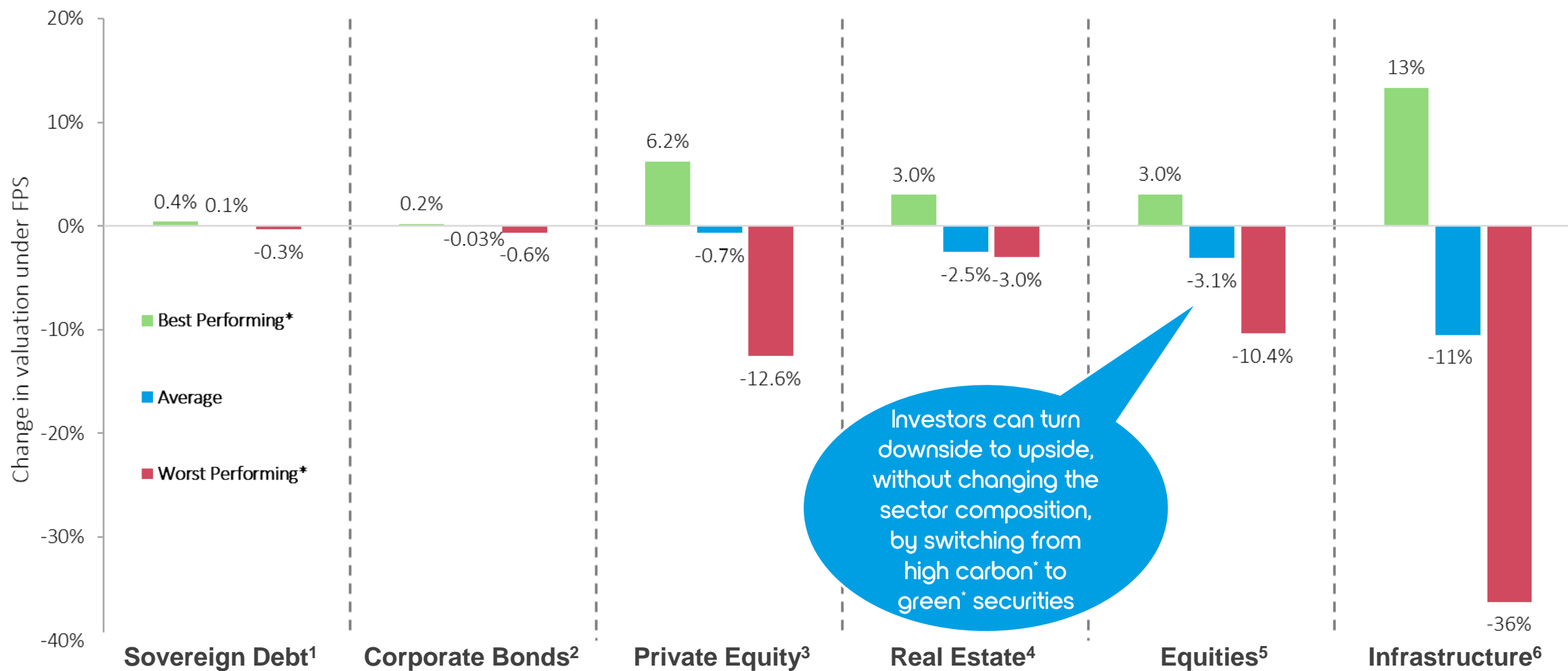
Asset Managers – Converting IPR into valuation analysis

(Drawing examples from IPR 2019 analysis)

The asset model draws on results from IPR Phase I to generate financial impacts of the IPR 1.8°C Forecast Policy Scenario across various asset classes, starting with equities



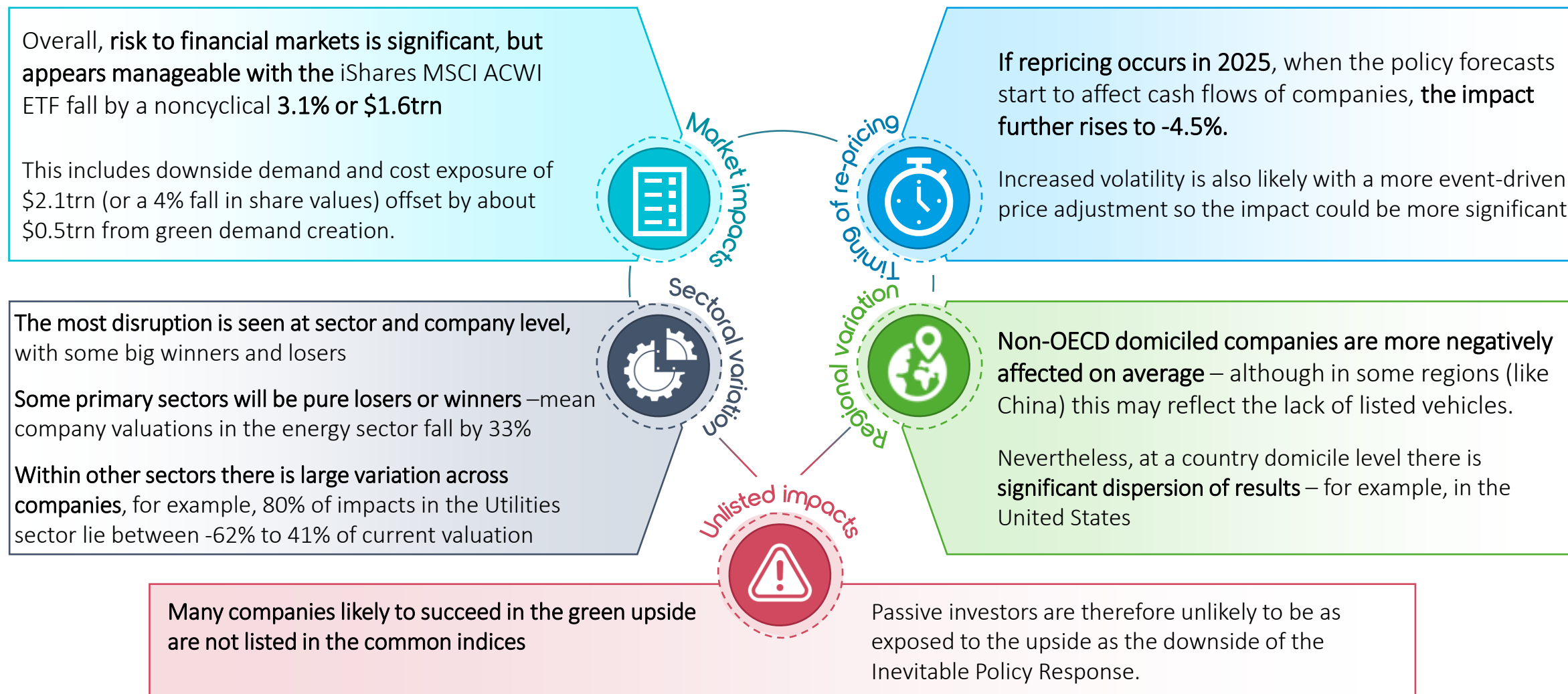
Examples from 2019 Strategic Asset Allocation analysis



Green* and high carbon* indices for Corporate Bonds, Private equity, Real Estate, Equities, and Infrastructure are constructed by applying sector weights to the 90th and 10th percentile of companies (in terms of valuation change in FPS). Sovereign debt Green / high carbon impacts are from 10Y debt from Canada and the Netherlands. Real Estate Green assumes carbon neutral building with no carbon costs, whereas high carbon is average buildings with no abatement.

Equities

Key Findings: Disruption at the Sector and Company level



How do we think about the ‘impacts’ of the Inevitable Policy Response?

Current valuations



Current equity valuations are based on expectations of future company performance. We assume these expectations are consistent with a scenario where current NDCs* as reflected in the IEA NPS (now STEPs) are achieved.

1

2

The IPR Forecast Policy Scenario (FPS)



The IPR FPS was developed to show the macro and sector level impacts of a specific set of policy forecasts taking affect around the time of the 2025 Paris Agreement ‘ratchet’. These generate impacts to company profits going forward due to changes in demand, prices and costs for companies.

3

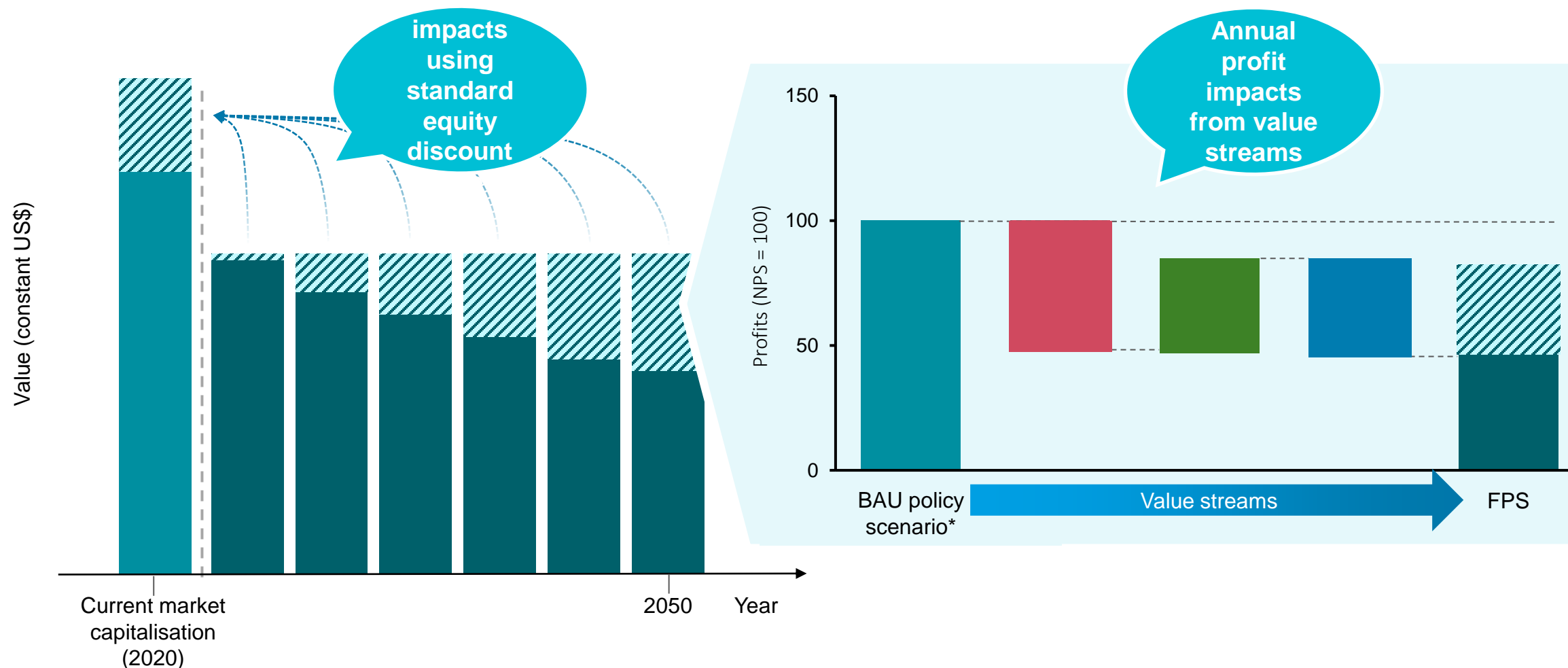


We then define ‘impacts’ as the implied changes in valuation in terms of market capitalisation if investors repriced immediately on the basis of these expected cash flow changes **

Notes: *NDCs refer to countries’ nationally determined contributions to the Paris Agreement. **Immediately is our default assumption in this report but we set sensitivities around delayed repricing in 2025 as well.

Source: Vivid Economics

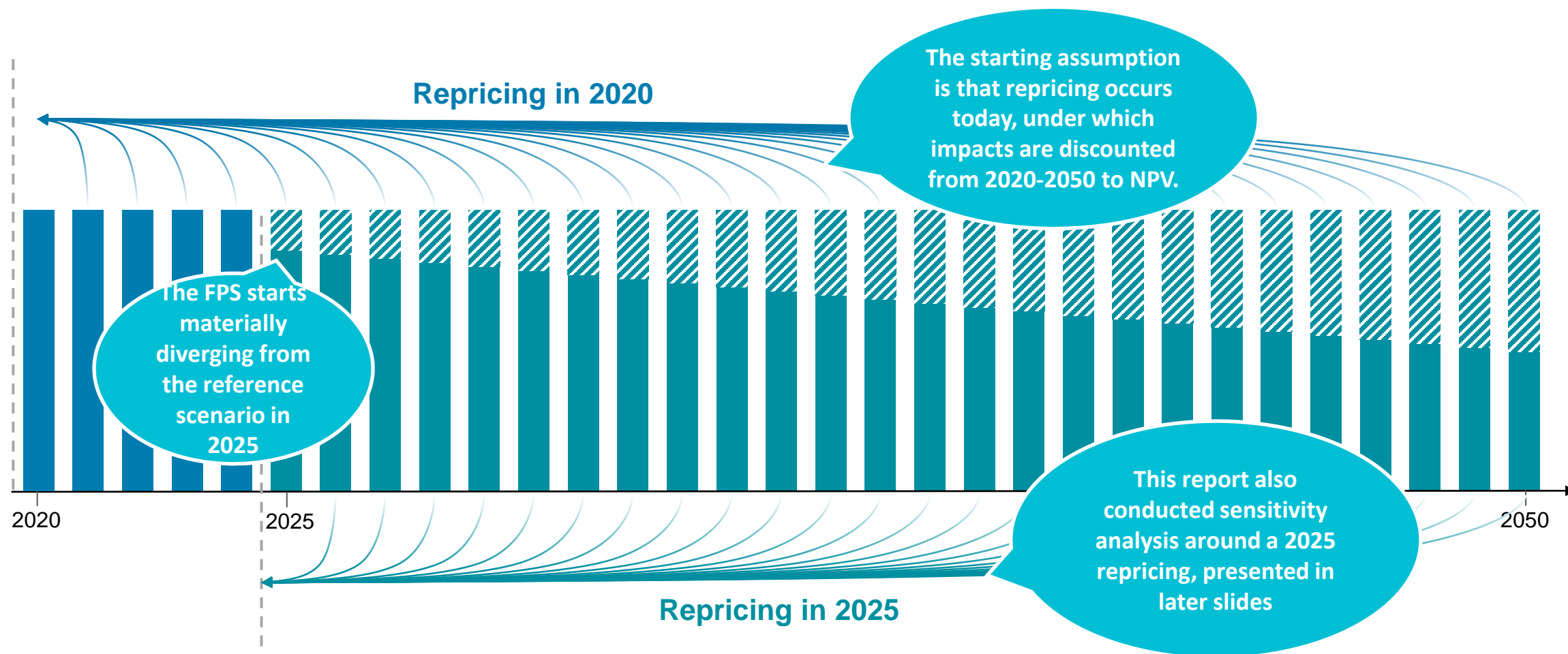
To arrive at a quantitative estimate, the approach estimates annual impacts on profits from 2020 to 2050 and discounts these back to the present



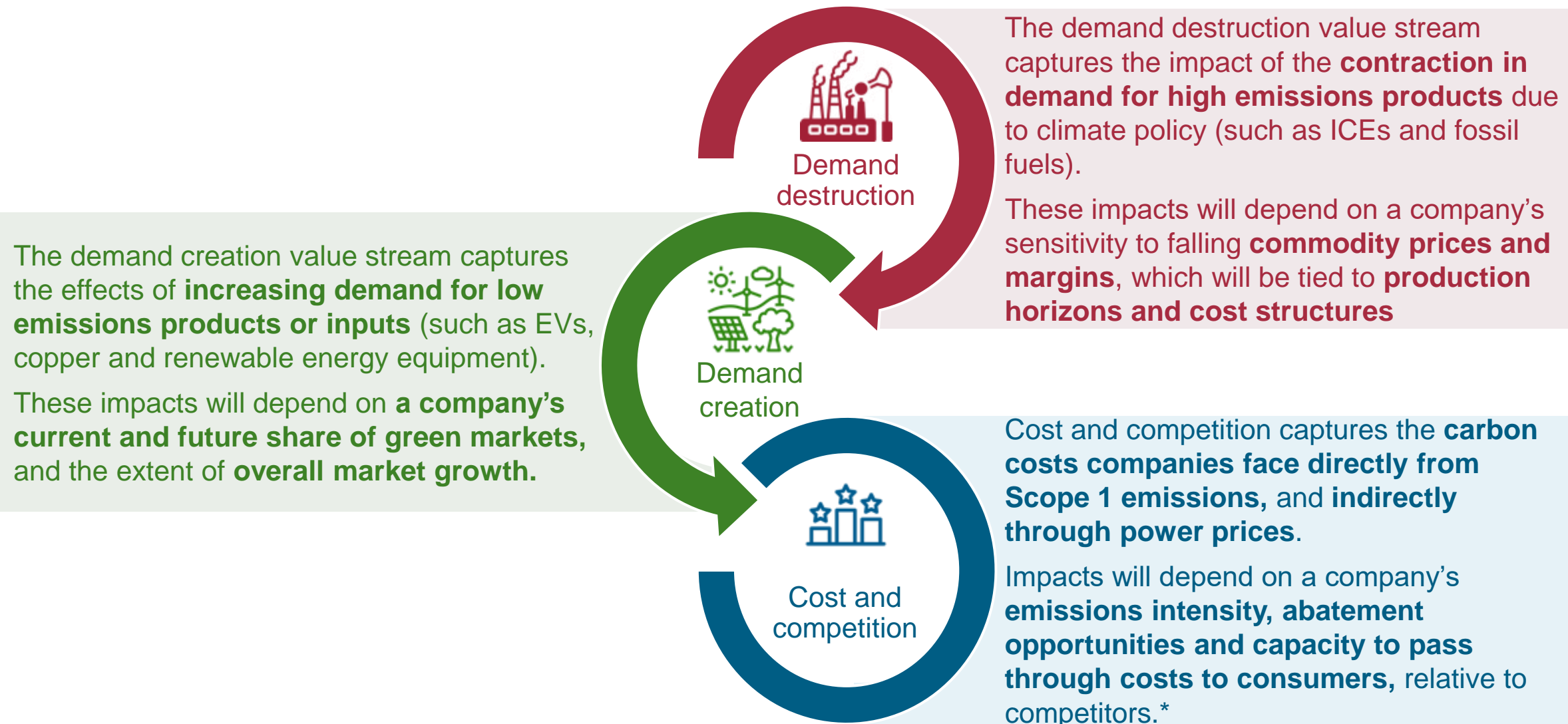
Notes: Current valuation is assumed to be the NPV of projected profits to 2050 based on a 'business as usual' policy scenario where countries implement their stated policies (or NDCs), akin to what is represented in the IEA STEPS (formerly NPS). While in reality, different equities may be valued based on different expectations of a future climate pathway, this assumption is necessary to provide 'value at risk' figures relative to a baseline.

Source: Vivid Economics

The 1.8°C Forecast Policy Scenario starts impacting equity valuations in 2025, but repricing could occur any time from now to 2025



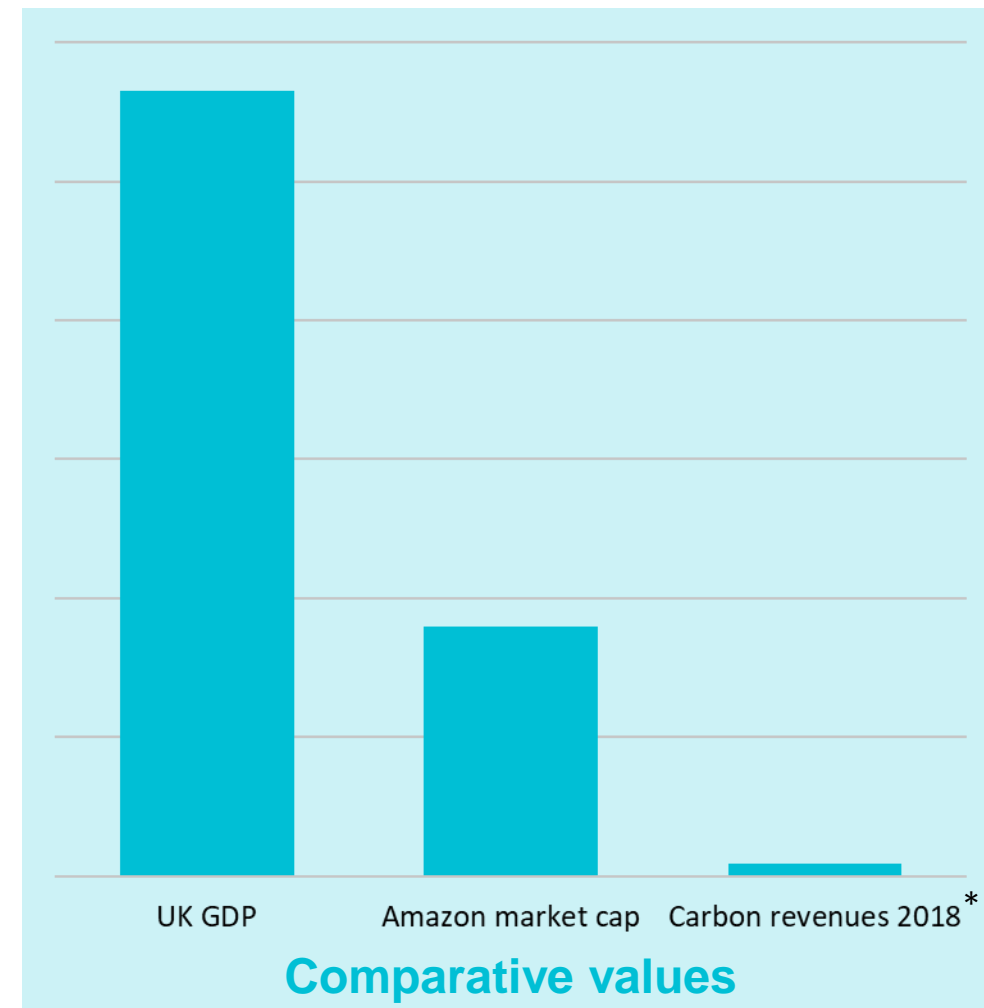
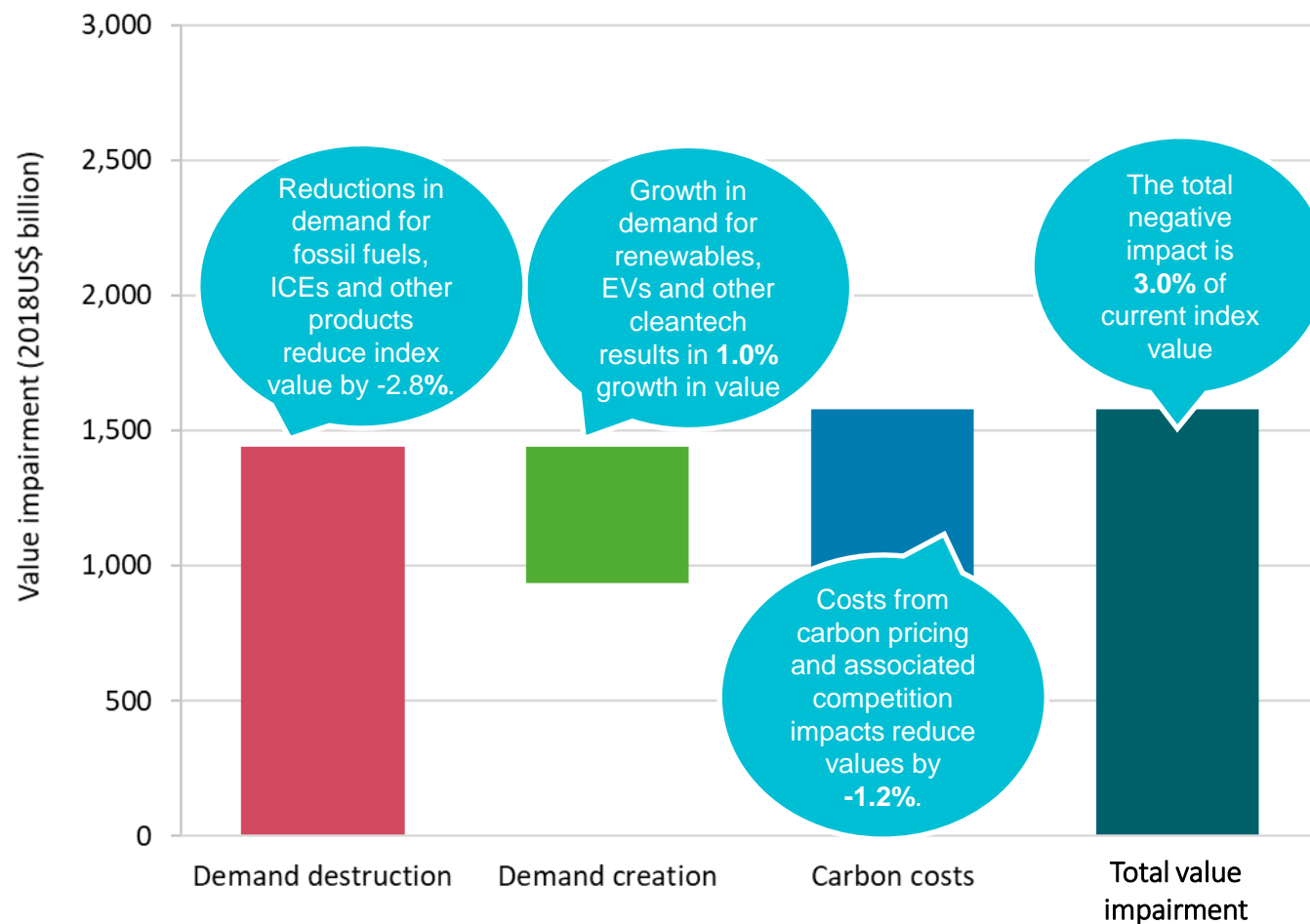
The value streams capture the dynamics of the transition, which affects production costs directly through carbon pricing and indirectly through demand changes



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

Source: Vivid Economics

2019 Example: the impact on the current value of the world index was modest in percentage terms, although it implies that US\$1.6 trillion (over half of UK GDP) would be wiped off the index



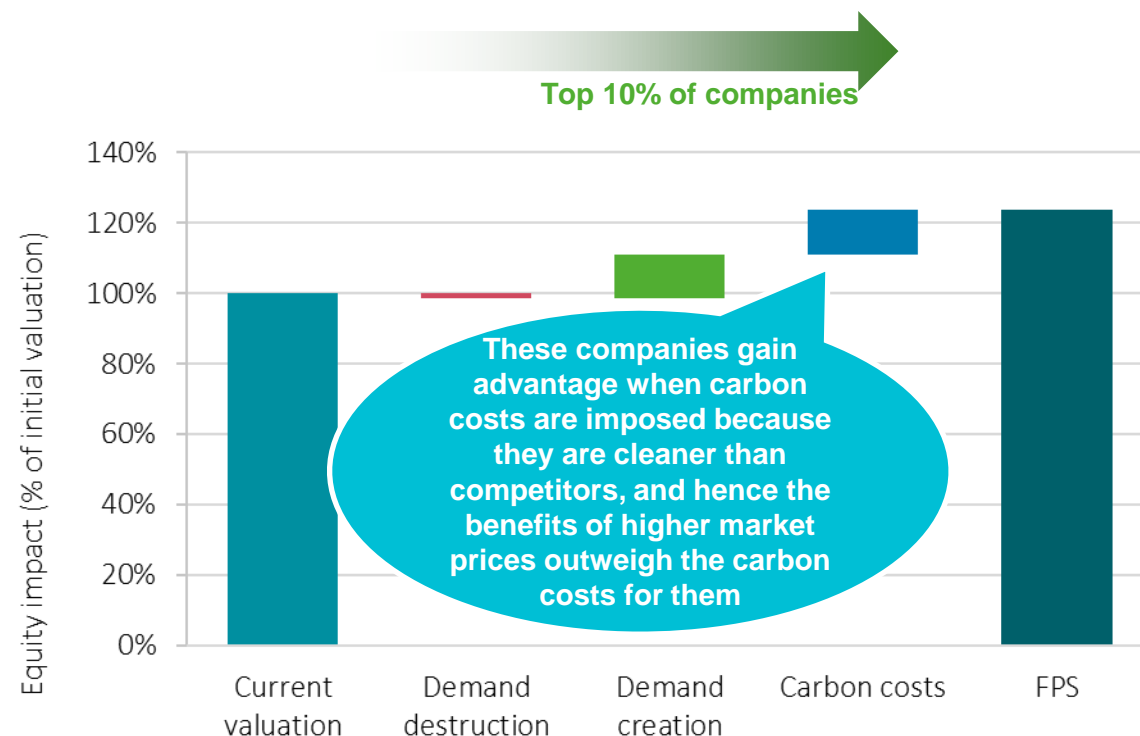
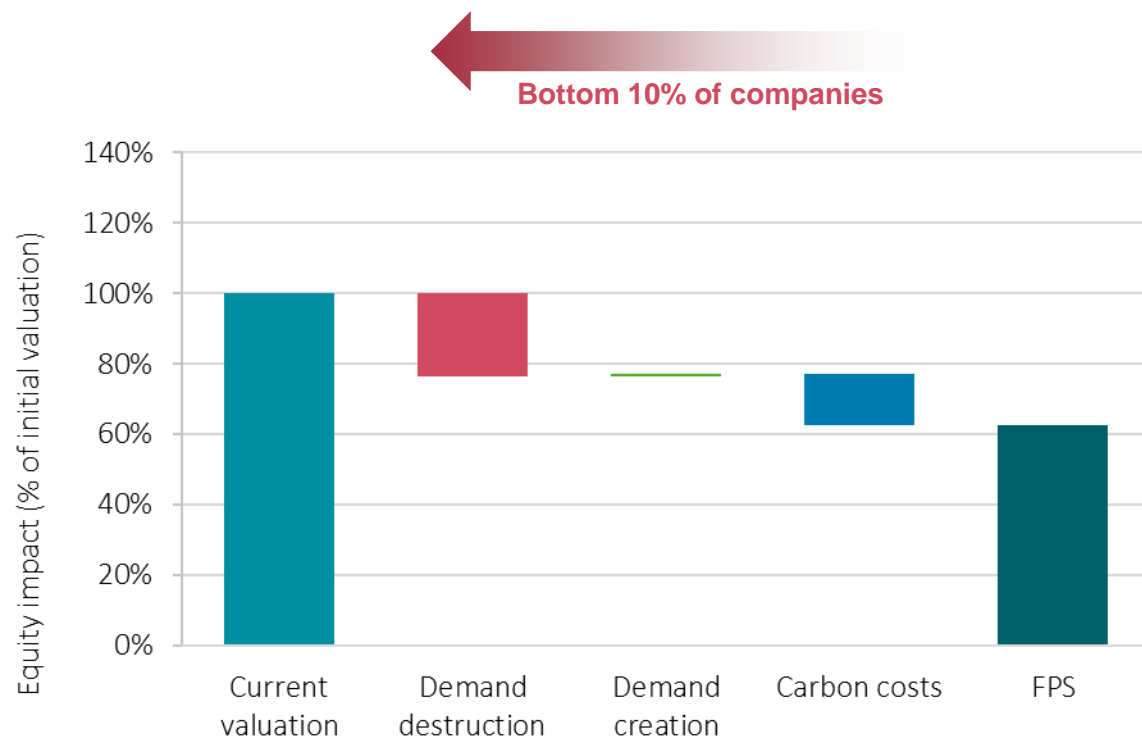
Note: Carbon revenues are government revenues from carbon pricing (see State and Trends of Carbon Pricing 2019, World Bank). Detail on timing of repricing can be found in the Technical Annex.

Source: Vivid Economics Net Zero Toolkit



2019 Example: Impacts for the top and bottom performers within the index are driven by different value streams

- The **bottom 10%** of companies face significant **demand destruction** and **suffer from carbon costs**
- The **top 10%** of companies experience significant **demand creation** and **benefit from a carbon cost advantage**

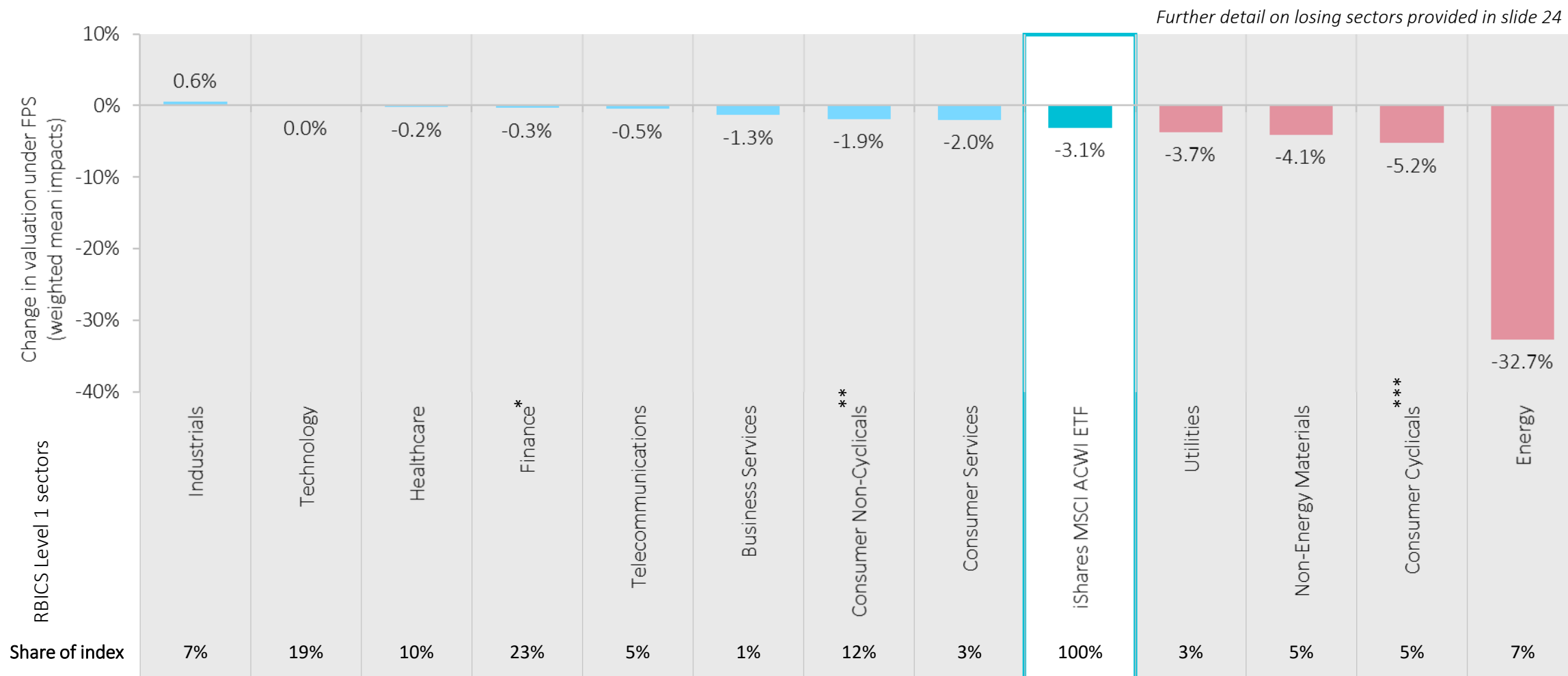


Note: For further within sector analysis, see [Annex](#)

Source: Vivid Economics Net Zero Toolkit




2019 Sectoral Example: Overall index-level impacts are small in percentage terms since the majority of companies in the index are in sectors with low exposure to climate policy

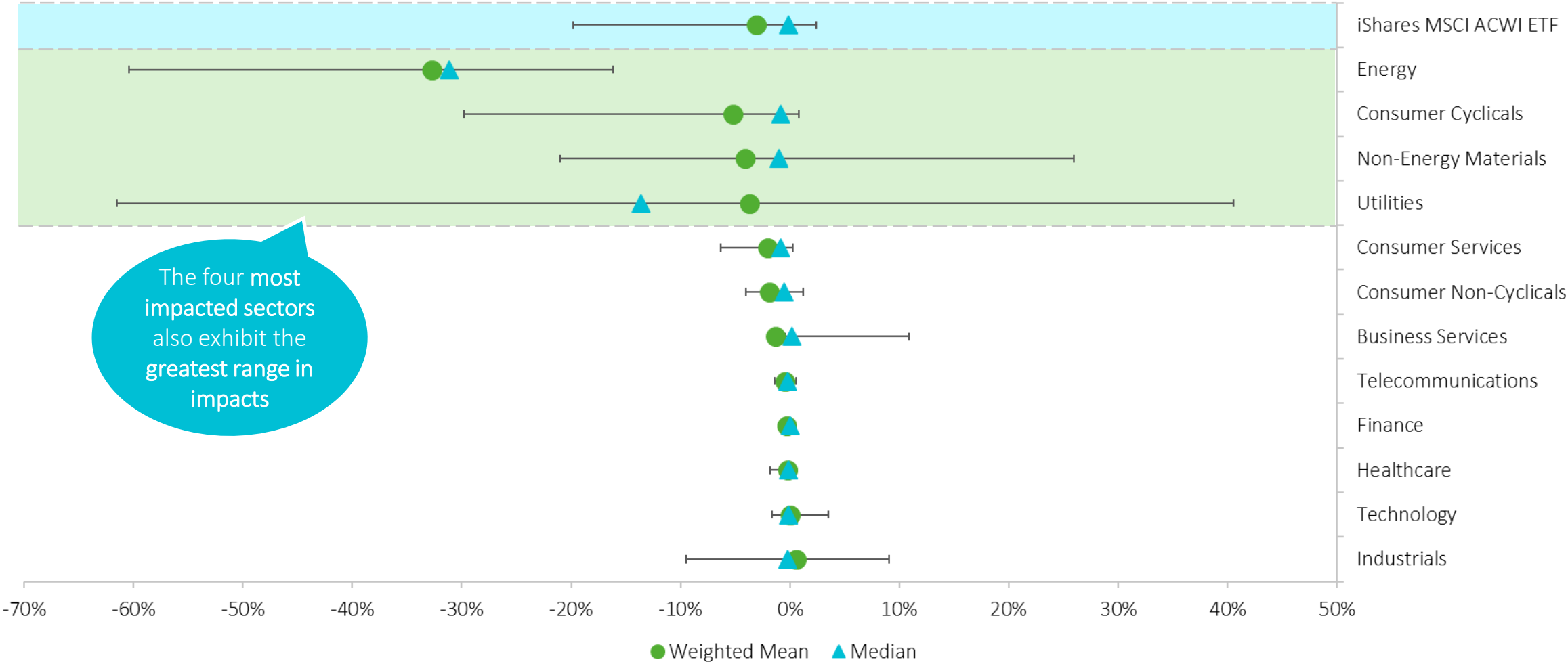


* Finance sector impacts do not include impacts on financial holdings. ** Consumer Non-Cyclicals include Agriculture. This sector is explored further in the sector insights section. *** Consumer Cyclicals include Automobiles (see sector results for further detail).

Source: Vivid Economics Net Zero Toolkit



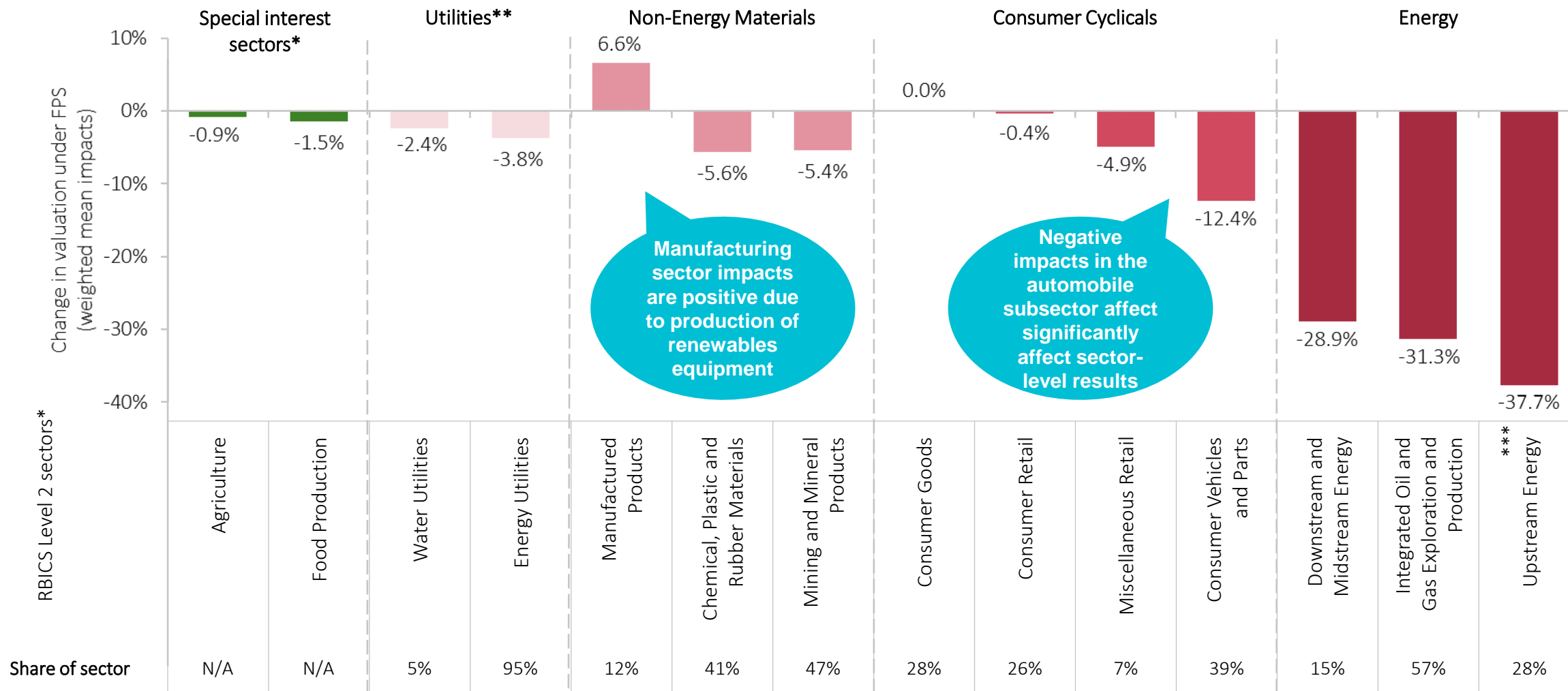
2019 Sectoral Example: Within-sector variation can be significant, particularly for the four most impacted sectors in the index: Energy, Consumer Cyclicals, Non-Energy Materials and Utilities



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



2019 Sectoral Example: Zooming in on the sectors with the most negative impacts on average and special interest sectors, it is clear that subsectors can experience considerably different impacts

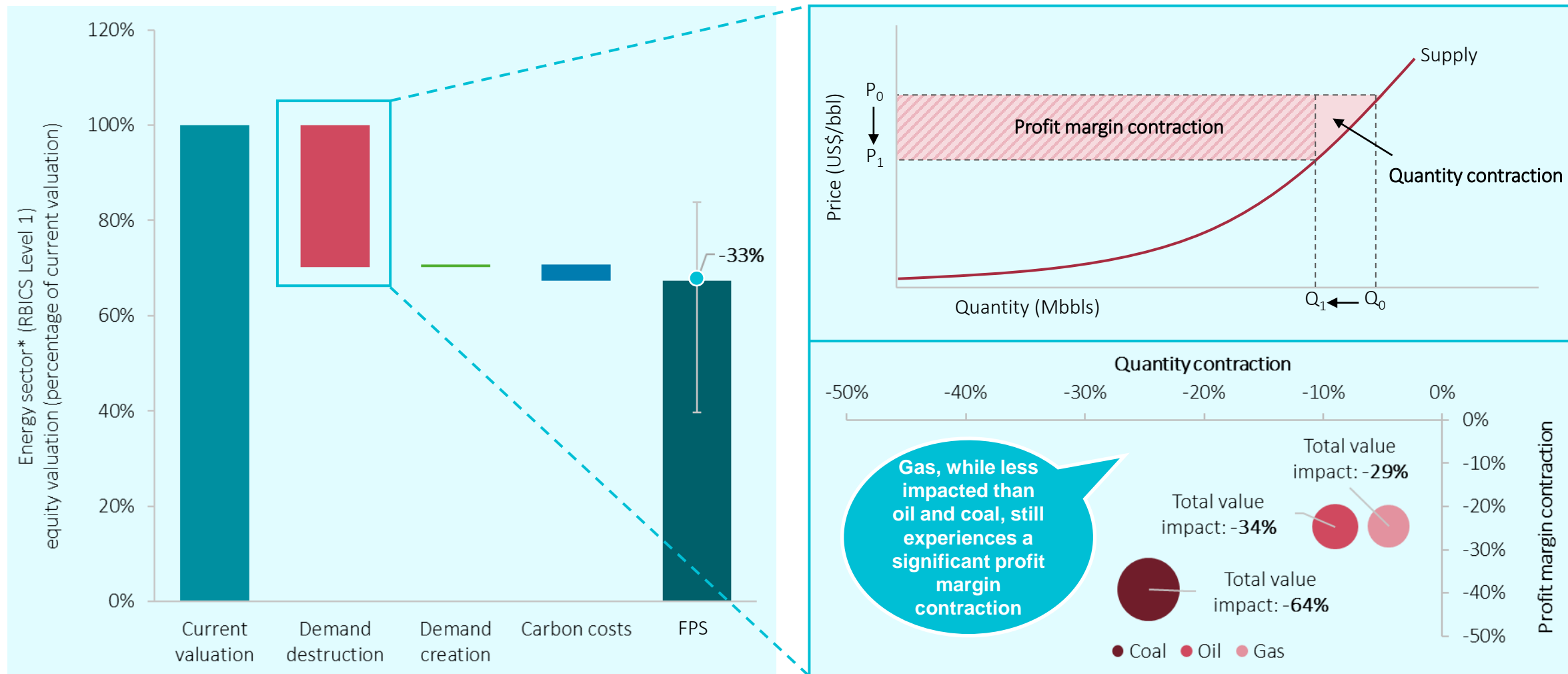


* The special interest sectors are contained Consumer Non-Cyclicals. Agriculture is a Level 3 subsector, Food production a Level 4 subsector. Sector shares are not available as results for the 'Agriculture' sector are based on oversampling of companies – there are very few agriculture companies in the index.

** Utilities sector broken down to RBICS level 3 to provide further detail. *** Upstream energy includes coal mining and oil and gas exploration and production.



2019 Example - Fossil fuels: The majority of impacts on fossil fuels come from squeezed profit margins from falling prices, rather than reductions in the quantity produced






Notes: The error bar on the left graph indicates the 10th and 90th percentiles of impact in the sector. Value of the dot is weighted average impact.

*The energy sector includes upstream, downstream and midstream sectors and cover oil, gas and coal production

Source: Vivid Economics Net Zero Toolkit

Example outcomes for companies driven by the IPR Forecast Policy levers*, particularly the coal and ICE phase-out, carbon pricing and zero-carbon power

Company (anonymised)	Description	Coal phase-out	ICE sales bans	Carbon pricing	CCS and industry decarbonisation	Zero-carbon power	Energy efficiency	Land use-based greenhouse gas removal	Agriculture
	A Utility (primarily renewable generation)	✓	(✓)	✓	X	✓	(✓)	X	X
	B Utility (primarily coal generation)	✓	(✓)	✓	X	✓	(✓)	X	X
	C Integrated Oil & Gas	(✓)	✓	✓	✓	(✓)	(✓)	X	X

Indirect effect through demand for electricity




Indirect effect through demand for power

Indirect effect through demand for gas power

Indirect effect through demand

Note: Further information on the IPR Forecast Policy Levers can be found on the [PRI website](#).
Source: Vivid Economics analysis

Utilities with more renewable generation gain at the expense of emissions intensive fossil fuel generators, and oil & gas suffer predominantly from falling demand

Company (anonymised)	Description	Company emissions intensity / market intensity*	Current valuation	Value streams			Total FPS impact
				Demand destruction	Demand creation	Carbon costs	
	A Utility (primarily renewable generation)	0.31	100%	-0.1%	0.4%	40.9%	41.3%
	B Utility (primarily coal generation)	3.71	100%	0.0%	2.7%	-62.5%	-61.5%
	C Integrated Oil & Gas	0.39	100%	-27.2%	3.2%	3.6%	-22.2%

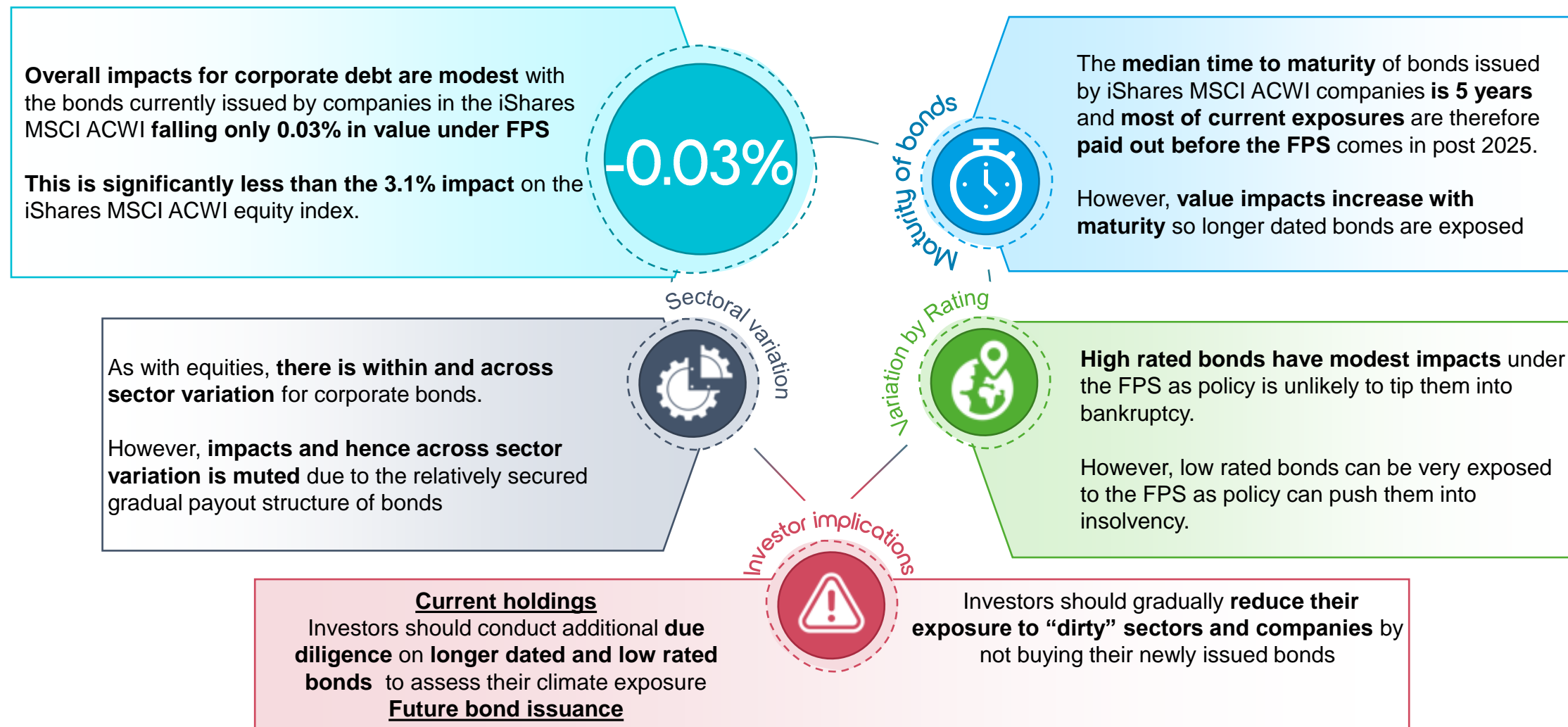
Small renewable energy equipment business

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

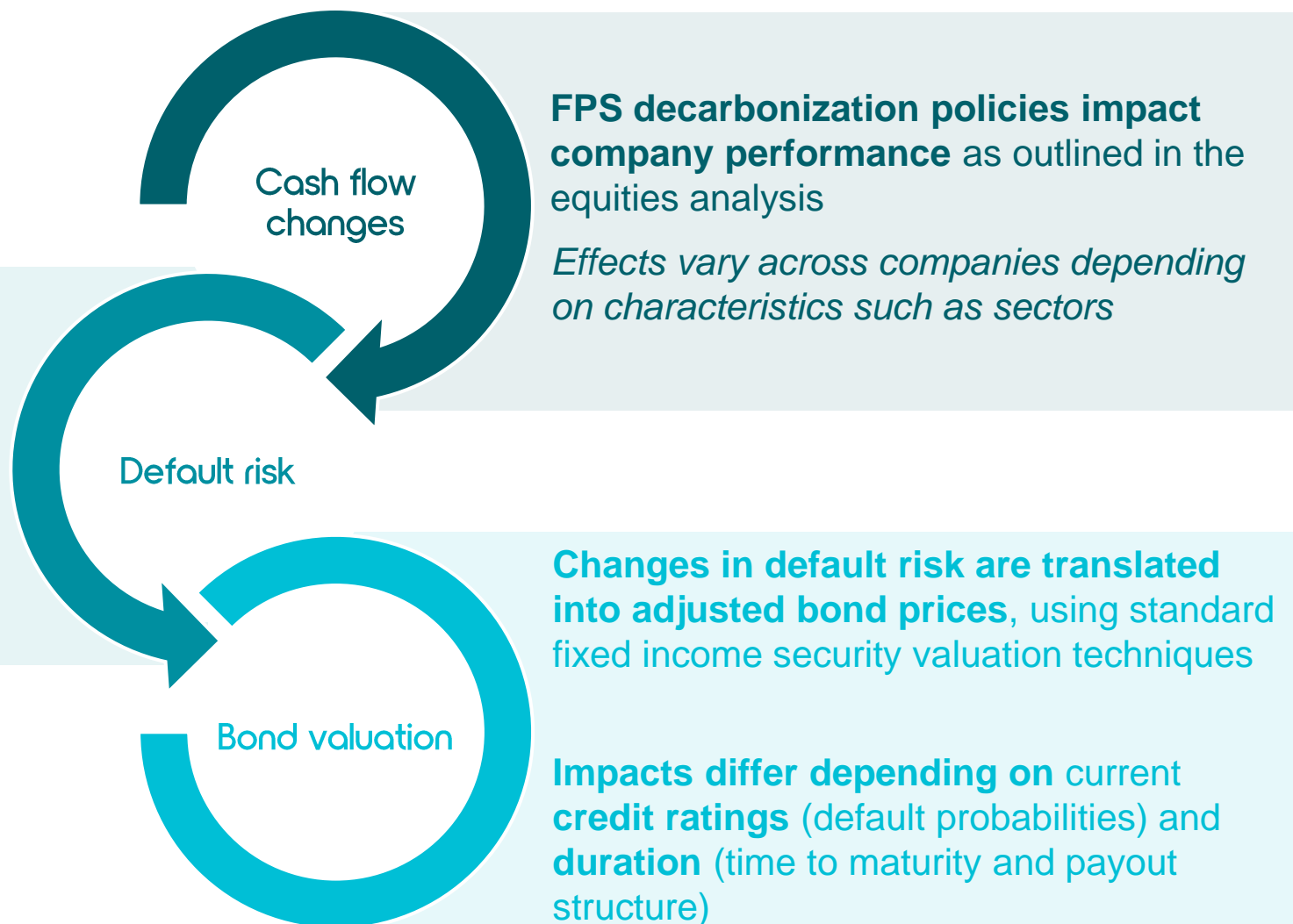
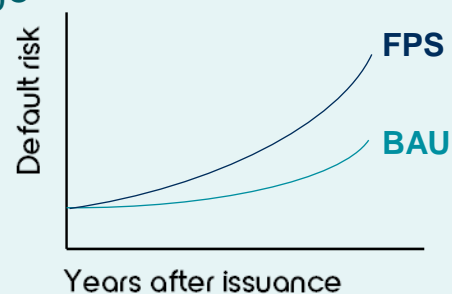
Corporate Debt

Key Findings: Corporate debt impacts are modest as most issued bonds mature before the FPS kicks in, which presents a realignment opportunity for investors

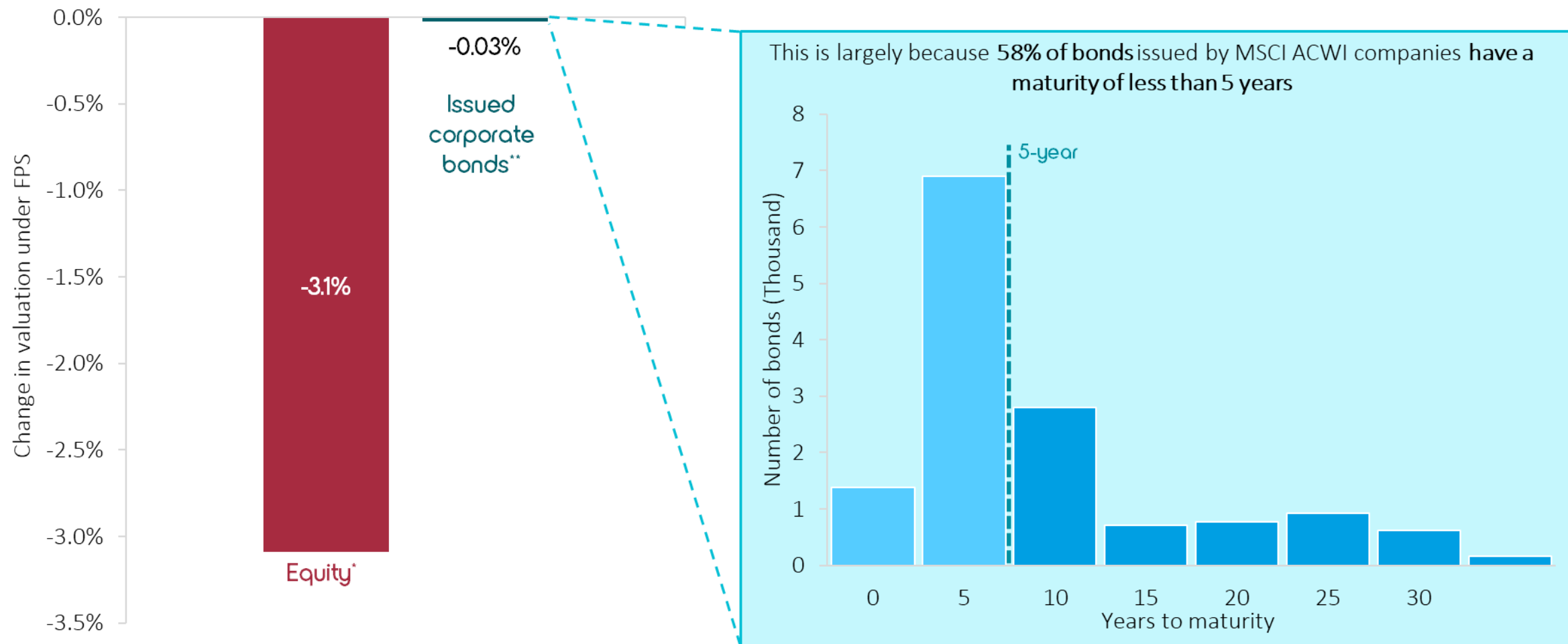


Changes in company fundamentals arising from the FPS affect default risk and as a result corporate bond valuations

Changes in cash flows impact default risk, as companies ability to service their debt change

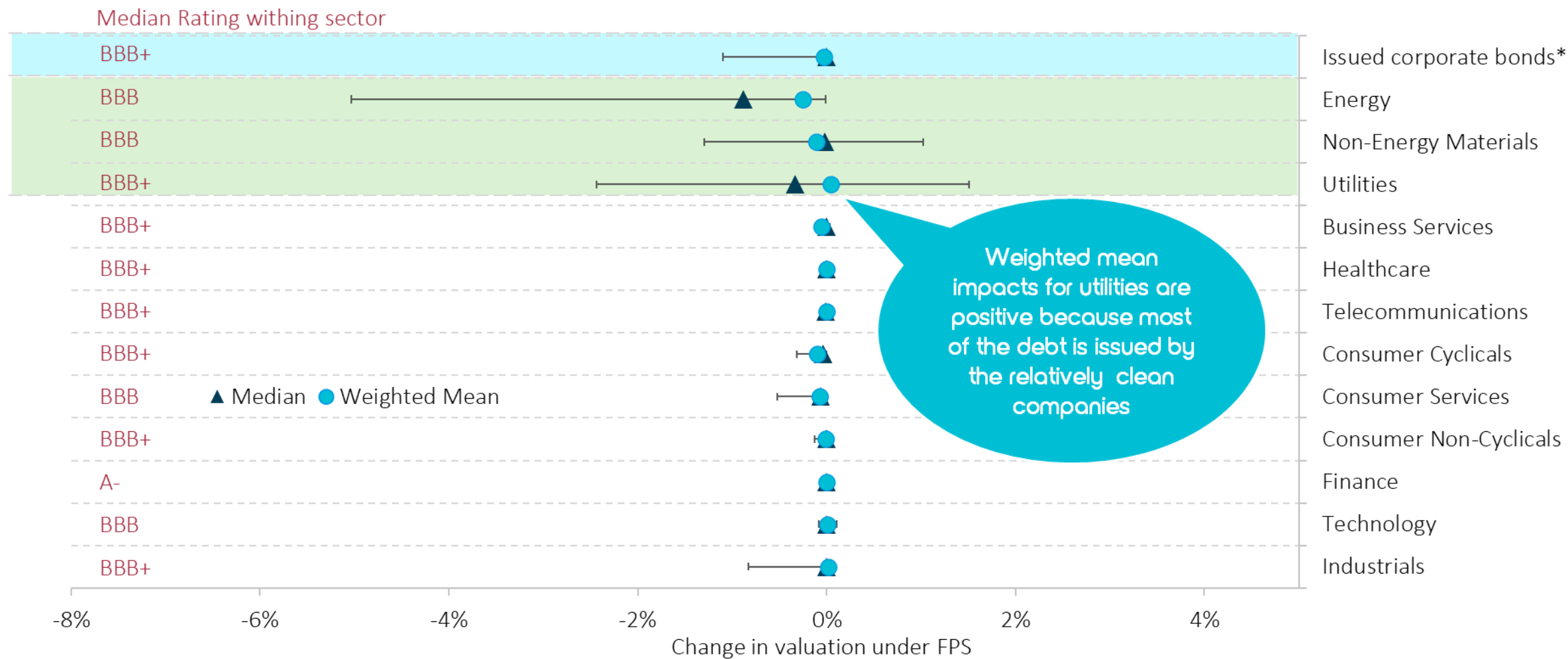


Overall impacts are modest relative to equities as most issued bonds pay out before impacts kick in – the majority of analysed bonds have a maturity under 5 years



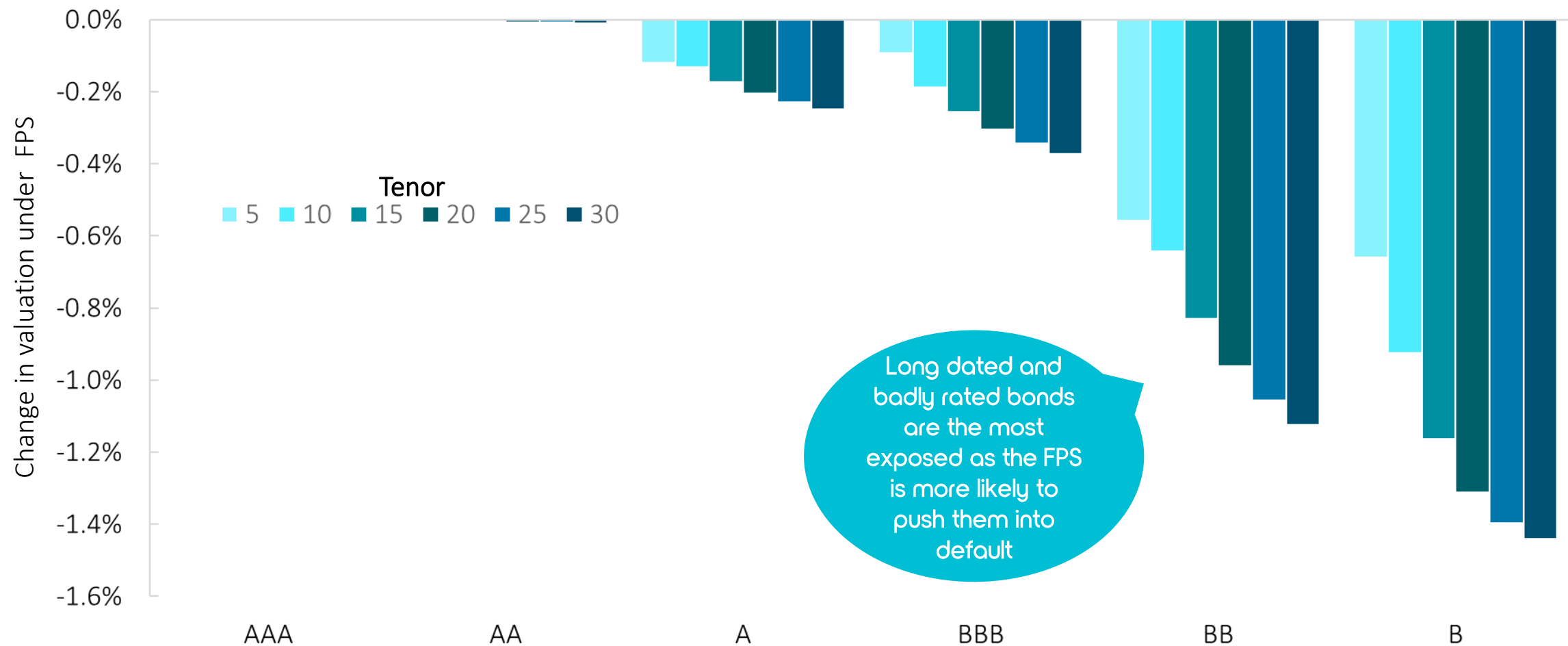
*Equity is based on the iShares MSCI ACWI ETF, Issued corporate bonds** represents bonds issued by companies within the iShares MSCI ACWI ETF
Source: Vivid Economics (Net-zero toolkit)

However, as with equities, within-sector variation can be significant, particularly for: energy, non-energy Materials and utilities



Notes: Error bars indicate the 10th and 90th percentiles of impact within each sector. Sectors: RBICS level 1. Issued corporate bonds* represents bonds issued by companies within the iShares MSCI ACWI ETF Source: Vivid Economics (Net-Zero Toolkit)

Beyond company fundamental, discussed in the equities release, variation in impacts can be explained by differences credit ratings and maturities*

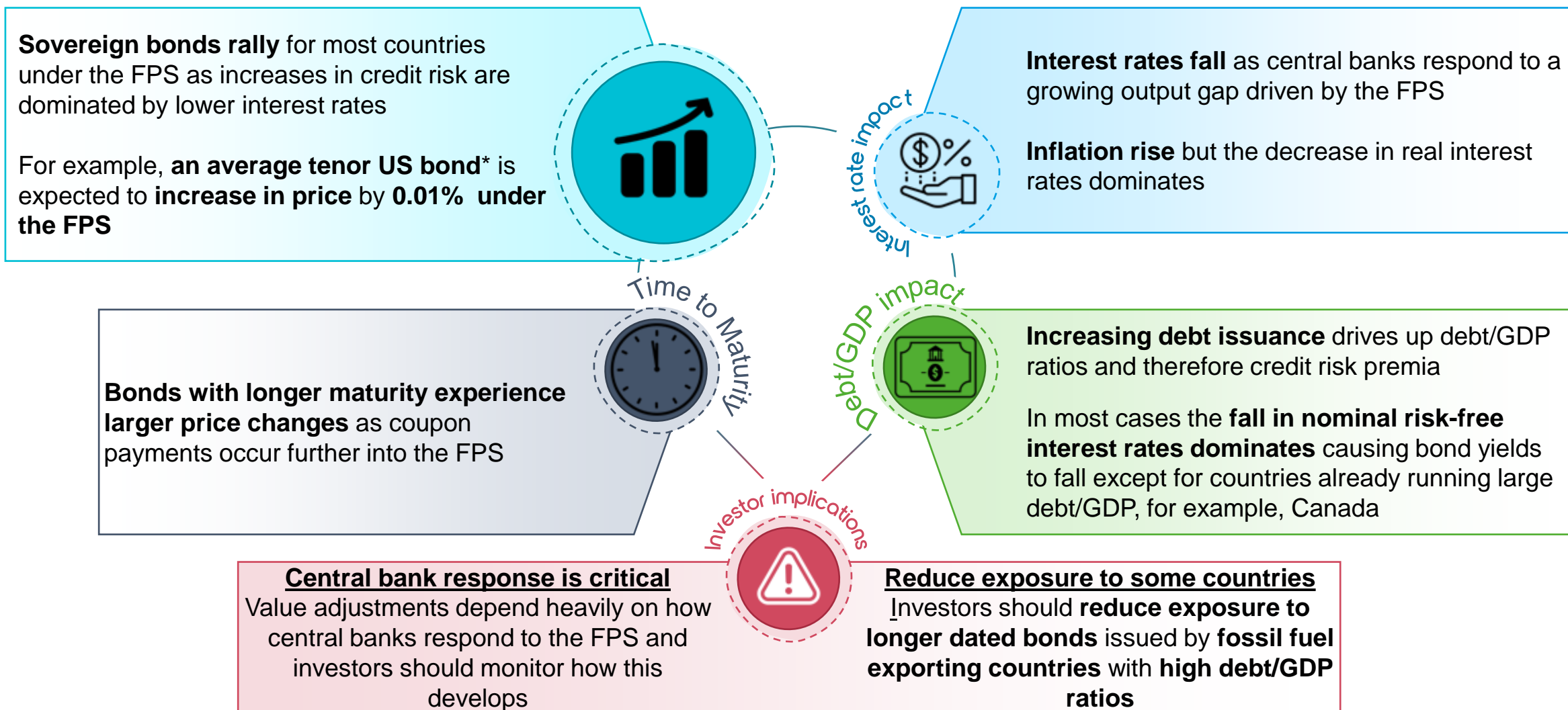


*Due to the lack of availability of long dated corporate bonds >10y the impacts on 30y debt is assessed through “hypothetical” bonds. Overall market on corporate bonds >10y is very small.

Source: Vivid Economics (Net-Zero Toolkit)

Sovereign Debt

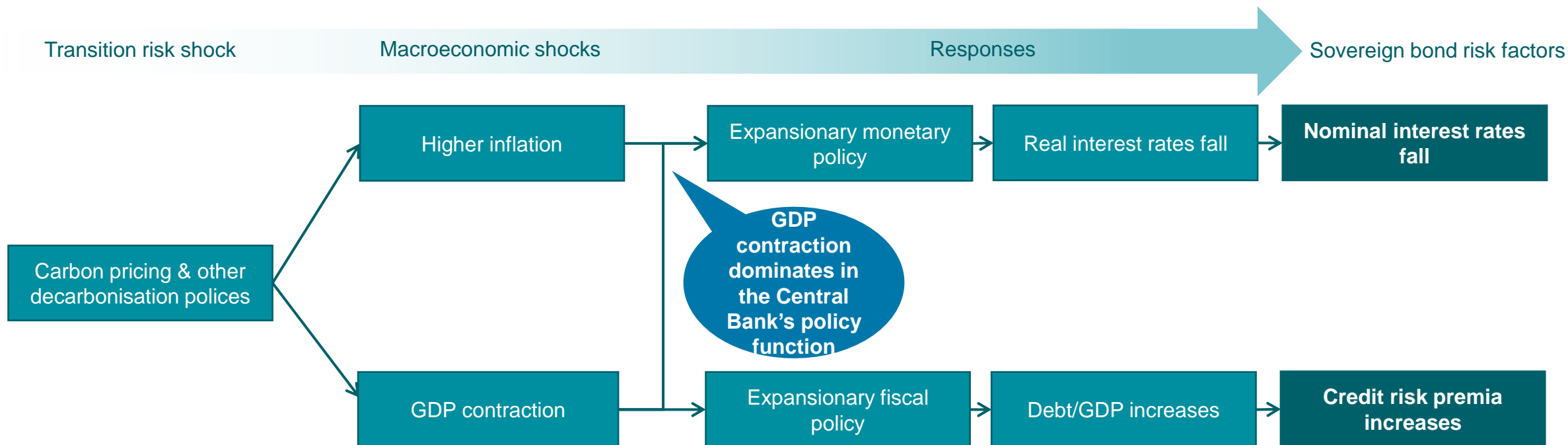
Key Findings: Sovereign bonds tend to rally under the 1.8C FPS as increases in risk premia are offset by central banks cutting interest rates in response to the policy shock



The analysis done on sovereign bond issuance assumes locally issued debt

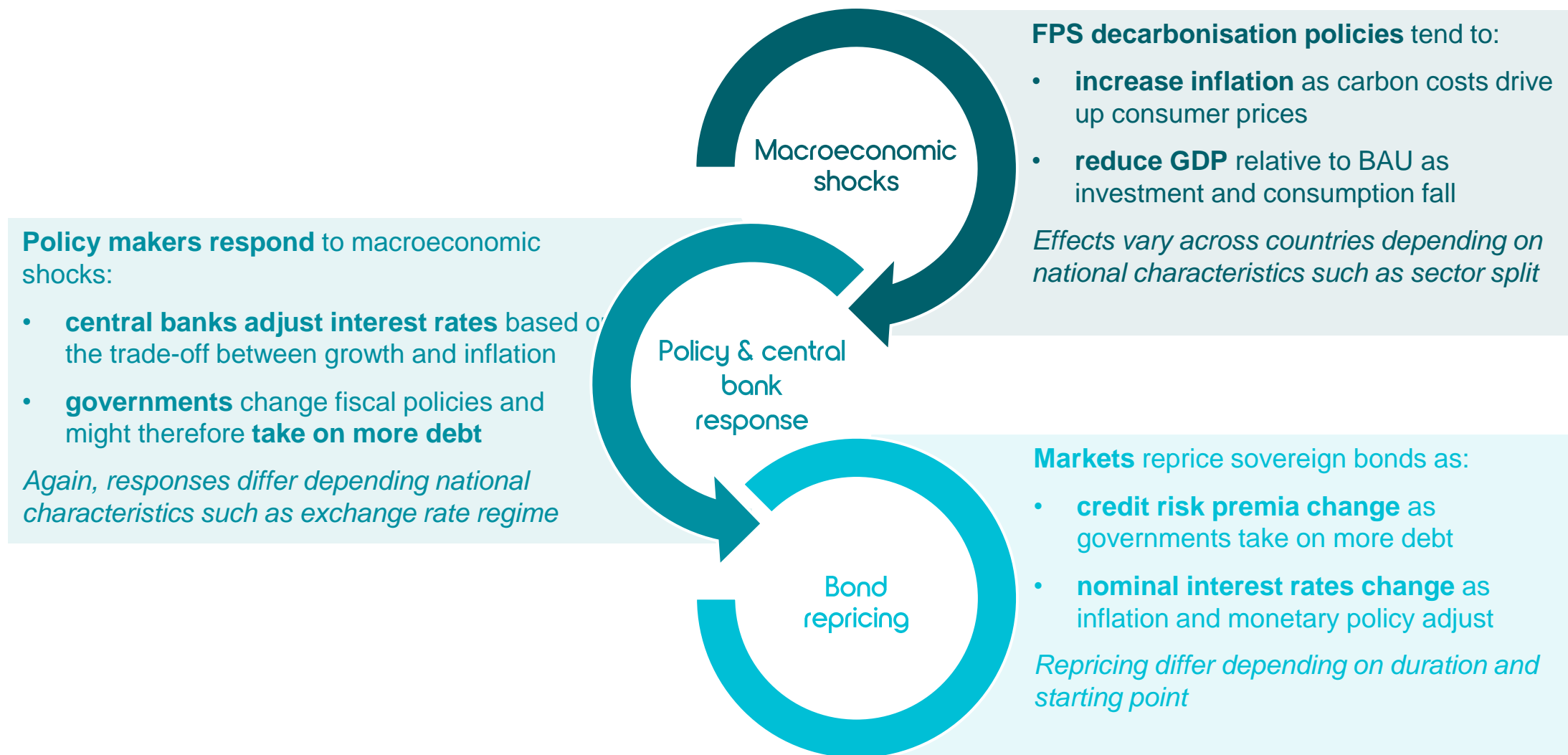
*Average tenor US bond is 6 years to maturity

The sovereign bond methodology captures the dynamics of transition, by modelling changes bond risk factors through changes in macroeconomic variables and policy



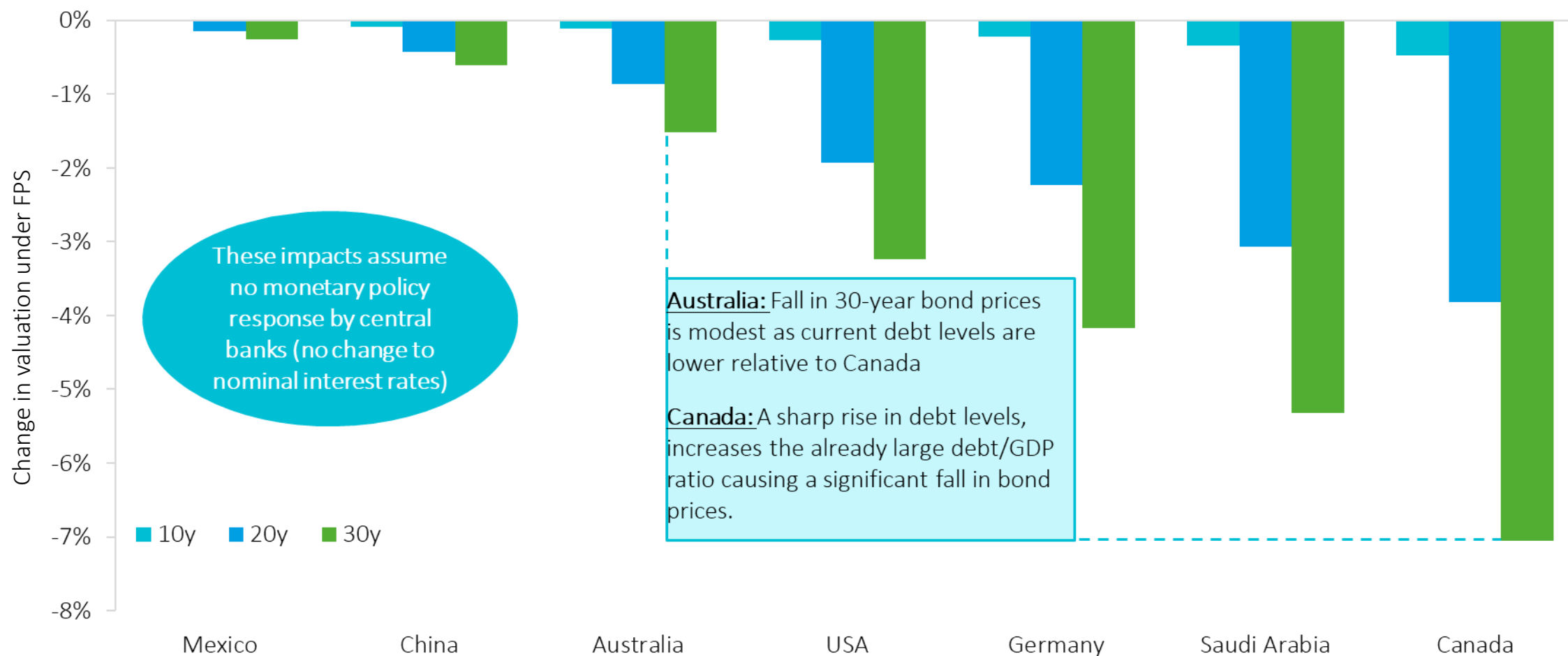
- **The Taylor rule in the macroeconomic model (G-Cubed)** used in this analysis leads to lower interest rates as central banks optimise over lower output vs higher inflation, induced by carbon pricing policies.
- **The diagram above depicts the *generic* impacts of the FPS on sovereign bond risk factors, but these vary by country.**
 - ◇ Current macroeconomic conditions and FPS impacts differ by country, therefore policy response (fiscal and monetary) differ by country as well.

Macroeconomic shocks and policy responses change nominal interest rates and credit risk premia which lead to a repricing of sovereign bonds



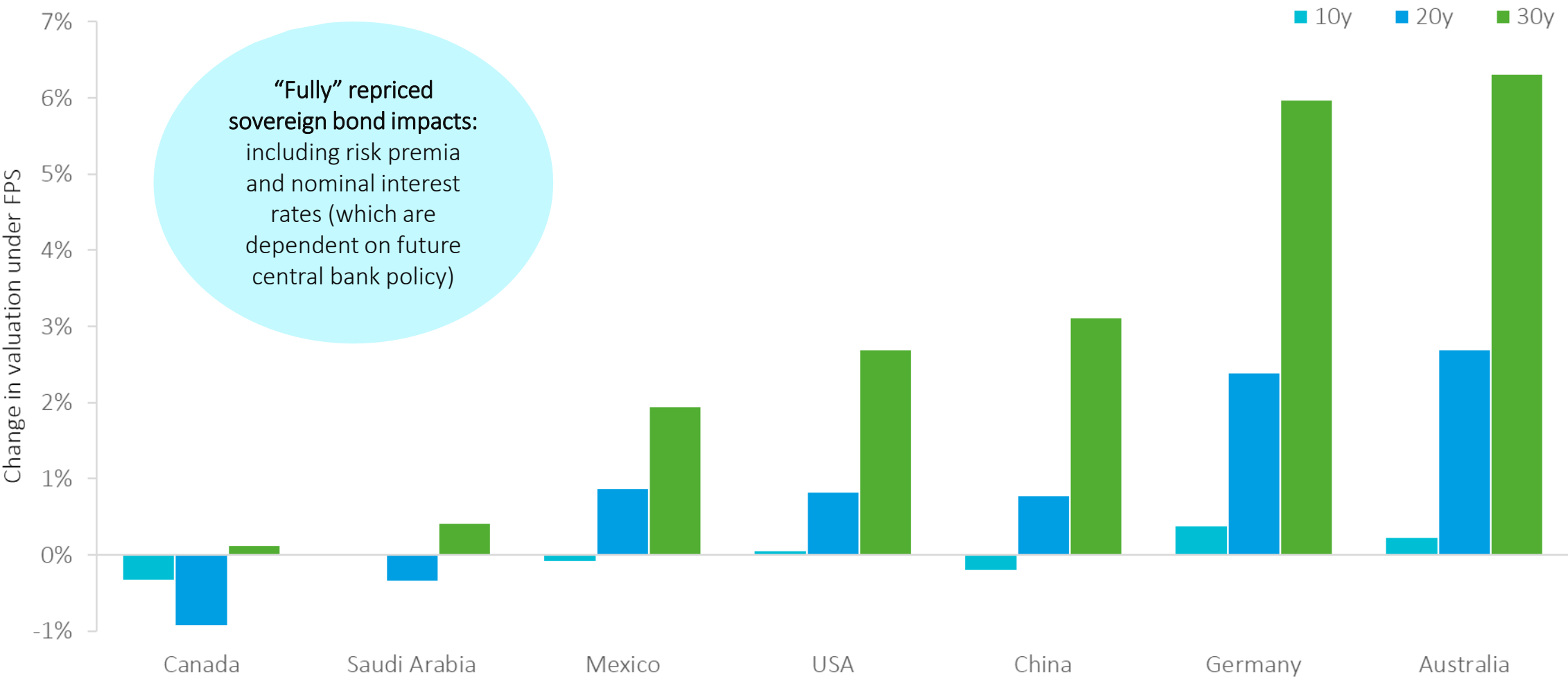
Macroeconomic modelling for the IPR FPS was conducted using G-Cubed, a multi-country, multi-sector intertemporal general equilibrium model of the global economy

2019 Example - In isolation, bond prices can fall significantly from rising debt/GDP as the sovereign default risk premia increases



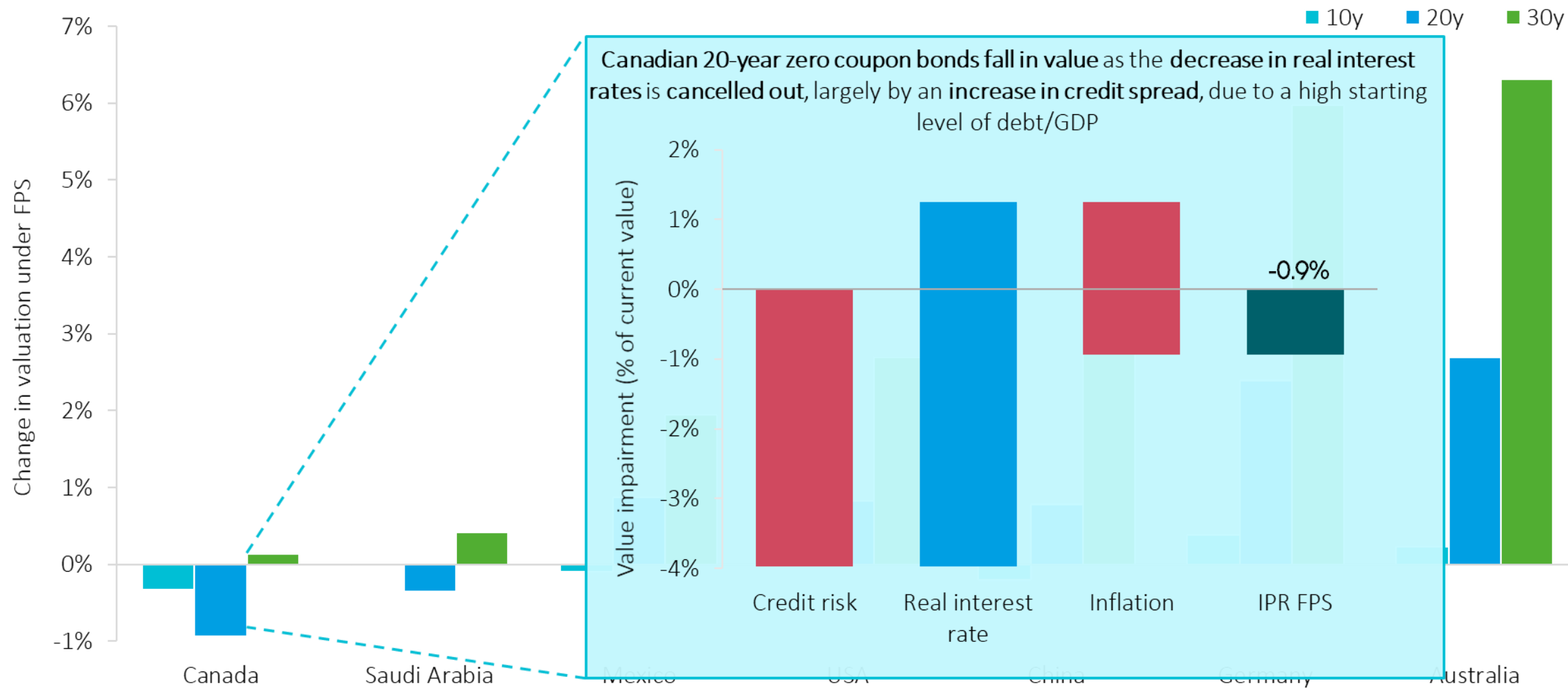
Source: Vivid Economics (Net-Zero Toolkit)

2019 Example - Full valuation impacts vary significantly across countries and by maturity, with longer-dated bonds having larger impacts, but most bonds rally under FPS



For bonds with tenors of 5 years or less, there is no impact as FPS scenario impacts materialise after 2025
Current (04/02/2020) yields are taken from Thomson Reuters
Source: Vivid Economics (Net-Zero Toolkit)

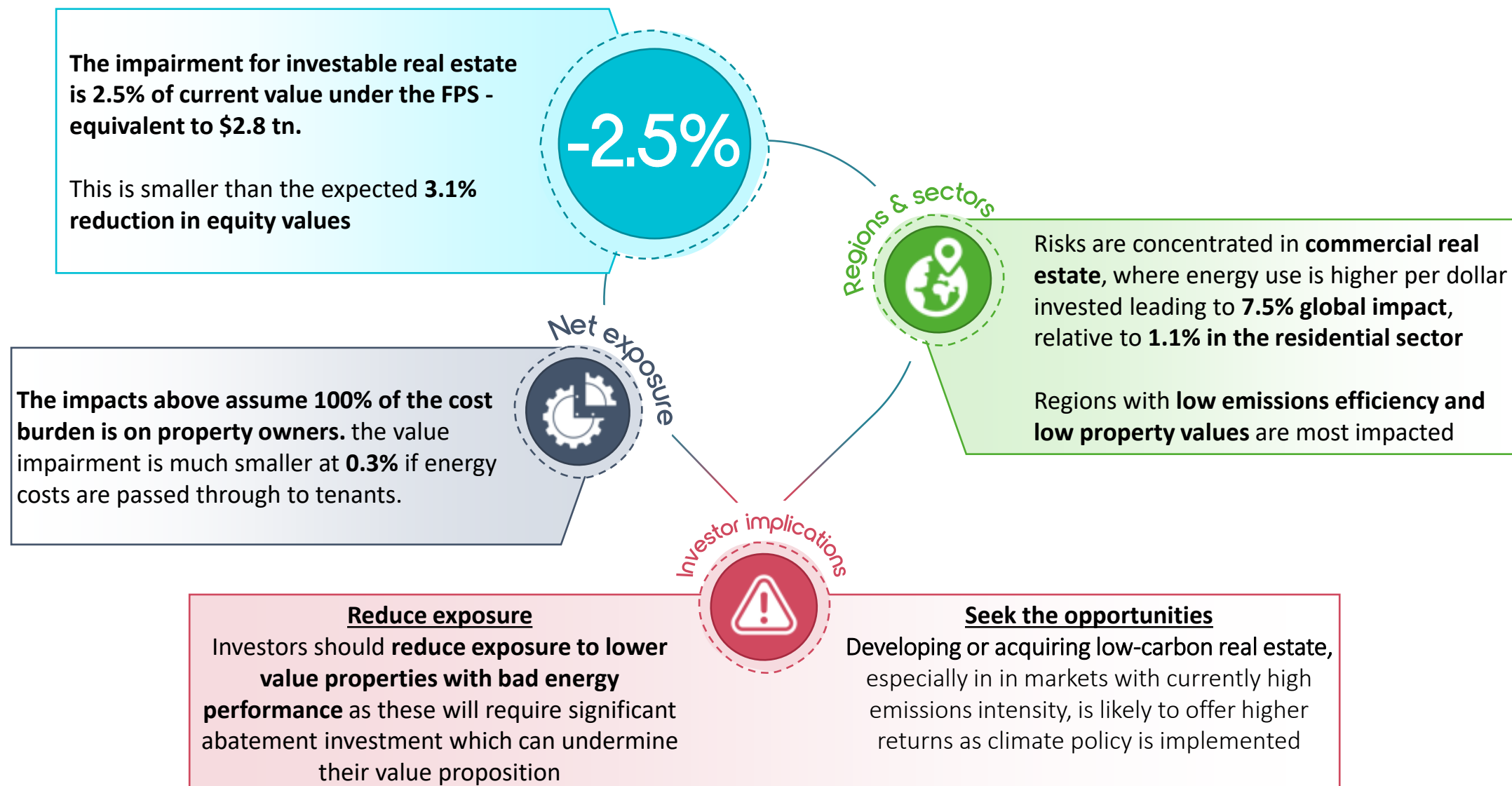
2019 Example - Higher credit risk can drive bond value reductions, but this is only for a small subset of highly exposed and leveraged countries such as Canada



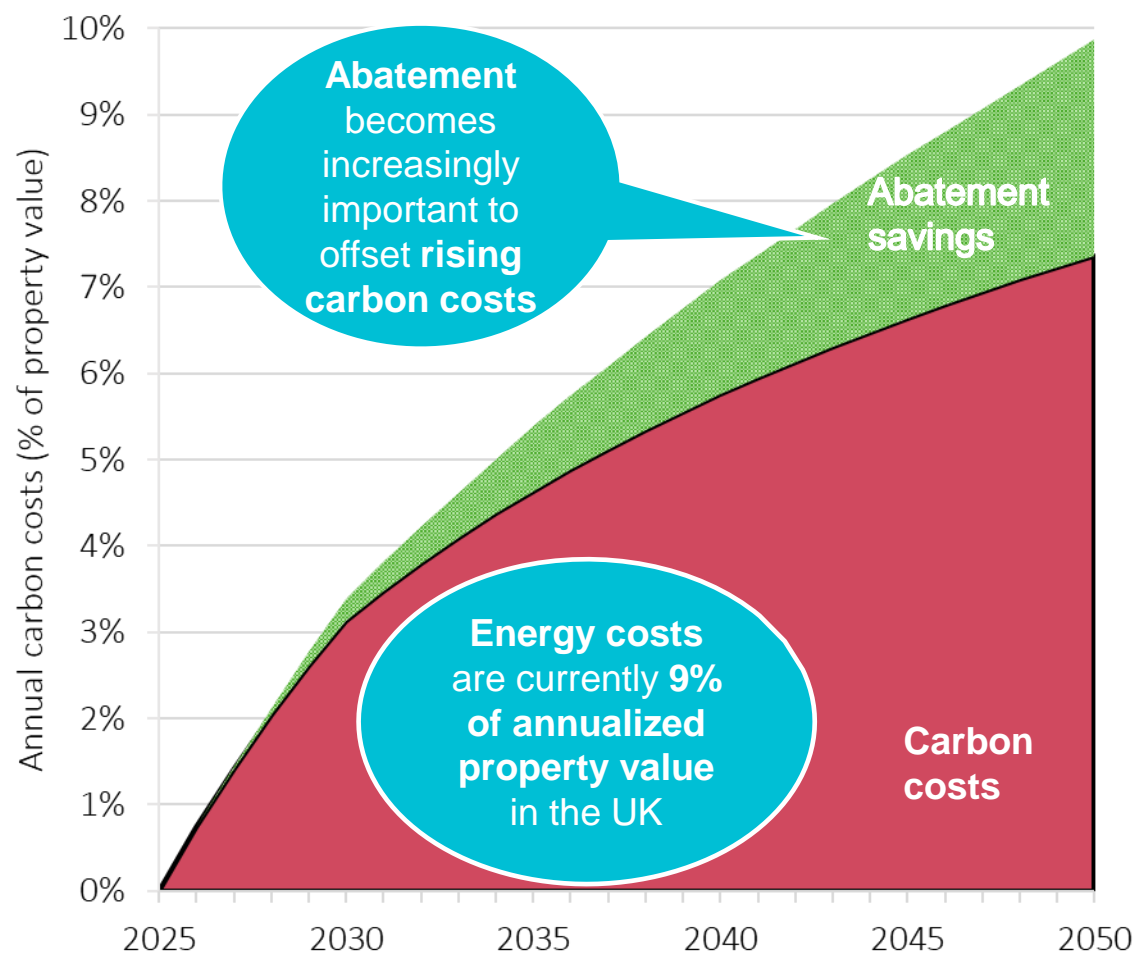
For bonds with tenors of 5 years or less, there is no impact as FPS scenario impacts materialise after 2025
 Current (04/02/2020) yields are taken from Thomson Reuters
 Source: Vivid Economics (Net-Zero Toolkit)

Real Estate

Key Findings: Real estate is almost as exposed as equities with impacts concentrated in commercial real estate and regions with high emissions intensity



2019 Example - Low-emission properties become increasingly attractive under the FPS as carbon pricing increases energy bills



As energy costs rise, differentiating factors will become increasingly important for individual investors. Factors which will affect property level impacts include:



Physical characteristics: e.g. age, location, energy consumption by source, historic energy efficiency refurbishment expenditure*



Sensitivity of demand to price changes (by building type)



Building-level market value (current), discount rates used in current valuations

Note: figures assume constant scope 2 emissions intensity – any reduction in scope 2 emissions intensity will reduce carbon costs.

*If none of the above: average CO₂ emissions (by building type)

Infrastructure

2019 Example - Large parts of global infrastructure is built for the high carbon economy and therefore exposed to the FPS

The iShares Global Infrastructure index falls by -11%, which is significantly larger than the impact to listed equity of -3.1%

Infrastructure assets are typically investor specific but broad exposure can be understood through proxy infrastructure equity indices



Infrastructure impacts are large as the asset class is **more exposed to sectors that are significantly impacted from the FPS**, for example Utilities (-14%) and Energy (-29%). However cleaner infrastructure assets provide potentially large opportunities for targeted investors



Investor implications



Large potential benefits by tilting to cleaner infrastructure. There is also need for **increased due diligence** on existing

holdings particularly within sectors that are exposed to the FPS, for example Energy

Private Equity

2019 Example - Private equity is likely to capture more green upside through smaller cleantech companies

The impact to a proxy **private equity portfolio based on a representative portfolio of small and mid-cap listed equities is -0.7%** which is smaller than the impact to listed equity of -3.1%

Private equity assets are investor specific but broad exposure can be understood through the use of small and mid-caps as proxies



Private equity impacts are **relatively small at the asset class level**. The **asset class is more exposed to cleantech companies in the industrials sector (relative to MSCI ACWI)**, which shows modest gains these are cancelled out by losses in energy



Investor
relations

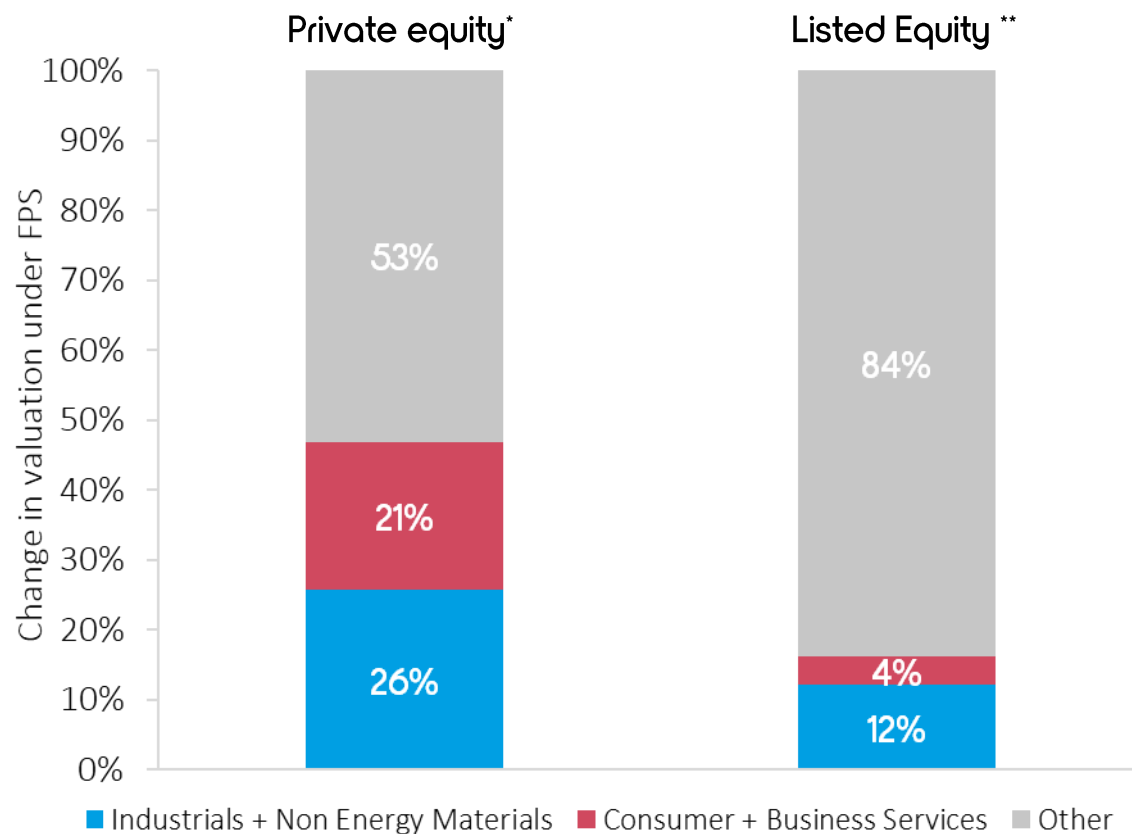


Large potential upside by investing in growing cleantech companies that have not matured to listed indexes that tend to contain

more established firms. Investors also need to be cautious of “dirty” energy firms in the sector which experience losses

2019 Example - Private equity investment is disproportionately higher in industrial sectors which are more likely to benefit from cleantech growth, leading to a small overall impact

Sector breakdown



As private equity is owner specific, there is limited data available.

This analysis **constructs a private equity portfolio based on a representative portfolio of small and mid-cap** listed equities, with firm size and sector exposure based on the average private equity holdings***

The private equity portfolio **is more exposed to smaller cleantech companies'** in the industrials sector. **Private equity is also more exposed to "cleaner" sectors** for example consumer and business services (10%), relative to listed equity

Other* includes technology, healthcare, consumer products, business services, financial services, leisure services, real estate, transport, construction, defence and agriculture

Notes: **listed equity based on MSCI ACWI ETF *PE portfolio based on a representative portfolio of small and mid-cap listed equities, with firm size and sector exposure based on <https://www.pwc.de/en/private-equity/private-equity-trend-report-2020.html>

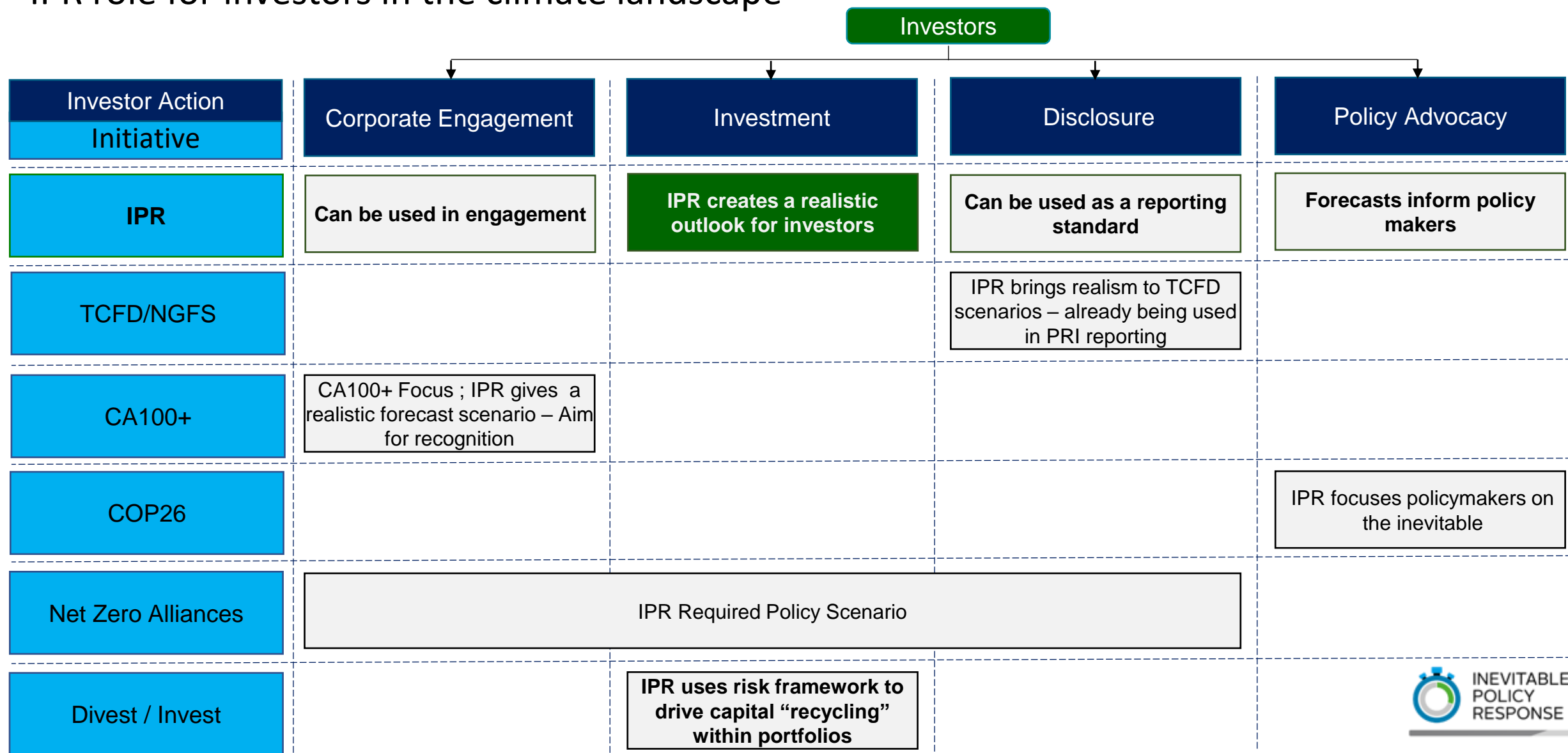
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APPENDICES

IPR role for investors in the climate landscape



Progress to date

Thematic highlights

Clean energy shares jumped 142% in 2020, while oil shares fell

WilderHill New Energy Global Innovation Index (NEX) versus NYSE Arca Oil Index, full year 2020 (rebased)



Source: BloombergNEF. NEX is WilderHill New Energy Global Innovation Index

Thematic highlights

The market value of clean energy ETFs jumped 10-fold in 2020

Dollar market cap and number of shares outstanding in nine global clean energy ETFs, full year 2020 (rebased)



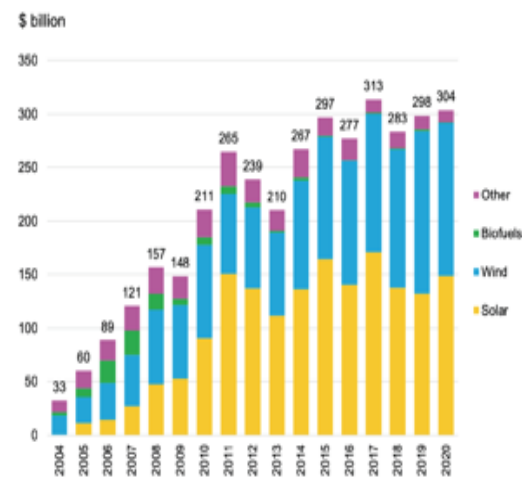
Source: BloombergNEF. Dollar values are indexed to 100 on January 1, 2020

Progress to date - Bloomberg

Energy transition investment: renewable energy

Global renewable energy investment running at around \$300 billion a year

Global new investment in renewable energy by sector

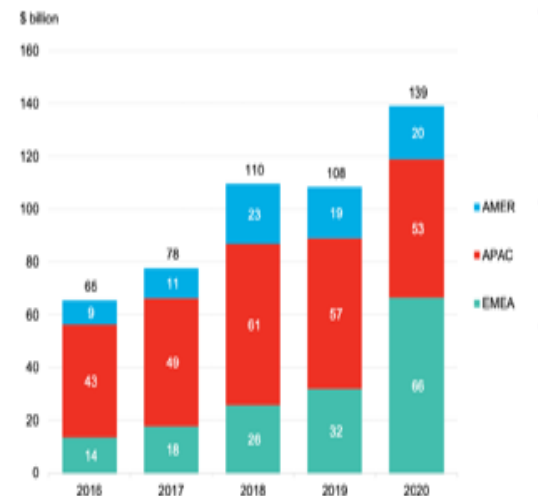


Source: BloombergNEF

Energy transition investment: electrified transport

Global outlays on electric vehicles and charging infrastructure are rising

Electrified transport investment by region

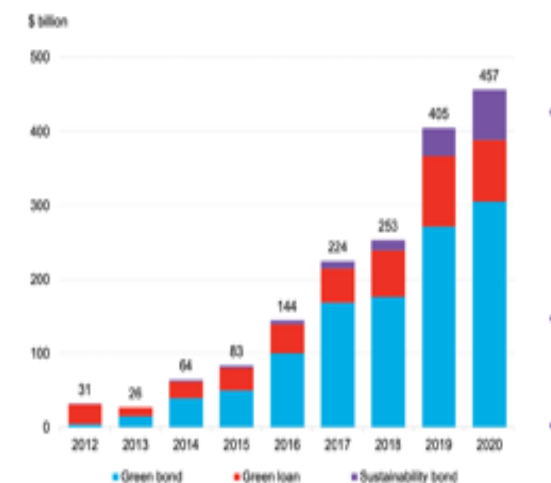


Source: BloombergNEF. Note: * ET investment includes investment in vehicles and charging infrastructure. 2020 investment totals include estimated vehicle prices. Excludes two- and three-wheelers. We do not capture private charging investment.

Thematic highlights

Sustainable debt issued for green proceeds nears \$500 billion per annum

Green bond, sustainability bond and green loan issuance

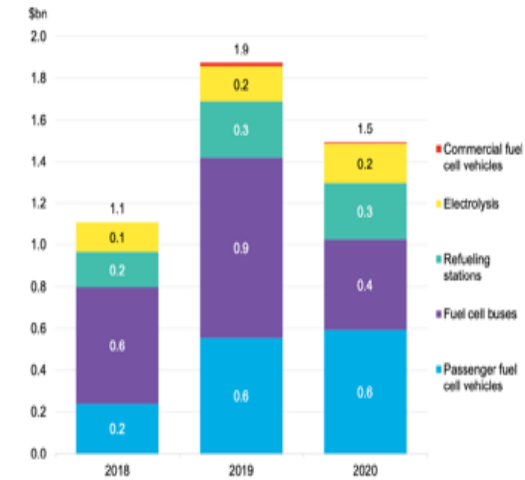


Source: BloombergNEF, Bloomberg LP. * Sustainability-linked instruments are not included, as funds raised are not required to be spent on specific green activities, unlike green bonds and loans, and sustainability bonds.

Energy transition investment: hydrogen

Investment in hydrogen fell in 2020 on a lower level of fuel-cell bus deployments

Global investment in hydrogen by category



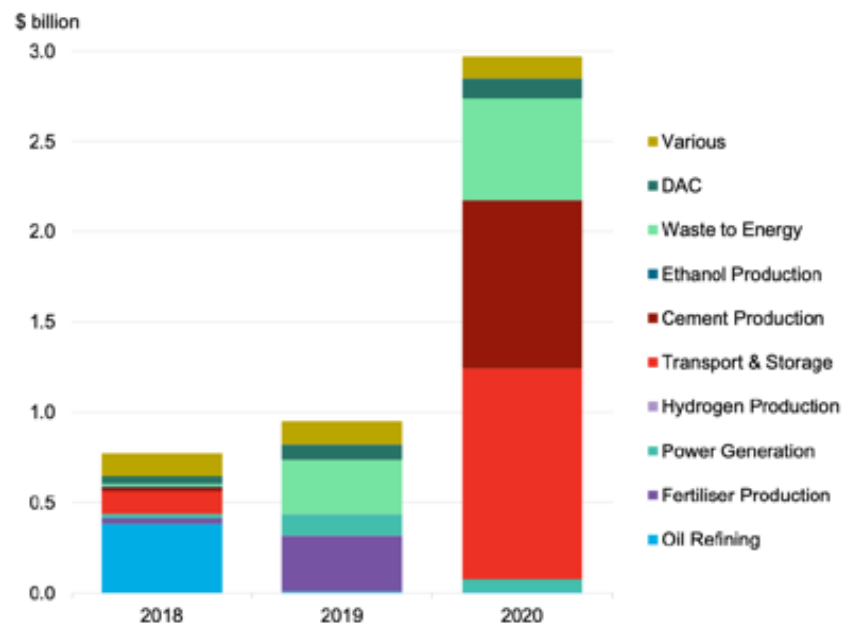
Source: BloombergNEF. Note: not all electrolysis systems included necessarily use clean electricity; refueling stations do not necessarily supply clean hydrogen, and vehicles do not necessarily use clean hydrogen.

Bloomberg NEO data

Energy transition investment: carbon capture and storage

Just a few projects represent most of the investment in CCS since 2018

Global investment in CCS by sector

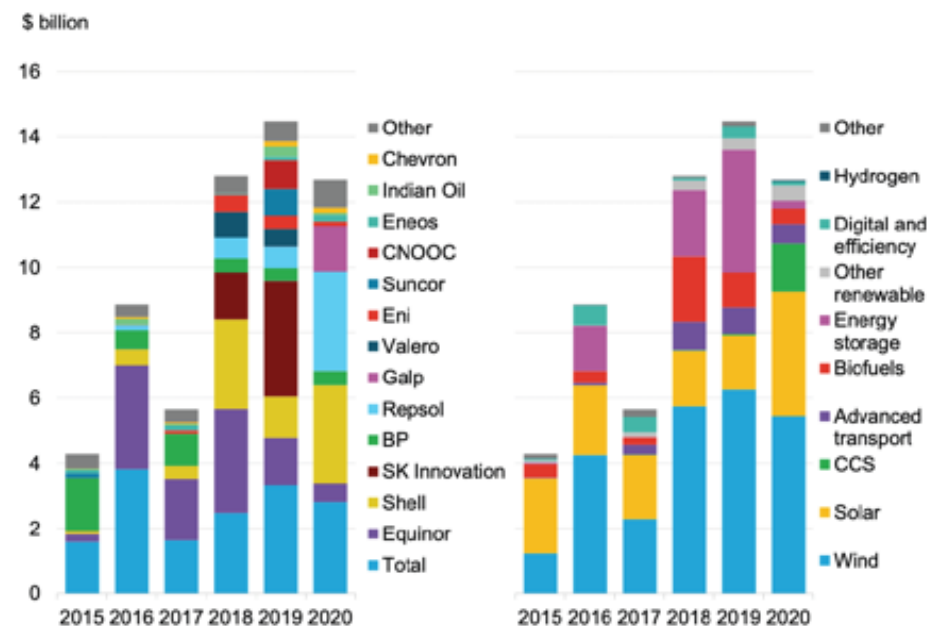


Source: BloombergNEF. Note: expenditure commitments considered only if recipient is announced.

Thematic highlights

Investment by oil and gas companies has held up during the pandemic

Clean energy investment by oil and gas companies, 2015-2020



Source: BloombergNEF, company disclosures. Note: analysis includes all completed deals, and estimated values for undisclosed deals. CCS data excludes non-commercial projects that have not disclosed investment values. Asset finance data may overstate investment by each company where project equity shares have not been disclosed.

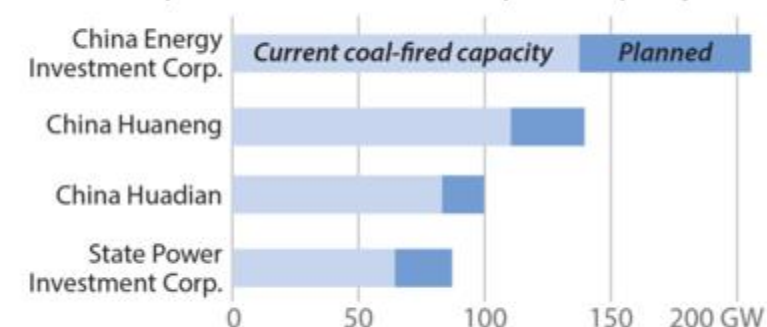
Example risks: China power and investors – its all about debt

- President Xi Jinping's estimated \$21 trillion carbon neutrality pledge
- Highly leveraged, dubious transition strategy but with the implicit Chinese government guarantee priced in to give solid ratings - (A+/Stable)
- The five biggest state-backed power firms have announced plans to develop about 305 gigawatts of new wind and solar capacity in the next five years, according to BloombergNEF, almost twice the amount it estimates the U.S. will install over the same period. At peak generation, the total being added would be about enough to power the whole of Japan

“2021 WILL BE A YEAR FOR RE-CALIBRATING ASSUMPTIONS ABOUT DEFAULT RISK FOR CHINESE SOEs. Fixed income investors learned some tough lessons in 2020 about the Chinese government’s newfound willingness to let SOEs default on debt obligations.” Source: IEEFA

Chinese Power Producers Issue Green Bonds

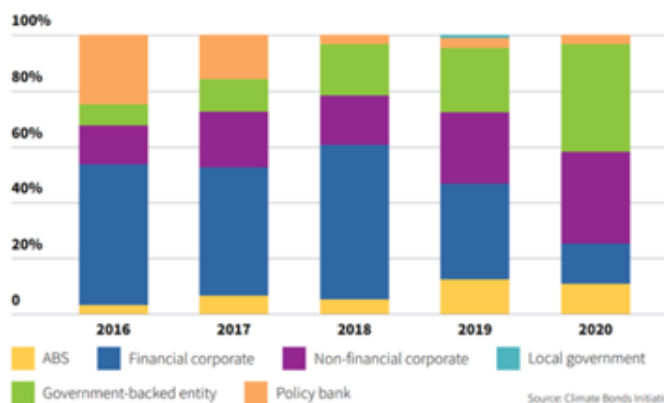
Issuers also plan to add new coal-fired power capacity



Sources: GEM, Urgewald Global Coal Exit List

IEEFA

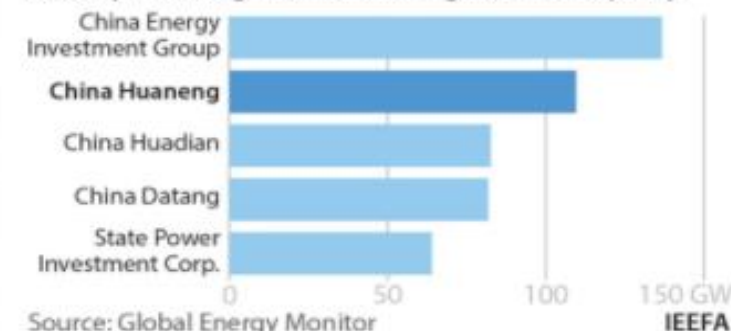
The evolution of green bond issuer types



Source: Climate Bonds Initiative

Largest Coal-Fired Power Plant Owners

Globally, Huaneng ranks second in generation capacity











Source: Global Energy Monitor

IEEFA

The IPR Forecast Policy Scenario (FPS) forecasts higher policy ambition across eight policy levers

In March 2021, the IPR FPS update was informed by a rigorous evidence review and large-scale survey of country climate policy experts

 Carbon pricing <ul style="list-style-type: none">• Carbon taxes• Emissions trading systems• Border carbon adjustments	 Coal phase-out <ul style="list-style-type: none">• Prohibiting regulations• Emissions performance standards• Electricity market reforms	 100% clean power <ul style="list-style-type: none">• 100% clean power targets• Renewables capacity auctions and other support policies	 Zero emission vehicles <ul style="list-style-type: none">• 100% zero emission vehicle (ZEV) sales legislation• Manufacturer ZEV obligations• ZEV consumer subsidies
 Low-carbon buildings <ul style="list-style-type: none">• Prohibiting regulations for fossil fuel heating systems• Purchase subsidies for low-carbon heating systems• Thermal efficiency regulations for new build and retrofit• Minimum energy performance standards for new appliances	 Clean industry <ul style="list-style-type: none">• Emissions performance standards for industrial plant• Subsidy for new or retrofit clean industrial processes	 Low-emissions agriculture <ul style="list-style-type: none">• Methane or nitrous oxide emissions tax or cap-and-trade system• Subsidy for low-emissions agricultural practices and technologies• Farmer education and technical assistance programmes	 Forestry <ul style="list-style-type: none">• Strong policy action against deforestation, such as monitoring and penalties, supported by consumer pressure• Incentives for reforestation and afforestation via domestic action and carbon markets