



Energy
Transitions
Commission

Financing the transition

ETC Webinar Series

Thursday 18th April 2024

Agenda

- **Welcome and Introduction**
- ***Financing the transition***
 - Capital investment estimates
 - Real economy policies and financial sector action
 - Financing the transition in middle and low income countries
 - Concessional / grant payments
- **What has happened since we published?**
- **Q+A**



Introduction





Energy Transitions Commission

Chair
Adair Turner

Knowledge partners

SYSTEMIQ

BloombergNEF



Energy



Industry



Finance



Civil society



The ETC's work: Three key phases

Phase 1

2016-20

Is Net Zero feasible?
*Describing a coherent
mid-century vision*



From 80% decarbonisation to 100%

Clean energy can decarbonise the last 20% of emissions at manageable costs.

Phase 2

2020-22

How to achieve Net Zero?
*Scaling the clean energy system of the
future – technologies, regions, sectors*



The clean energy system will be dominated by electrification, with roles for bio, H2, CCUS and CDR

Required technologies, system change, actions and policies, and costs.

Phase 3

2022-

Scaling the new, phasing down the old
*Implementation barriers and
bottlenecks, and the future of the
current fossil fuel system*

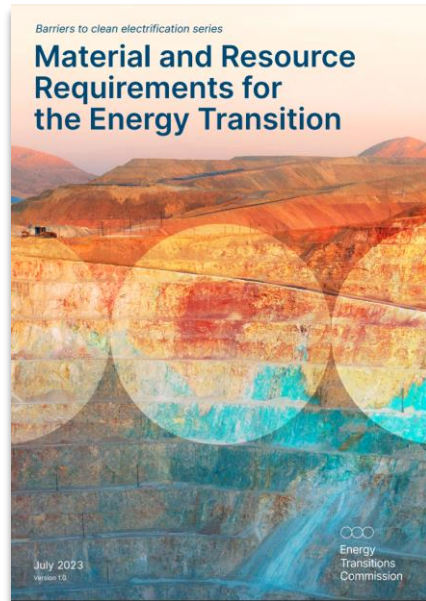


How does the energy transition get on track by 2030?

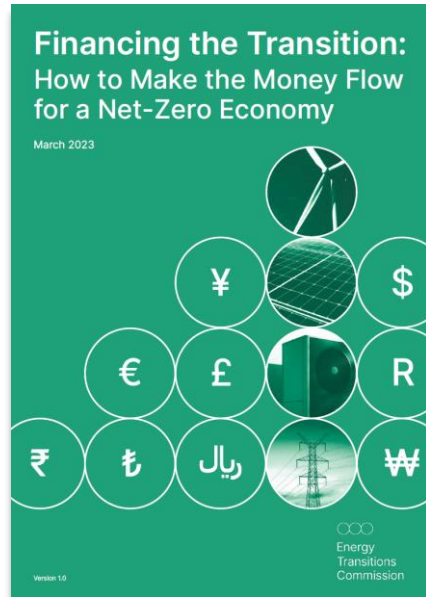
Focus on the key debates taking place throughout this crucial decade



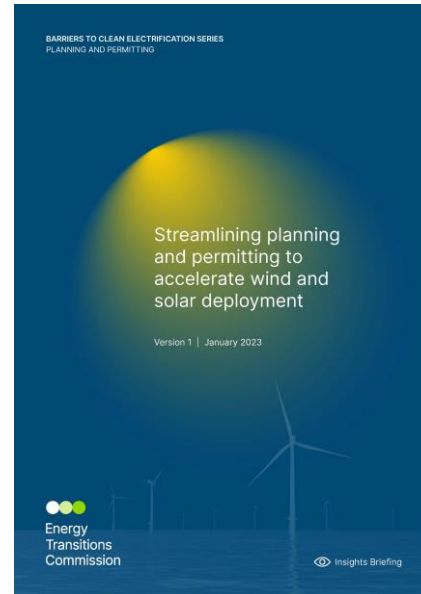
The ETC's 2024 webinar series



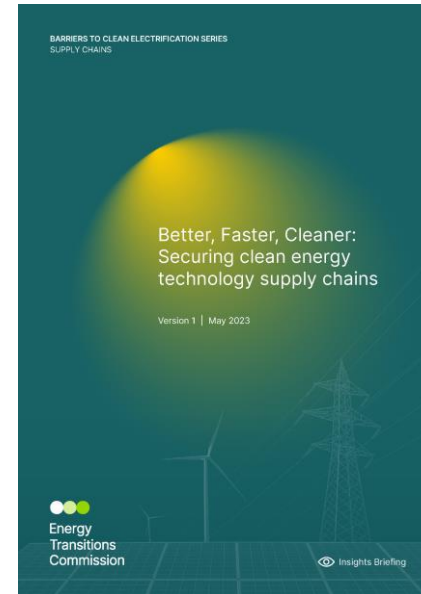
February 13th



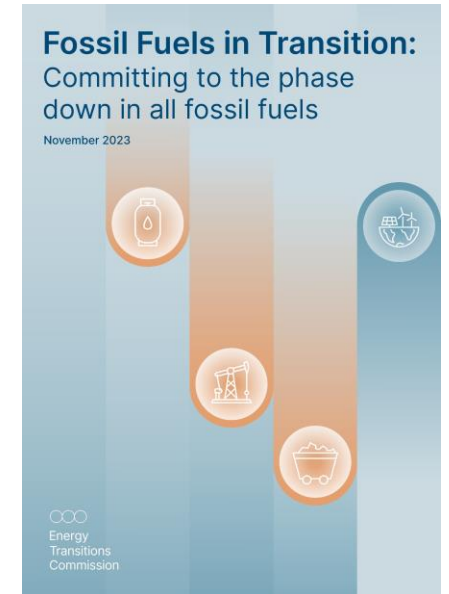
April 18th



July 11th



September 12th



November 7th

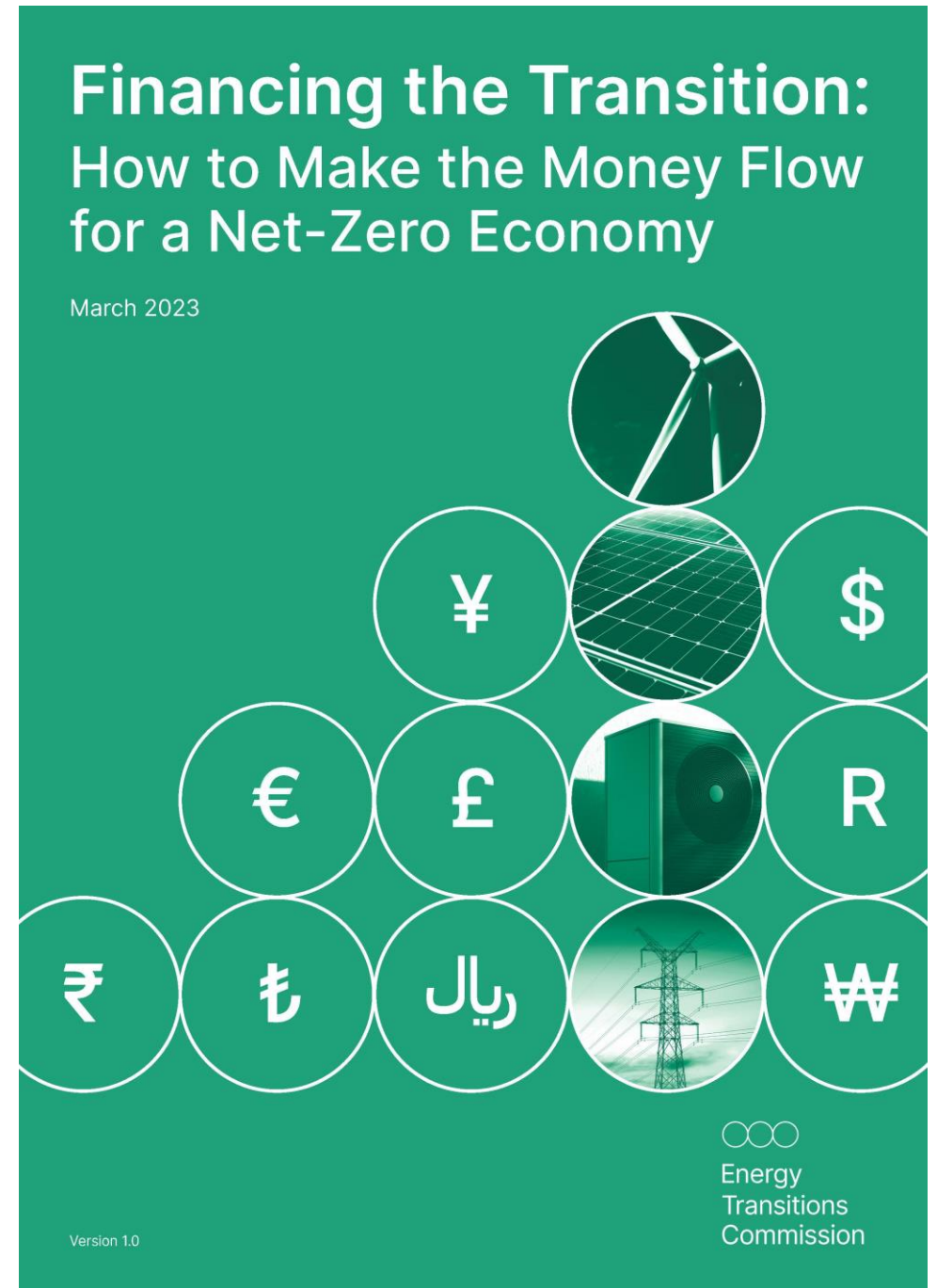


Financing the Transition



3 key ways the ETC's finance report contributes to the conversation

- Provides greater clarity on the profile of investments required
 - One-off scale-up in investments
 - Comparison to fossil fuel savings
 - Detailed splits by sector and country income group
- Clarifies the relative importance of real economy policies and specific financial sector action in mobilising finance, and how this differs between high-income and middle- and low-income economies.
- Distinguishes between two conceptually different categories of financial flow – capital investment and concessional/grant payments.



Finance is a critical enabler of the transition – two forms of financial flow are required

Capital investment

Concessional/grant payments

Annual flow required

\$3.5 trillion
globally

At least \$0.3 trillion
in middle and low income countries (excl. China)

What does it cover?

- Purchase of assets which create a stream of future consumption benefits and returns
- Physical infrastructure, buildings, equipment, machinery
- Delivers future returns

- Payments for decarbonization actions which will not occur fast enough unless concerted policy action is complemented by payments to compensate economic actors for:
 - Early coal phase out
 - Ending deforestation
 - Carbon dioxide removals

Possible with real economy and financial system levers

A crucial political issue

Overall assessment



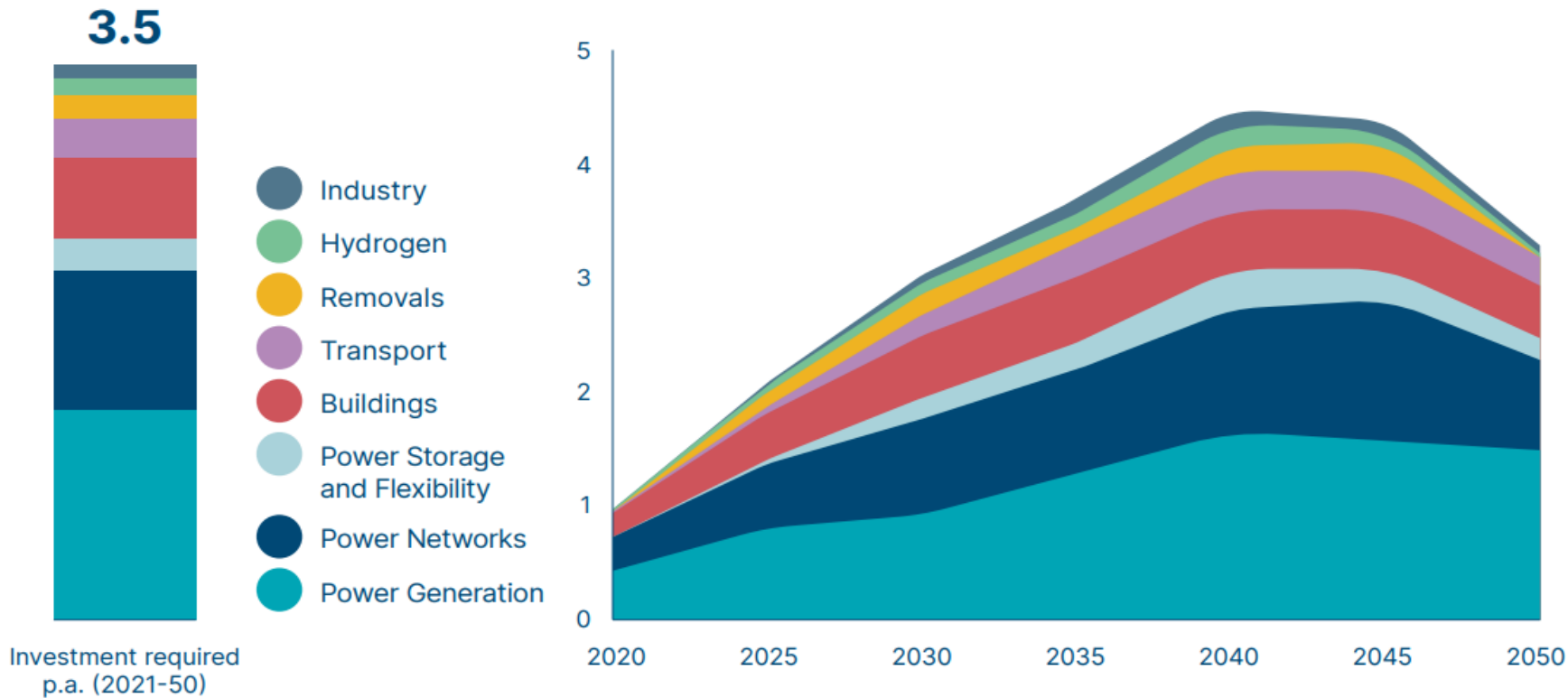
Capital investment estimates



By far the largest investment will be required in the power system, which accounts for ~70% of the global total, followed by ~15% for buildings

Capital investment for the energy transition

\$ trillion p.a.

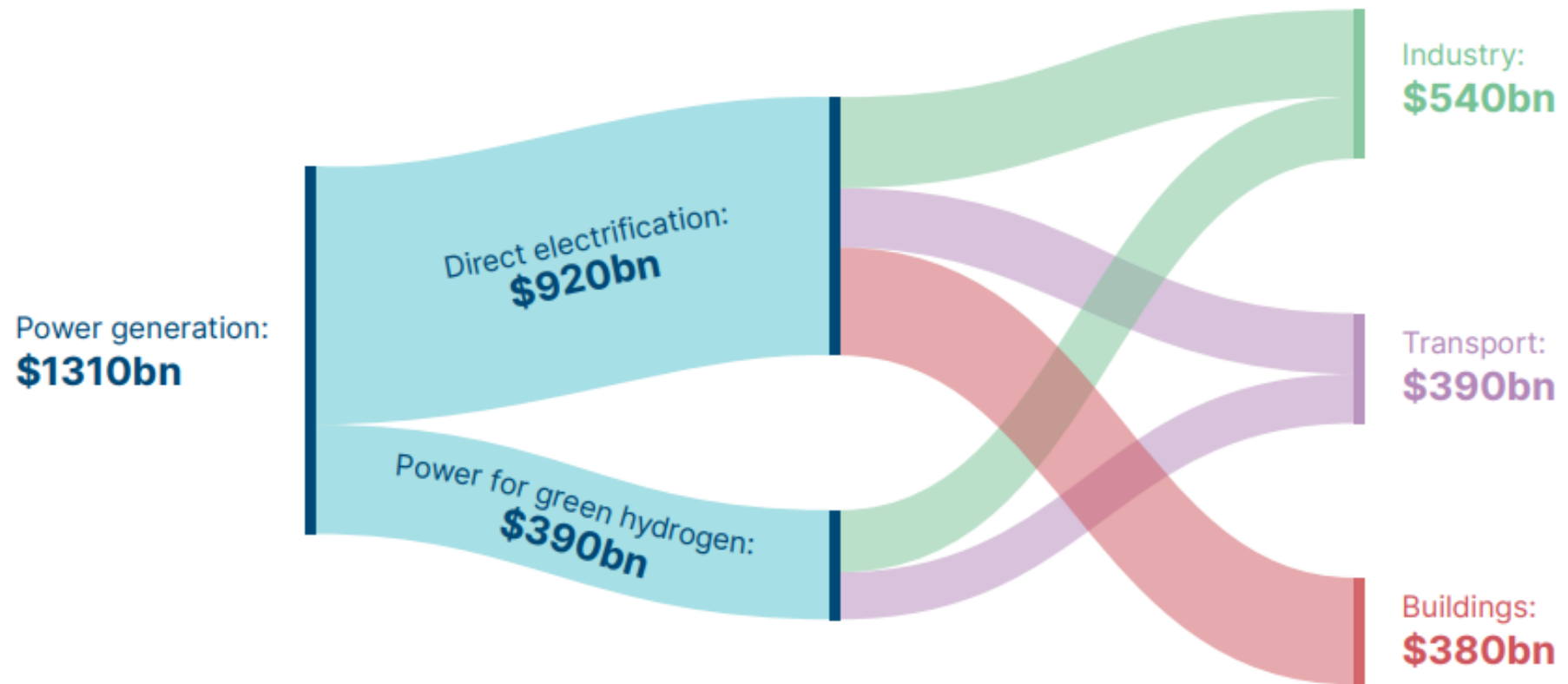


- **Power:** wind and solar, expanding T&D grids, battery + hydrogen storage
- **Buildings:** retrofits (insulation, smart upgrades), heat pumps, renewable heating and cooking
- **Transport:** road charging infrastructure, sustainable aviation fuel production plants, facilities for ammonia/methanol syntheses
- **Removals:** natural climate solutions, building direct air capture plants
- **Hydrogen:** building production facilities, refuelling stations, pipelines, storage facilities
- **Industry:** integrating chemicals and cement plants with CCS, hydrogen-based direct reduced iron facilities

SOURCE: Systemiq analysis for ETC (2022).

Investment in low-carbon power and clean electrification underpins the decarbonisation of all other sectors

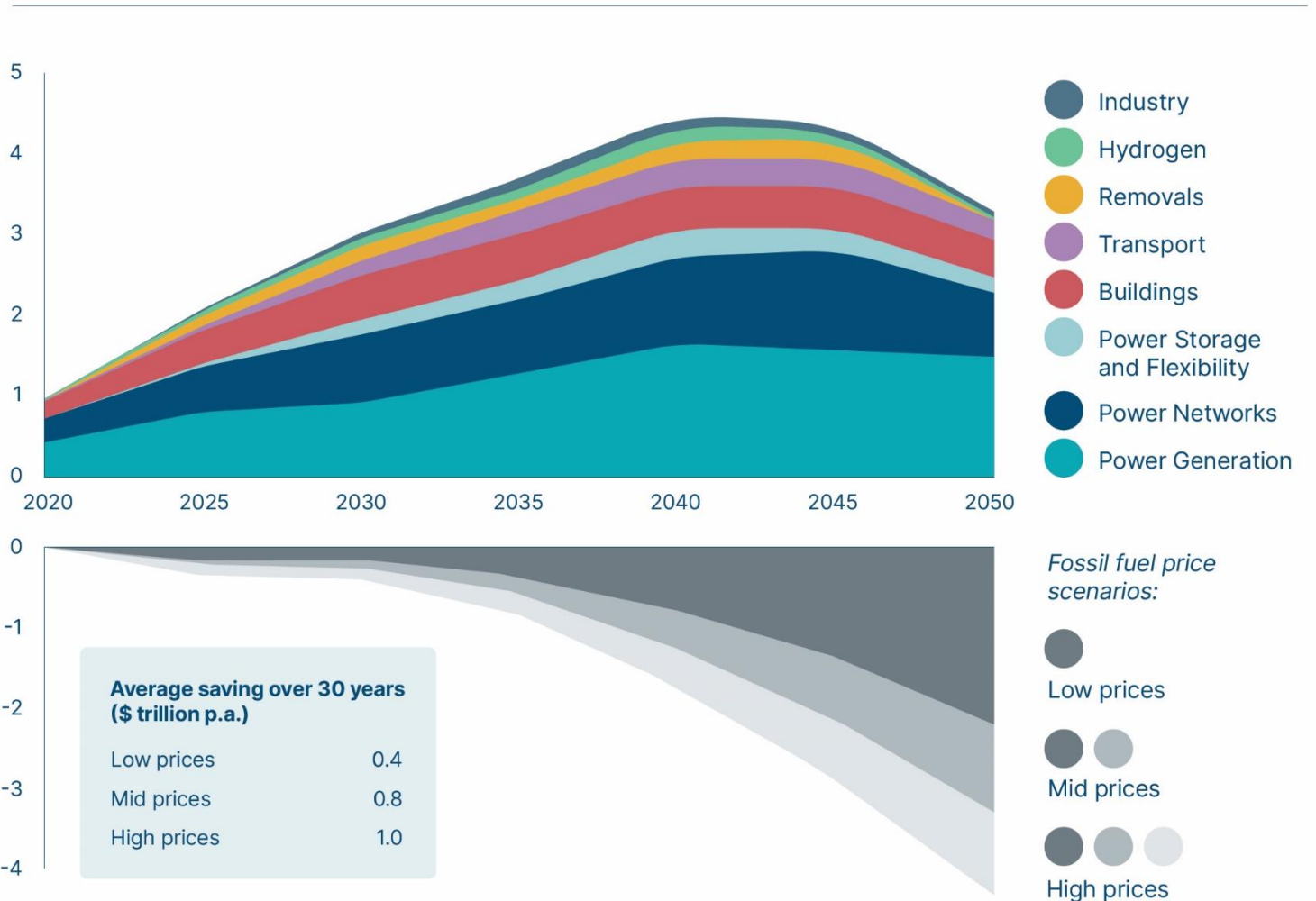
Electricity production investments between 2021-2050, allocated to end-sector based on relative consumption
\$ billion, annual capital expenditure



Savings on fossil fuel spending could be around \$0.4-0.8 trillion a year, on average between now and 2050, depending on how fossil fuel prices evolve

Annual capital expenditure in the energy system, and annual savings from reduced spending on coal, oil and gas under different price scenarios

\$ trillion



Putting \$3.5 trillion a year into context

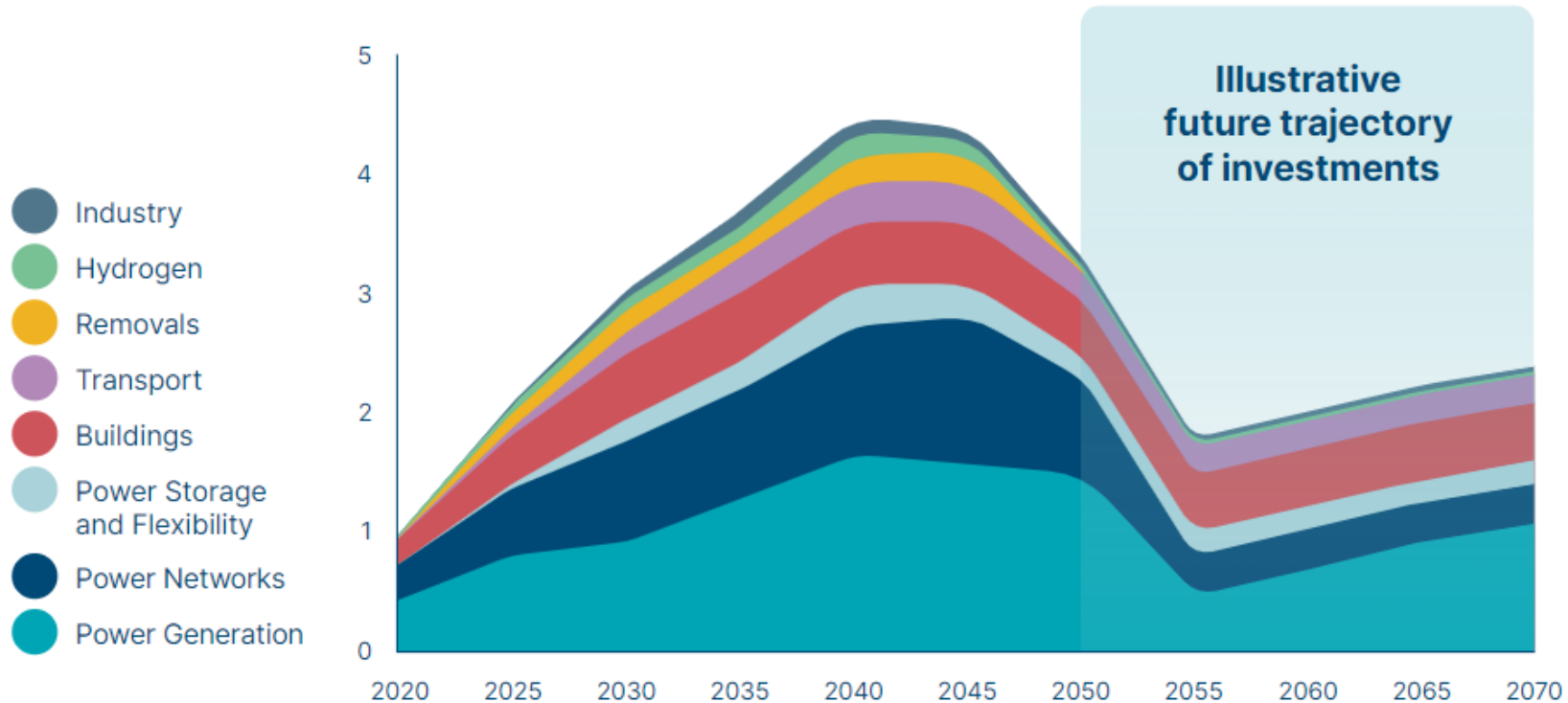
- 1.3% of annual global GDP
- \$3.5 trillion a year by 2030 is a *gross* total – not all of this will be additional to what would occur in any case
- Offset by declining investment in offset fuels: \$3.5 → \$3 trillion
- Transition to a system of low operating and fuel expenditures over time – significant savings

SOURCE: ETC (2021), Making Clean Electrification Possible [demand projections]; IEA (2022), World Energy Outlook 2022 [fossil fuel prices, non-weighted averages or regional projections].

NOTE: Demand projections are based on the ETC Supply Decarbonisation Only scenario. This scenario sees an increase in gas consumption until 2045 vs 2020 demand, meaning there are no natural gas savings projected until 2045. Estimated fossil fuel savings are based on fossil fuel price projections under different IEA scenarios (i.e., low prices = Net-zero scenario, mid prices = Announced Pledges scenario, high prices = Stated Policies scenario). We focus on the low and mid price scenarios; this is because in the high prices scenario, a large amount of the savings represents reduced economic rent paid from users to producers, which is a distributional impact as opposed to a net saving.

Investments reach \$3 tr/year by 2030 and peak at \$4.5 tr in 2040, but then tail ff beyond 2050, with stock turnover of renewables driving some investment in the latter half of the century

Capital investment for the energy transition, 2021-70
\$ trillion



SOURCE: Systemiq analysis for the ETC (2023).

NOTE: With the exception of power, post 2050 investment in all other sectors is held at 2050 levels.



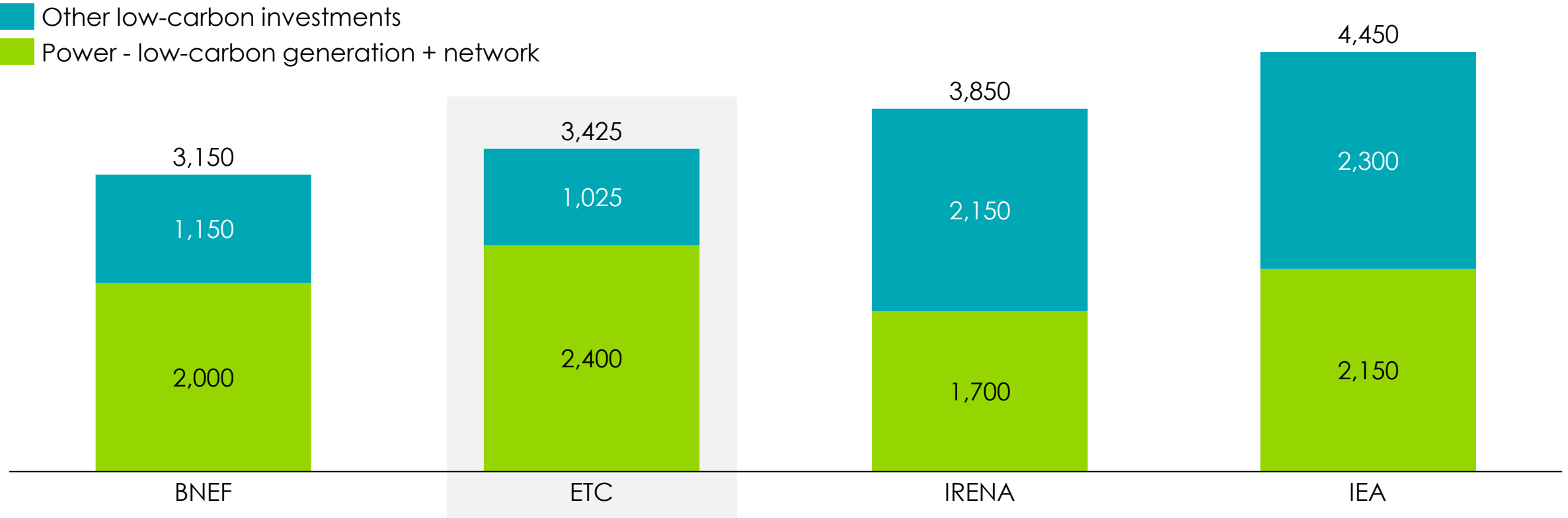
Estimates of the average annual investment need to 2050 are in the range of \$3-4.5 trillion

Global annual investment

USD billion per annum

Other low-carbon investments

Power - low-carbon generation + network

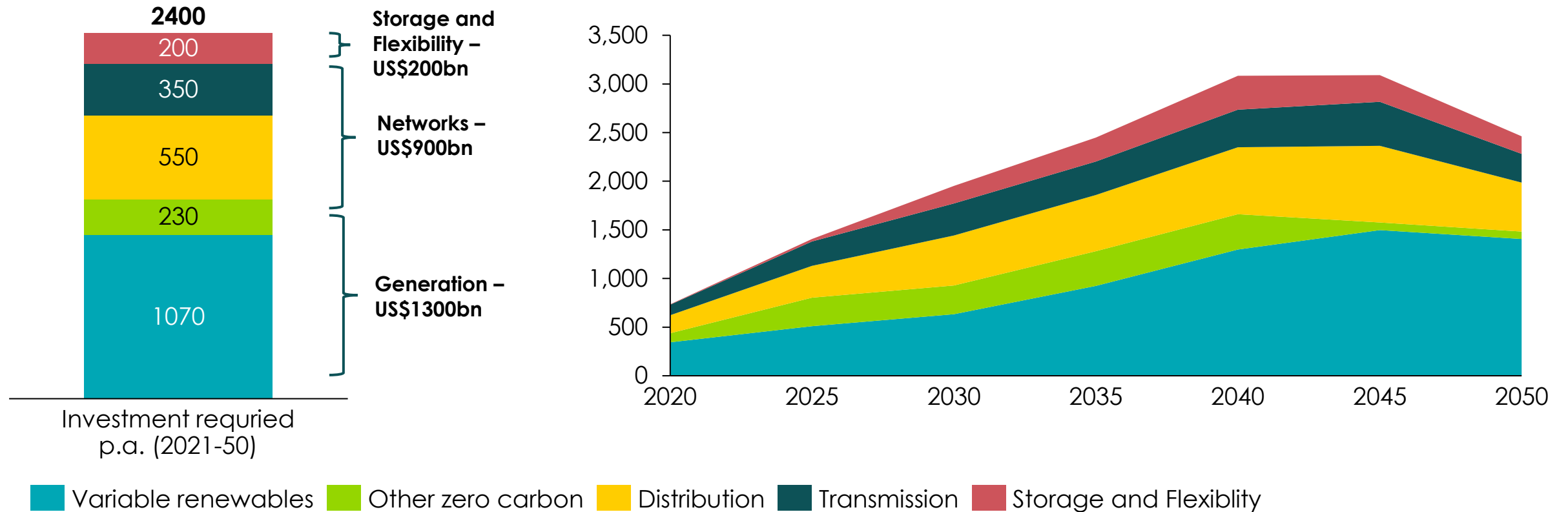


Sources: Systemiq analysis for ETC (2022); IEA (2022), *World Energy Outlook 2022*; IRENA (2021), *World Energy Transitions Outlook*; BNEF (2022), *New Energy Outlook 2022*.

Investments in power need to triple by 2030 to rapidly increase wind and solar installations by 5-7 times

Global annual investment

USD billion per annum



Sources: SYSTEMIQ analysis for the ETC (2022); BNEF (2022), *Energy Investment Trends*.

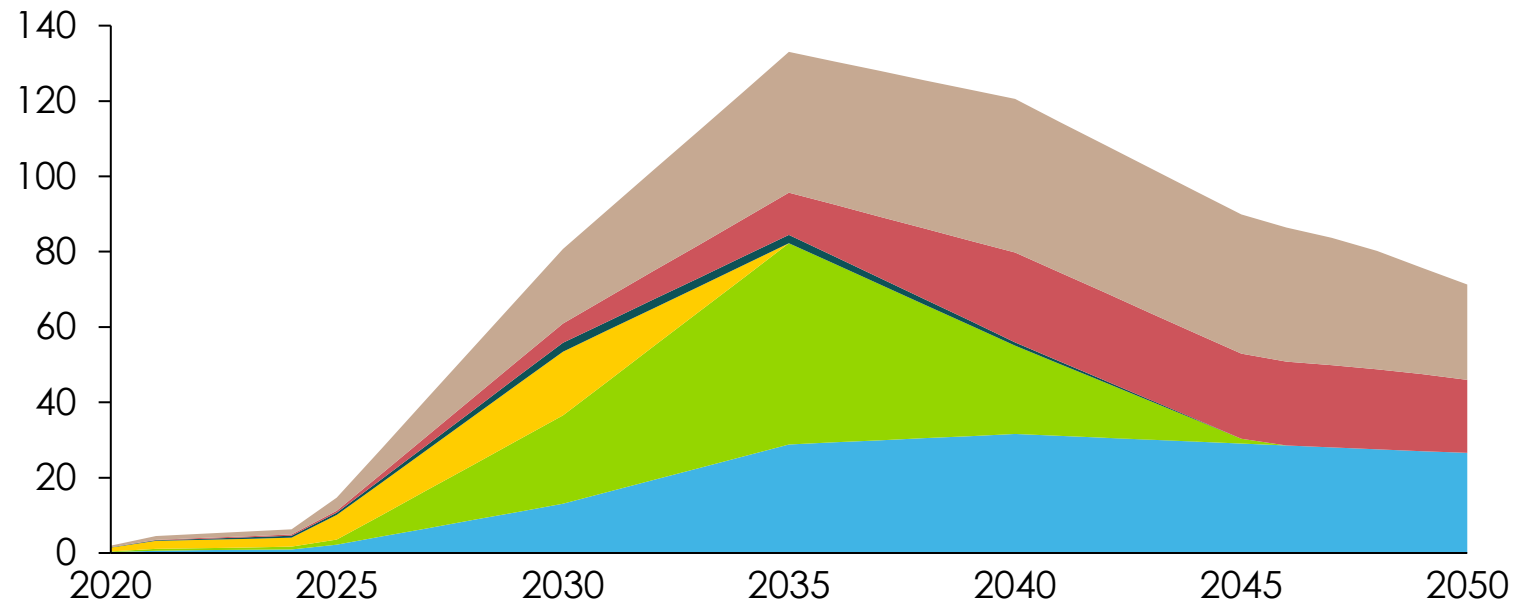
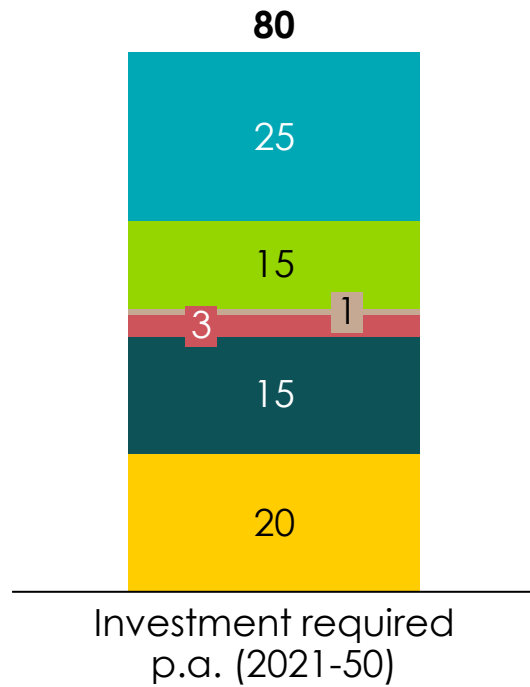
Note: includes investment in clean electricity generation required to produce green hydrogen.



Investments in hydrogen infrastructure need to ramp up from \$2bn to \$80bn by 2030, peaking in 2035 as blue hydrogen investments then phase out

Global annual investment

USD billion per annum



- Electrolyser
- Greenfield blue hydrogen
- Retrofit grey hydrogen
- CCS infrastructure
- Hydrogen transport
- Hydrogen storage

Sources: SYSTEMIQ analysis for the ETC (2022).

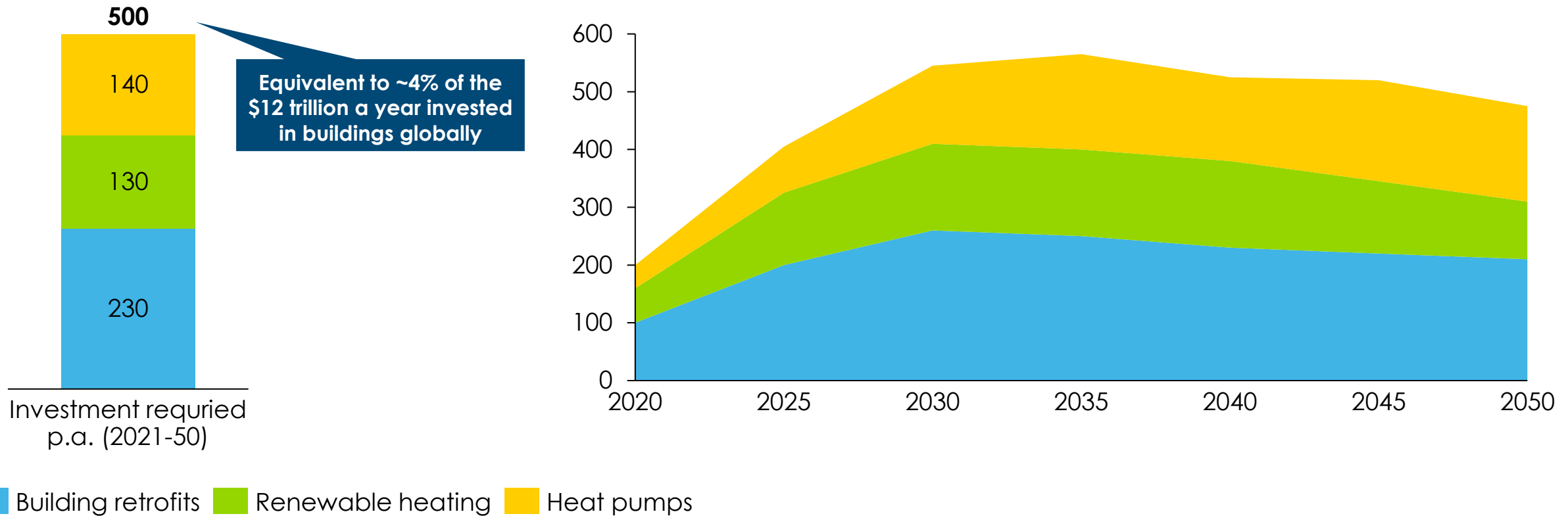
Note: excludes investment in clean electricity generation required to produce green hydrogen.



Capital investments to decarbonise buildings need to average \$500bn a year, driven by retrofits of the existing building stock in high income countries

Global annual investment

USD billion per annum



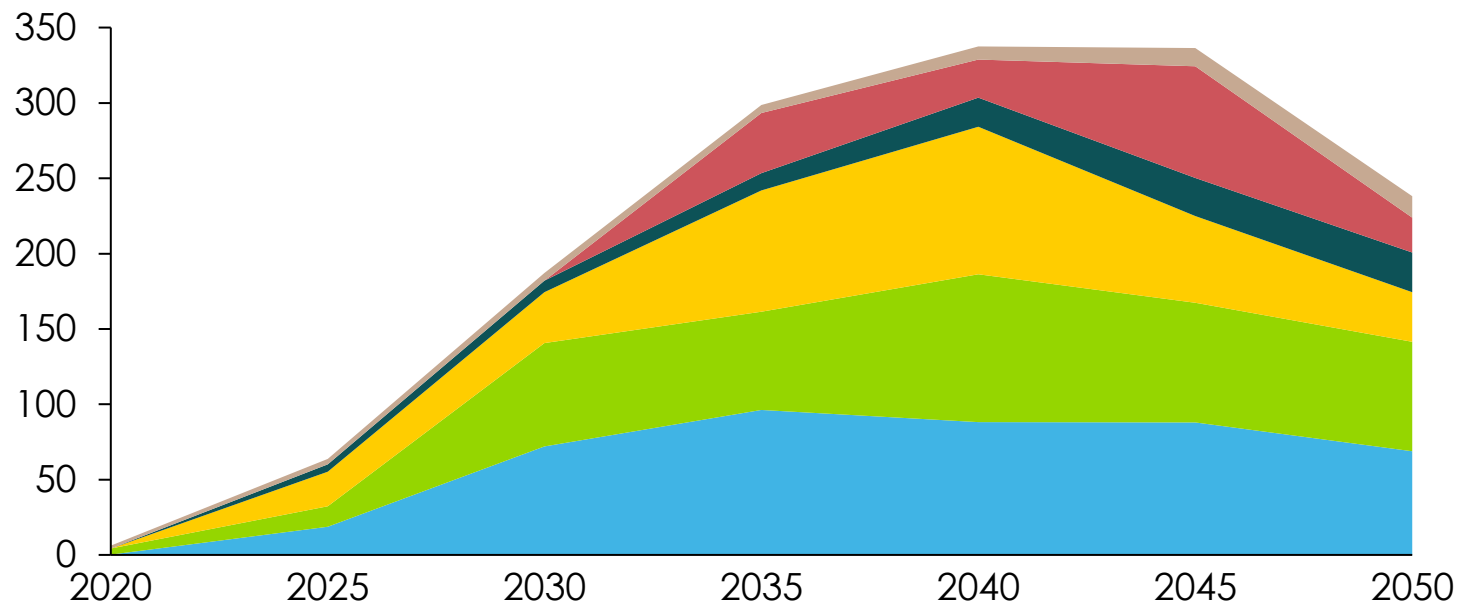
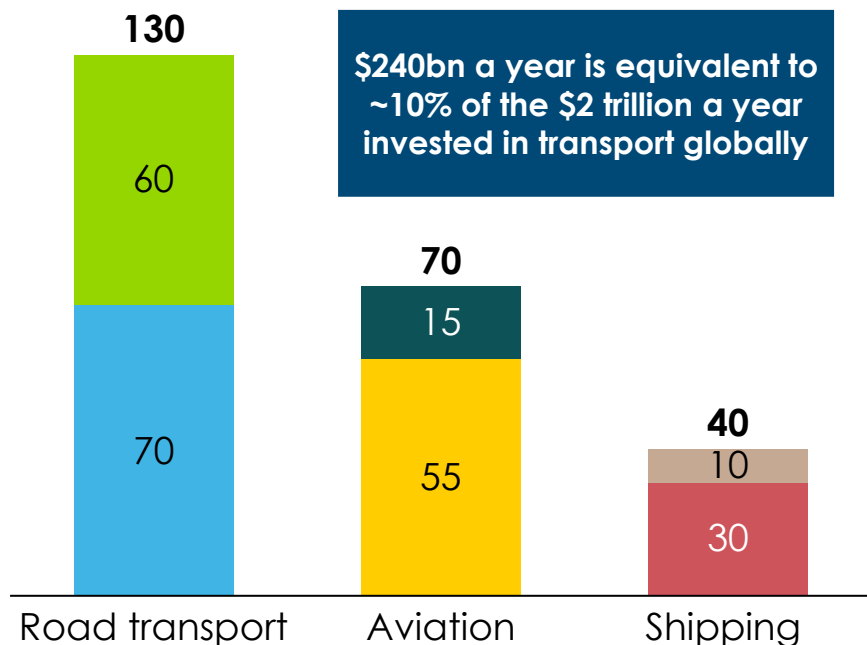
Sources: SYSTEMIQ analysis for the ETC (2022); IIGCC (2022), *Climate Investment Roadmap 2022*; Penn World Tables (2019), *Capital detail database*



Investments in low-carbon transport need to reach ~\$150bn pa in 2030 and peak at ~\$400 bn pa in 2040, driven by zero carbon fuels for aviation

Global annual investment

USD billion per annum



- Road charging and refilling infra: Heavy/medium-duty
- Aviation: zero carbon fuels
- Shipping: ammonia
- Road charging infra: Light-duty + buses
- Aviation: new aircrafts technology
- Shipping: new ship technology

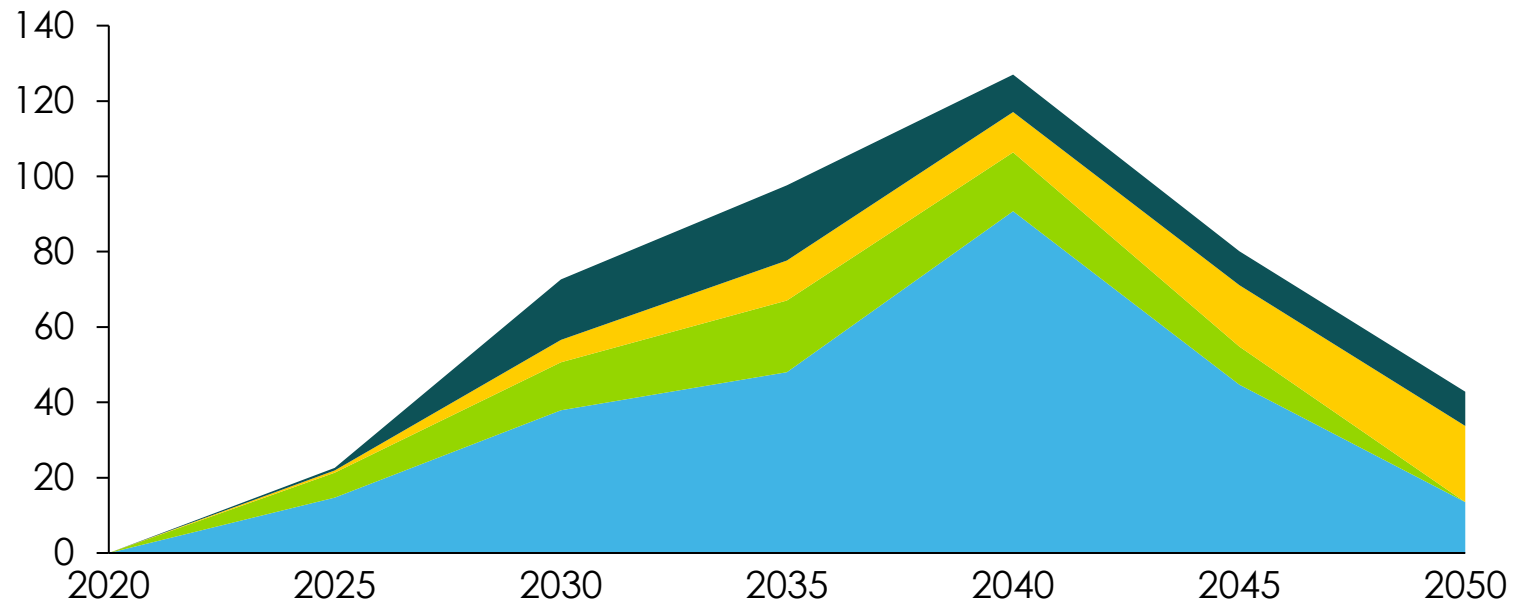
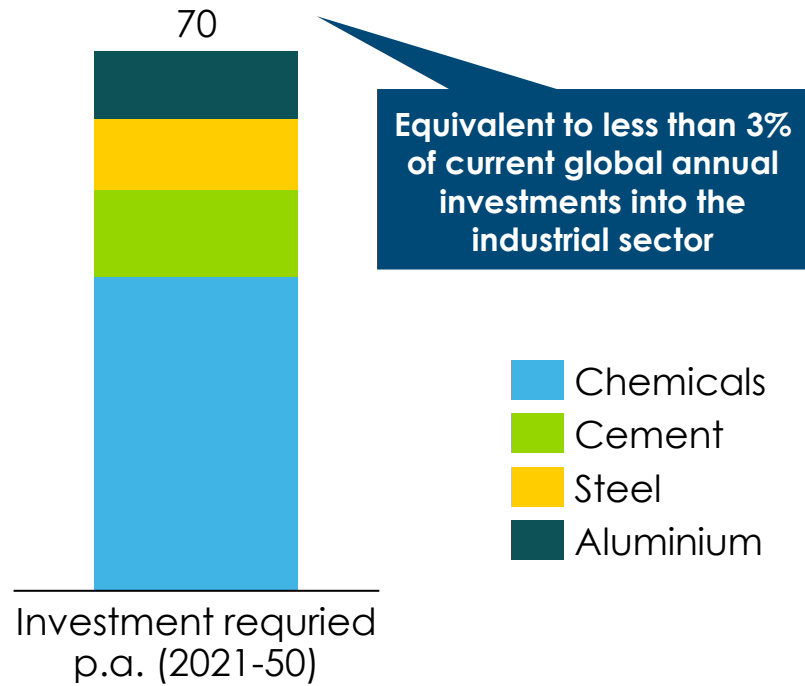
Sources: SYSTEMIQ analysis for the ETC (2022); MPP (2022), *Making Zero Emissions Trucking Possible*; MPP (2022), *Making Net-Zero Aviation Possible*; UMAS (2020), *Aggregate Investment for the Decarbonisation of the Shipping Industry (for GMF)*; Penn World Tables (2019), *Capital detail database*.



Industry investments must ramp up rapidly by 2030, when 30% of existing assets face an investment decision

Global annual investment

USD billion per annum



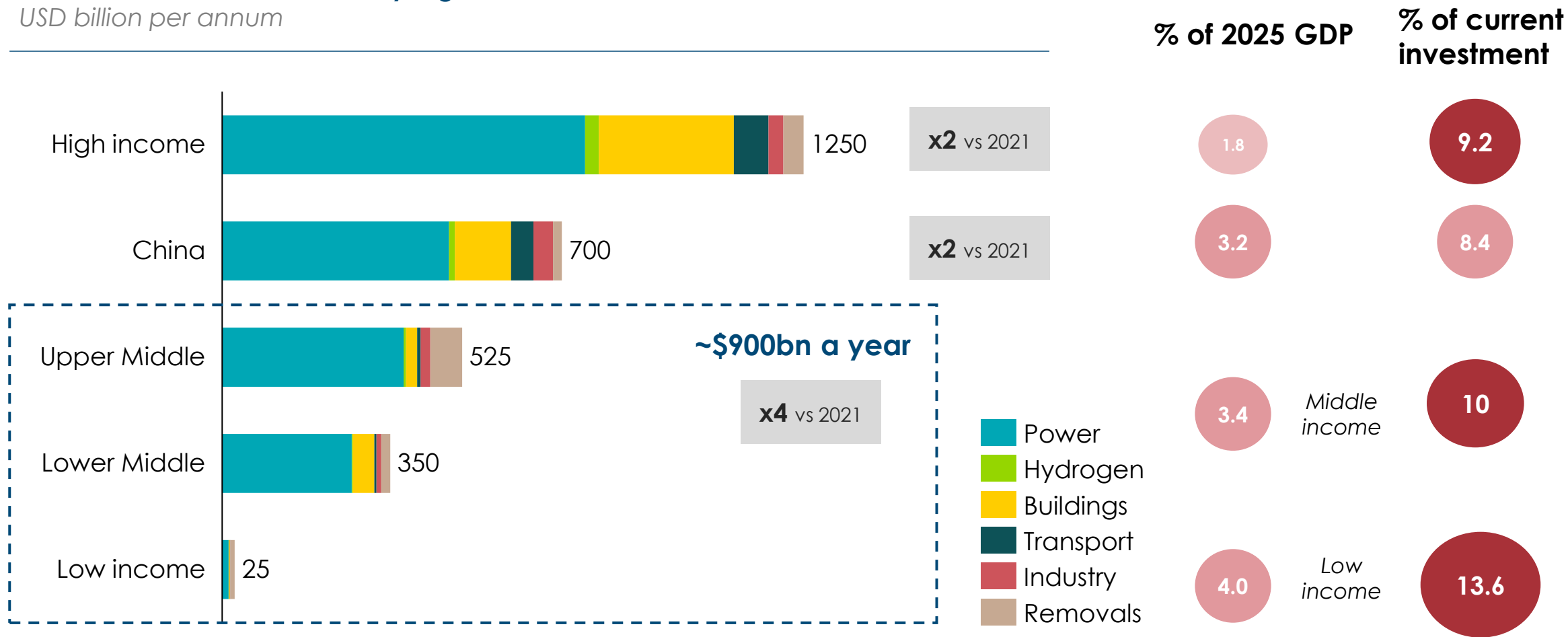
Sources: SYSTEMIQ analysis for ETC (2022); MPP (2023), *Making Net-Zero Steel Possible*; MPP (2022), MPP (2022), *Making Net-Zero Aluminium Possible*; Material Economics (2019), *Industrial Transformation 2050*



Capital investment in middle and low income countries needs to reach ~\$900 billion a year on average between 2026-2030

Estimated annual investment by region and sector, 2026 – 2030

USD billion per annum



Sources: SYSTEMIQ analysis for the ETC (2022), SYSTEMIQ - Investments for green recovery and transformational growth 2020–30: Technical Note (2021), IMF World Economic Outlook October 2022
 Note: 2025 GDP projection from the IMF, expressed in market exchange rate terms



Real economy policies and specific financial sector action



4 actions required in all countries

1 Critical role for well-designed real economy policy action which unleashes investment

Establish a clear strategic vision

Bridge green premiums

Reduce downside risks

Remove supply-side bottlenecks



2

Targeted role for public finance where there are material barriers to finance

Residential building retrofits – household subsidies/grants
FOAK technologies – de-risking from public investment banks
Key infrastructure – public investment, financial incentives

3

Supporting role for financial regulation to drive informed and efficient capital reallocation

Reporting and monitoring – disclosure of climate-related risks
Climate stress tests – understanding of exposure to risks
Green taxonomies – clarity on investment decisions

4

Supporting role for financial institutions to make net zero commitments which accelerate capital reallocation

Managed phaseout plans
Clear asset management + lending strategies in key sectors – power, buildings, hard to abate



Well-designed real economy policies are required in all countries to create sufficient incentives for the private sector to invest

Establish a clear strategic vision

- Clear medium-term targets
- Development of sector transition pathways
- Ambitious standards and regulations

Ensure adequate economic returns

- Bridging green premiums (e.g. tax incentives)
- Carbon pricing
- Public procurement
- Direct consumer subsidies

Reduce downside risks (i.e. volatility of returns)




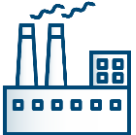

- Revenue stabilisation mechanisms (e.g. contracts-for-difference)
- Additional de-risking investment in early stage technologies (e.g. grants, co-investment)
- Credible and consistent policymaking
- Strategic planning

Remove bottlenecks

- Infrastructure rollout
- Streamlined planning, permitting and acquisition
- Addressing local opposition



What obstacles cannot be fully addressed by real economy policies?

Sector	Additional action required?	
 Power – high income countries + China	Minimal	<i>Vast majority of investment can be mobilised by the private sector with real economy policies</i>
Power – middle and low income countries	Significant	Action from Multilateral development Banks (MDBs) + financial institutions
 Buildings	Significant	Public finance support to households, public investment banks to pool investments to lower transaction costs Financial institutions to develop new products
 Transport	Some	Public finance support to support R&D, de-risk FOAK projects + scale up key infrastructure
 Industry	Some	Public finance support to support R&D, de-risk FOAK projects + scale up key infrastructure
 Hydrogen	Some	Public finance to develop industrial clusters + de-risk investments Financial institutions to develop expert teams and capabilities



Through GFANZ, more than 450 major financial institutions have set net zero commitments

Banks

Align operational and financed emissions to net zero and 1.5 °C by 2050 pathways

- 40% of banking assets
- 70 trillion AUM



Asset managers

Support investment along a 1.5 °C pathway to net zero by 2050

- 66 trillion AUM (60% of global total)
- 291 asset managers



Insurers

Align insurance underwriting portfolios to net zero and 1.5 °C by 2050 pathways

- ~5% of global premium volume
- > 10 leading insurers



Asset owners

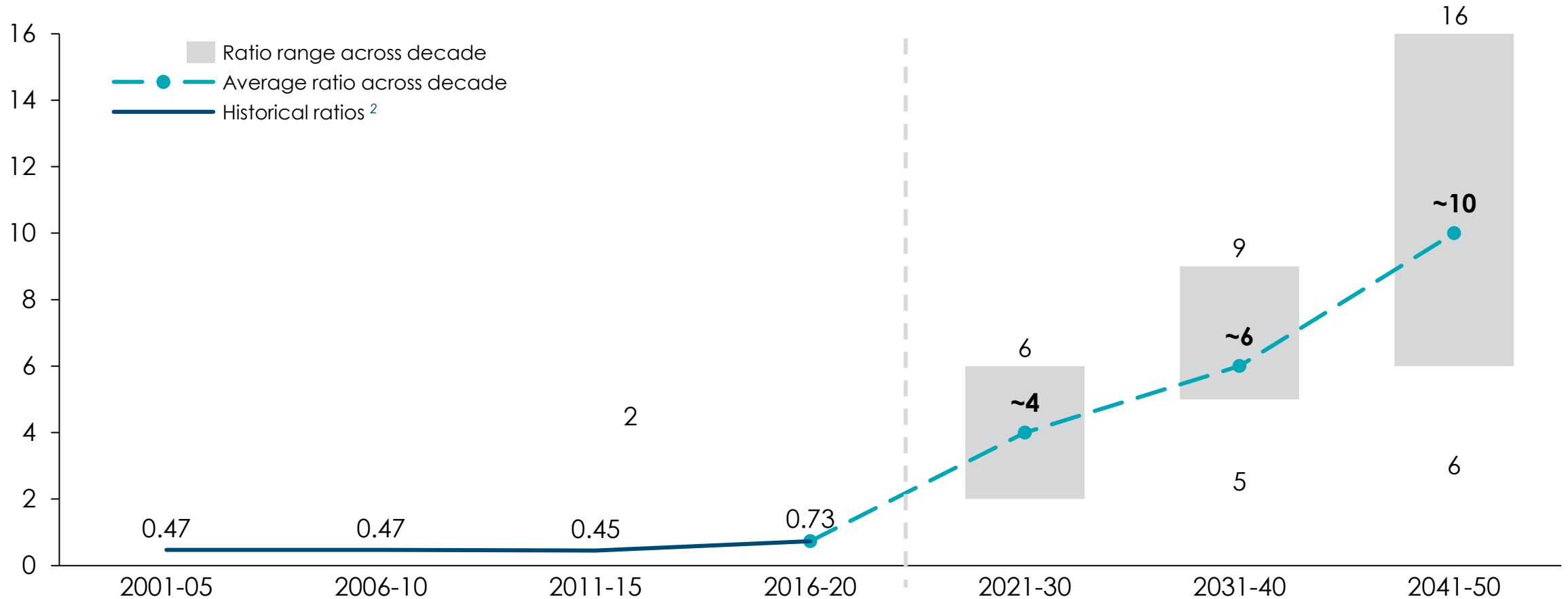
Align investment portfolio to net zero and 1.5 °C by mid-century pathways, and interim targets for 2025 and 2030



The ratio between clean energy and fossil fuel investments should increase from less than 1 today, to 10 in the 2040s

Range of energy supply investment ratios by decade, 2001-2050 (various net zero scenarios¹)

Ratio of clean energy investments to fossil fuel investments



Source: BloombergNEF (2022), *Investment Requirements of a Low-Carbon World: Energy Supply Investment Ratios*.

1 Results are an average of outputs from various net zero scenarios - BloombergNEF, IEA, IPCC and NGFS.

2 The historical 5-year average ratios denote estimated values based on IEA World Energy Investment reports.



Different types of financial regulation are emerging across the world that help equip the financial system for the transition to a net zero economy

Type	Description	Regulations in development <i>(not-exhaustive)</i>
Financial disclosure, including Green Taxonomies	Reporting and monitoring rules for public companies and large financial institutions to disclose climate-related risks and opportunities This includes taxonomies; a classification system that identifies which economic activities can be considered environmentally sustainable, which can entail reporting requirements	<p>TCFD aligned financial disclosure regulation is developed in e.g.: EU, Brazil, Japan, Singapore, the United States.</p> <p>Green taxonomies</p> <ul style="list-style-type: none"> • EU Taxonomy • China Green Bond Endorsed Projects Catalogue (China Taxonomy) • Mexico taxonomy plans in development
Climate stress tests	Regulatory tool of central banks to identify and reduce systemic physical and transition climate risk exposure of the financial sector as drivers for financial risks	<ul style="list-style-type: none"> • EU: The European Central Bank (July 2022) • UK: The Bank of England (May 2022)
Direct capital allocation levers	Regulation to favour low-carbon investments and discourage those in fossil fuels: <ol style="list-style-type: none"> 1. Increasing capital weights of entities exposed to climate-related risks 2. Adjusting monetary policy and liquidity provision frameworks to climate-related risks 	<ol style="list-style-type: none"> 1. No climate-specific capital weights adjustments have been made to date 2. Monetary policy framework adjustments include: <ul style="list-style-type: none"> • EU: The European Central Bank has announced a revision of their collateral framework and proposed a green tilt in its bond purchases • UK: The Bank of England has 'greened' its framework for corporate bond purchases



Public investment banks in high-income countries have a role to play

1

Mandates which commit them to support green investment

2

Exclude new fossil fuel investment, unless combined with credible CCUS projects

3

Focus on financing challenges where private finance alone might be insufficient or too costly



Examples:

European Investment Bank
KfW in Germany
UK Infrastructure Bank

- Unlikely to include wind and solar, where mature technologies, business models and regulation mean that adequate private finance will almost certainly be available at an attractively low cost of capital.
- Focus should be on investments such as:
 - Power market storage and flexibility
 - First-of-a-kind industrial applications
 - Infrastructure assets where investment is held back by difficulties in coordinating supply and demand development
 - Residential building retrofit.

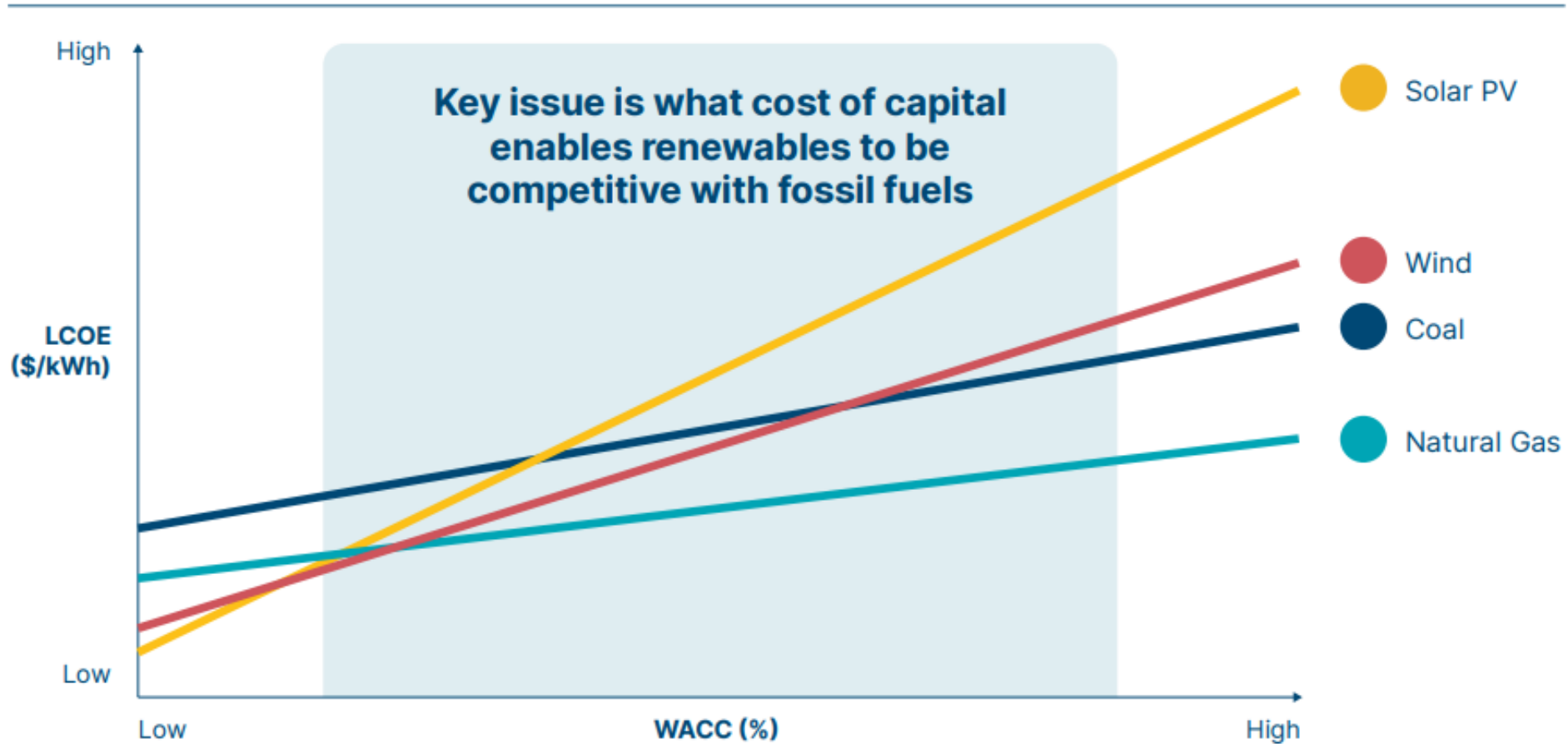


Financing the transition in middle and low income countries



Competitiveness of wind and solar is very sensitive to the cost of capital, which is significantly higher in middle- and low-income countries

Impact of weighted average cost of capital (WACC) on cost of power generation
\$/kWh



SOURCE: Source: Systemiq analysis for ETC (2022).



Additional actions required in middle and low income countries

1

Increased mobilisation of domestic savings and private financial flows

- Improved tax collection + carbon pricing
- MDBs support growth of local currency markets

2

Significant scale up in MDB and other external finance

- Explore levers to expand financial capacity
- Targeted use of concessional instruments (e.g., grants and guarantees)
- Utilise Special Drawing Rights

3

Expanded role for MDBs and national governments in creating the conditions for profitable investments

- Support countries to develop transition strategies
- Proactively develop bankable projects
- Catalyse more private finance

4

Private sector commitments and enhanced capability to invest in lower income countries

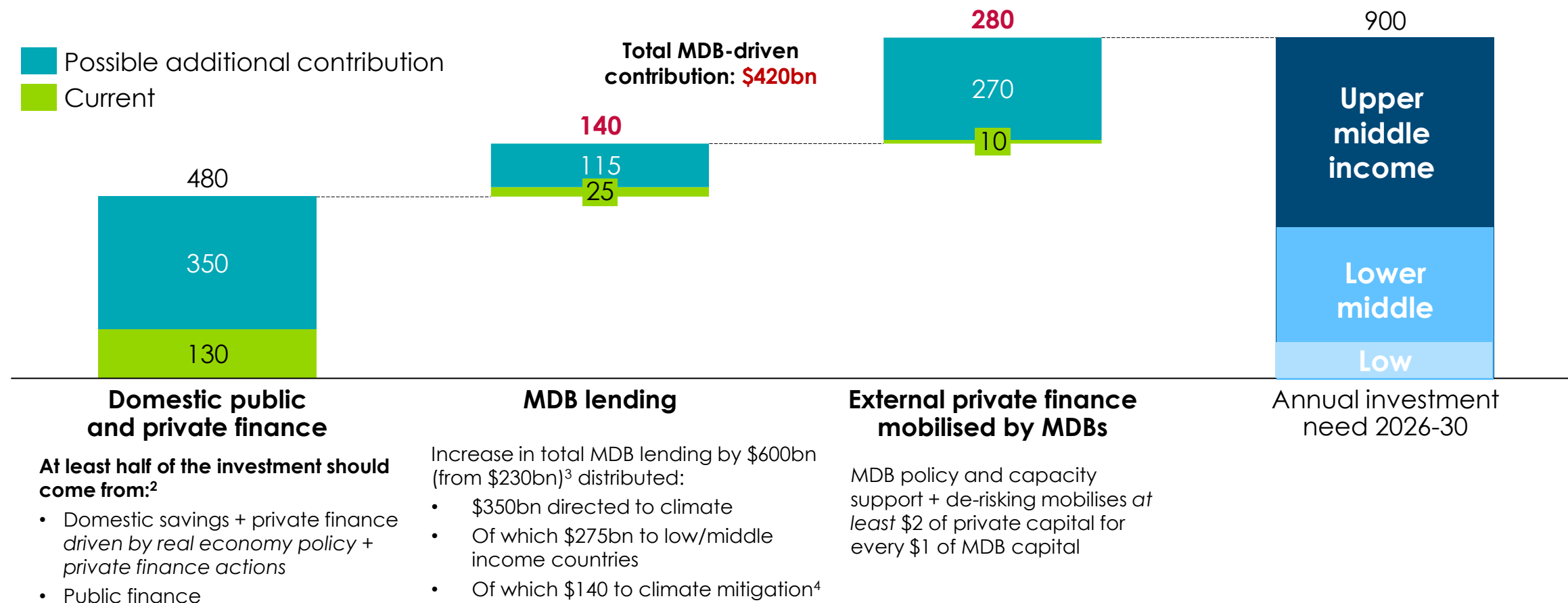
- Understand scale and nature of the opportunity
- Actively develop project pipelines
- Build relationships with MDBs where necessary



MDBs could realise half of the investment need through scaling up lending, policy and capacity building, and de-risking of private capital

Illustrative scenario for financing climate mitigation in middle and low income countries by 2030¹

USD billions per annum



Note: (1) Excludes China; (2) Estimates of current public and private investment cover regions dominated by middle and low income countries but likely overstate the true current amount invested as they do include some high income countries, but exclude China; (3) Literature view of estimates of feasible increases in MDB lending while maintaining a AAA rating; (4) Of total MDB finance, 50% used for climate, 2/3 directed to middle and low income countries, 50% used for mitigation (50% for adaptation).

Sources: SYSTEMIQ analysis for the ETC (2022); Climate Policy Initiative (2021), *Global Landscape of Climate Finance 2021*.



Concessional/grant payments



Finance is a critical enabler of the transition – two forms of financial flow are required

Capital investment

Annual flow
required by 2030

\$3 trillion
globally

- Purchase of assets which create a stream of future consumption benefits and returns
- Physical infrastructure, buildings, equipment, machinery
- Delivers future returns

What does it
cover?

**Possible with real economy and
financial system levers**

Concessional/grant payments

At least \$0.3 trillion
*in middle and low income countries (excl.
China)*

- Payments for decarbonization actions which will not occur fast enough unless concerted policy action is complemented by payments to compensate economic actors for:
 - Early coal phase out
 - Ending deforestation
 - Carbon dioxide removals

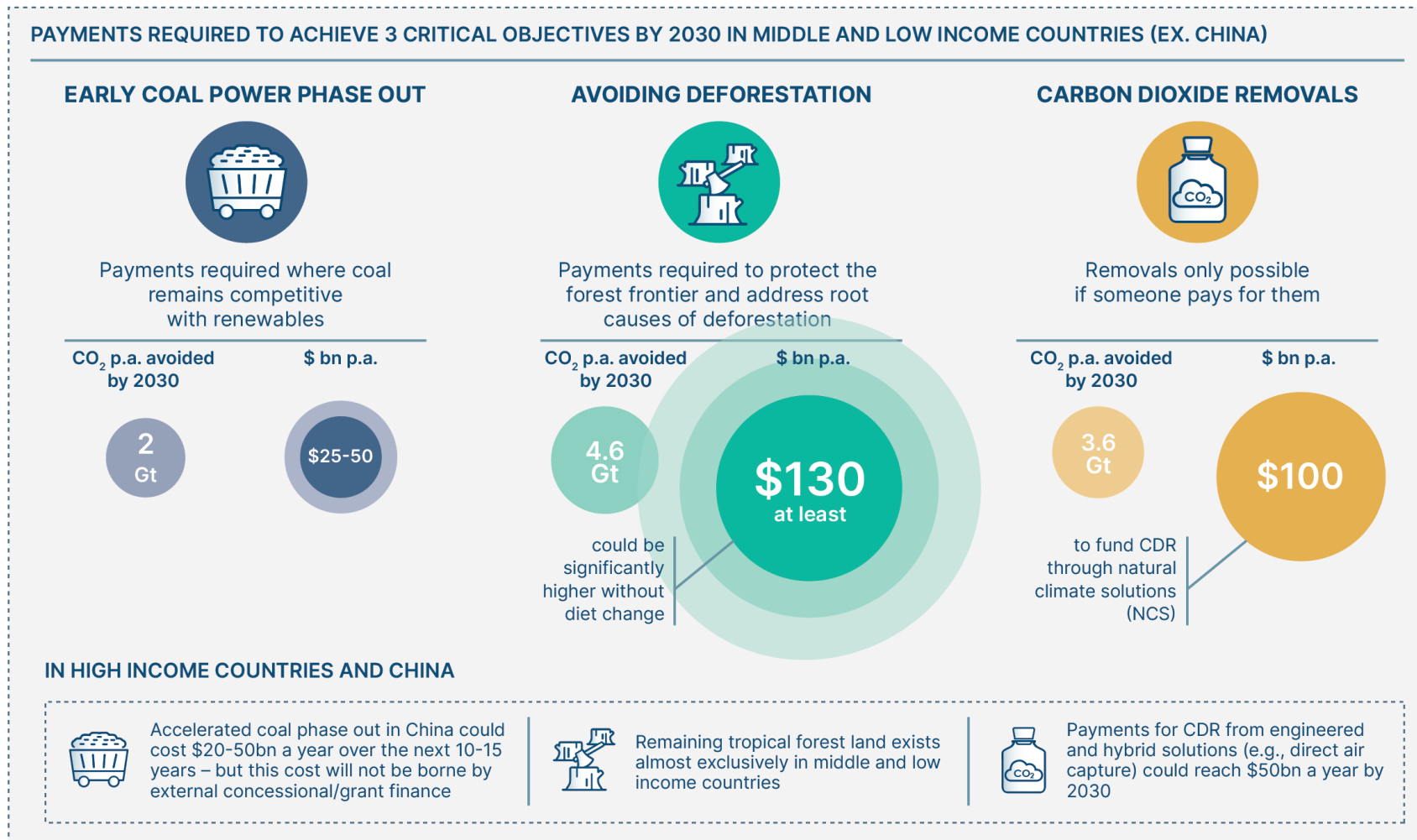
A crucial political issue

Overall assessment

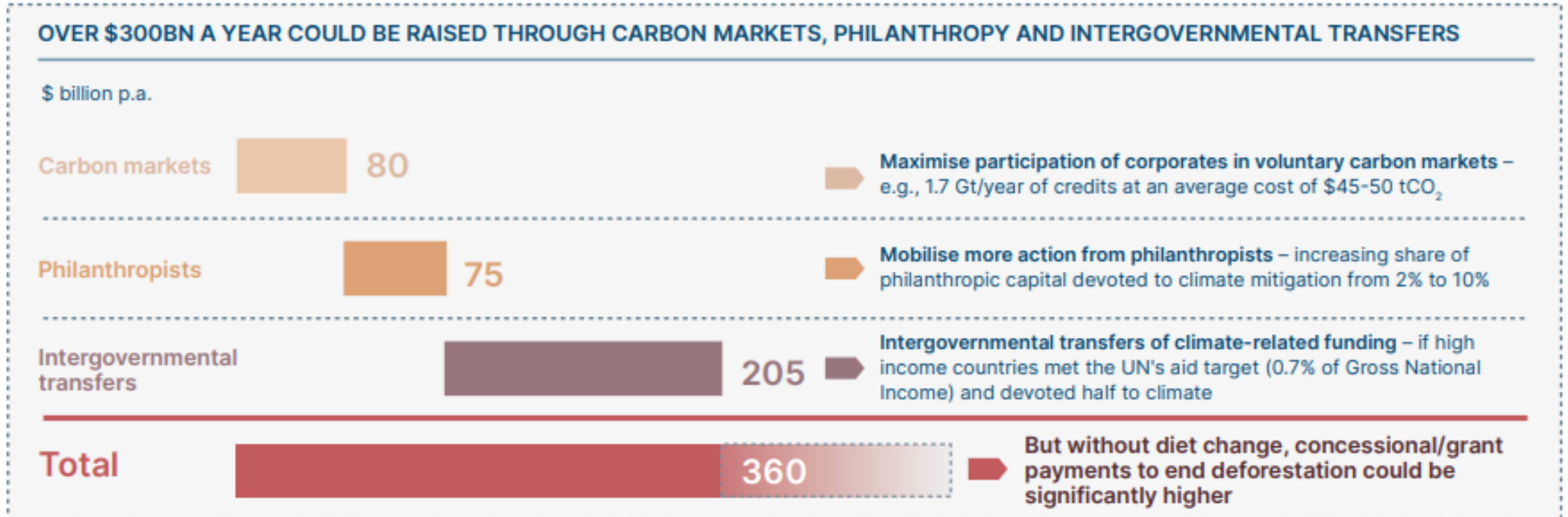


Payments required to achieve 3 critical decarbonisation objectives by 2030 in middle- and low-income countries (excl. China)

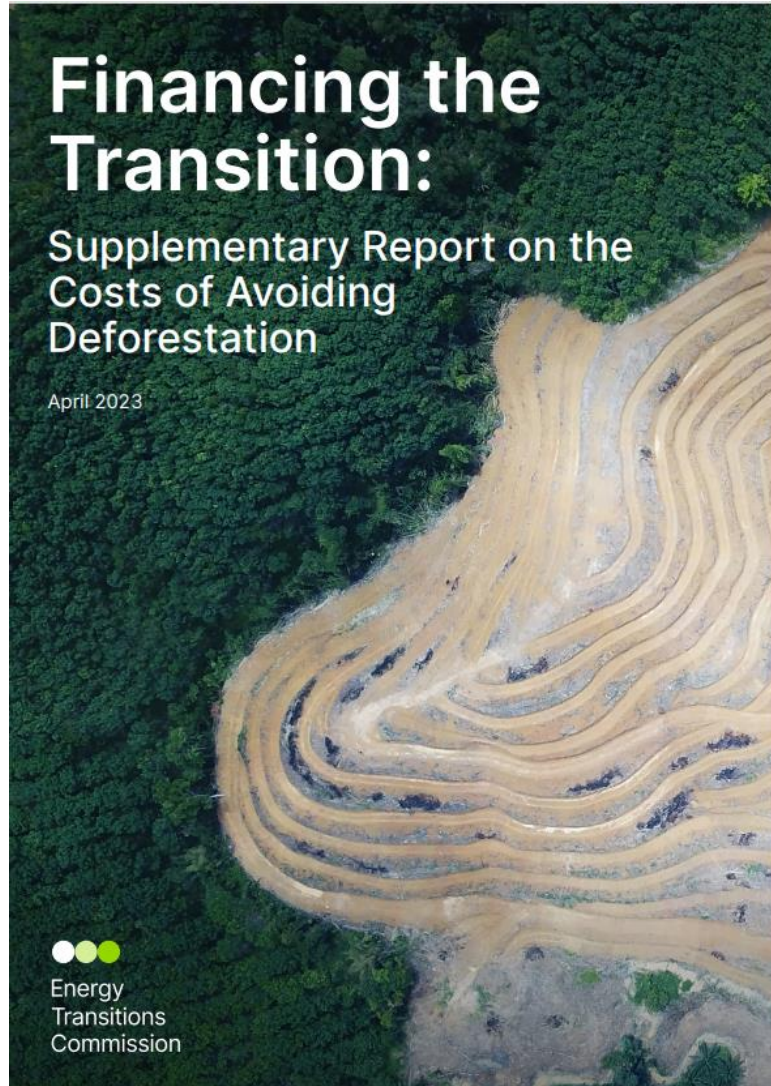
Concessional/grant payments: >\$300bn for 3 critical purposes



Three key sources of finance to scale concessional/grant payments



Supplementary report on the costs of avoiding deforestation



- Man-made deforestation is responsible for nearly 15% of total CO₂ emissions – and shows little sign of slowing
- Many reports have estimated the cost per tonne of CO₂ saved from avoiding deforestation but few have estimated **what it would cost to put a total end to deforestation.**
- We concluded that the cost of protecting all forests at high risk of deforestation by 2030 would be **so large – well in excess of \$130bn/year** - that it is **not credible** to assume that concessional/grant payments on this scale would occur
- Current domestic and international finance to protect forests is just **\$2-3bn a year.**
- Analysis demonstrates the **importance of policy and behaviour change:**
 - A **reduction in consumer demand** for the main products that make deforestation profitable (in particular, animal meat and palm oil).
 - The development of **alternative businesses** which can profit from standing forests (e.g., eco-tourism and various forms of sustainable agroforestry).
 - Government actions to **make deforestation illegal**, if combined with effective **enforcement.**
- But implementing these actions **will take time** - **some level of concessional/grant payments will therefore be essential** over the next decade to limit deforestation, buying time before more fundamental policy changes can be put in place.



Scale of payments required for deforestation is so large they cannot be the sole means of ending deforestation but \$130bn a year could make an important contribution

Approach 1

How much do you have to pay to prevent the deforestation that would otherwise occur each year?

~5 GtCO₂e

Annual emissions from deforestation

To protect the forest at immediate risk of deforestation, IPCC estimates suggest that it could cost:

- Increasing marginal cost ↓
- **\$30bn** a year to protect 2.3 GtCO₂e
 - An additional **\$100bn** to protect another 1.7 GtCO₂e
 - An additional **\$100bn** to protect another 1 GtCO₂e

Total of **\$230bn** required **every year** to protect the forest at immediate risk of deforestation

But these payments wouldn't prevent displacement to other areas of forest...



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Total of **\$230bn** required **every year** to protect the forest at immediate risk of deforestation

But these payments wouldn't prevent displacement to other areas of forest...

Approach 2

How much do you have to pay to protect the entire "forest frontier" whether currently threatened or not?

~200 GtCO₂

Carbon stock in tropical forest frontier

To protect the ~200GtCO₂ in the forest frontier (and also protect interior forest), it could cost:

- **\$130bn** a year between now and 2030 at **today's carbon prices for REDD+** of around **\$5/tCO₂**
- **\$900bn** a year between now and 2030 at carbon prices which reflect the **opportunity cost** of not cutting down forest for commodities (**~\$35/tCO₂**)

But these payments are inconceivably large



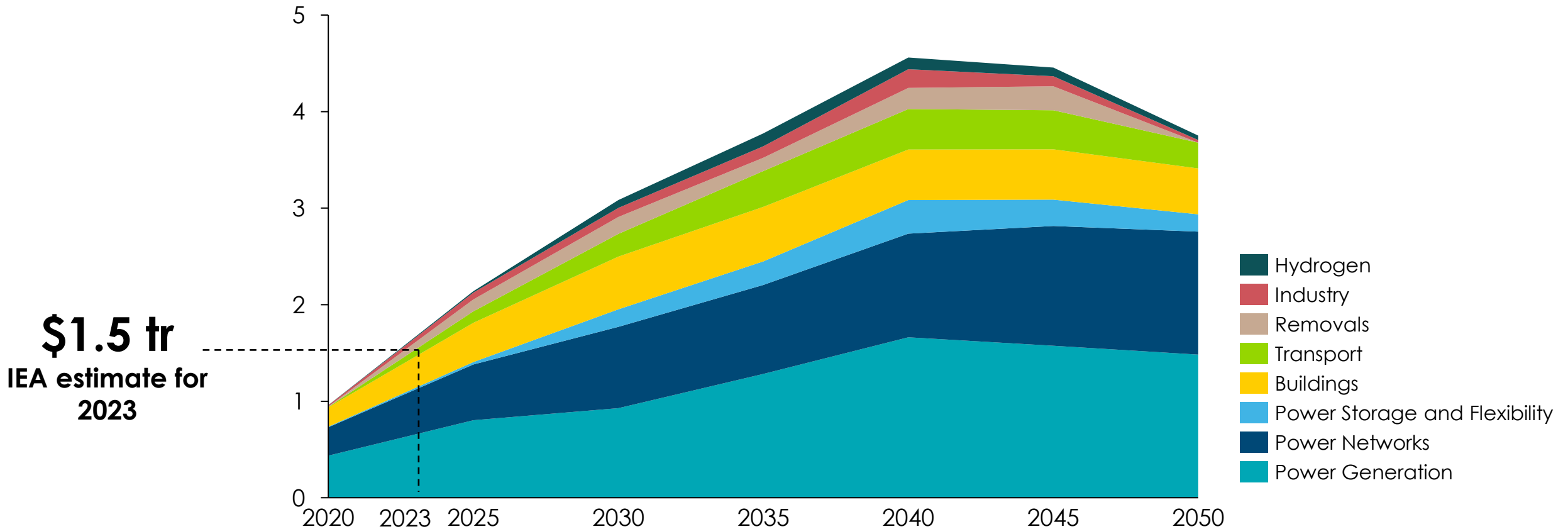
**What has
happened since we
published?**



Comparing like-for-like, the IEA's estimate of investment this year is around \$1.5 trillion – putting global investment roughly on track with the ETC's pathway

Annual capital expenditure in the energy system

Trillion \$



\$1.5 tr
IEA estimate for
2023

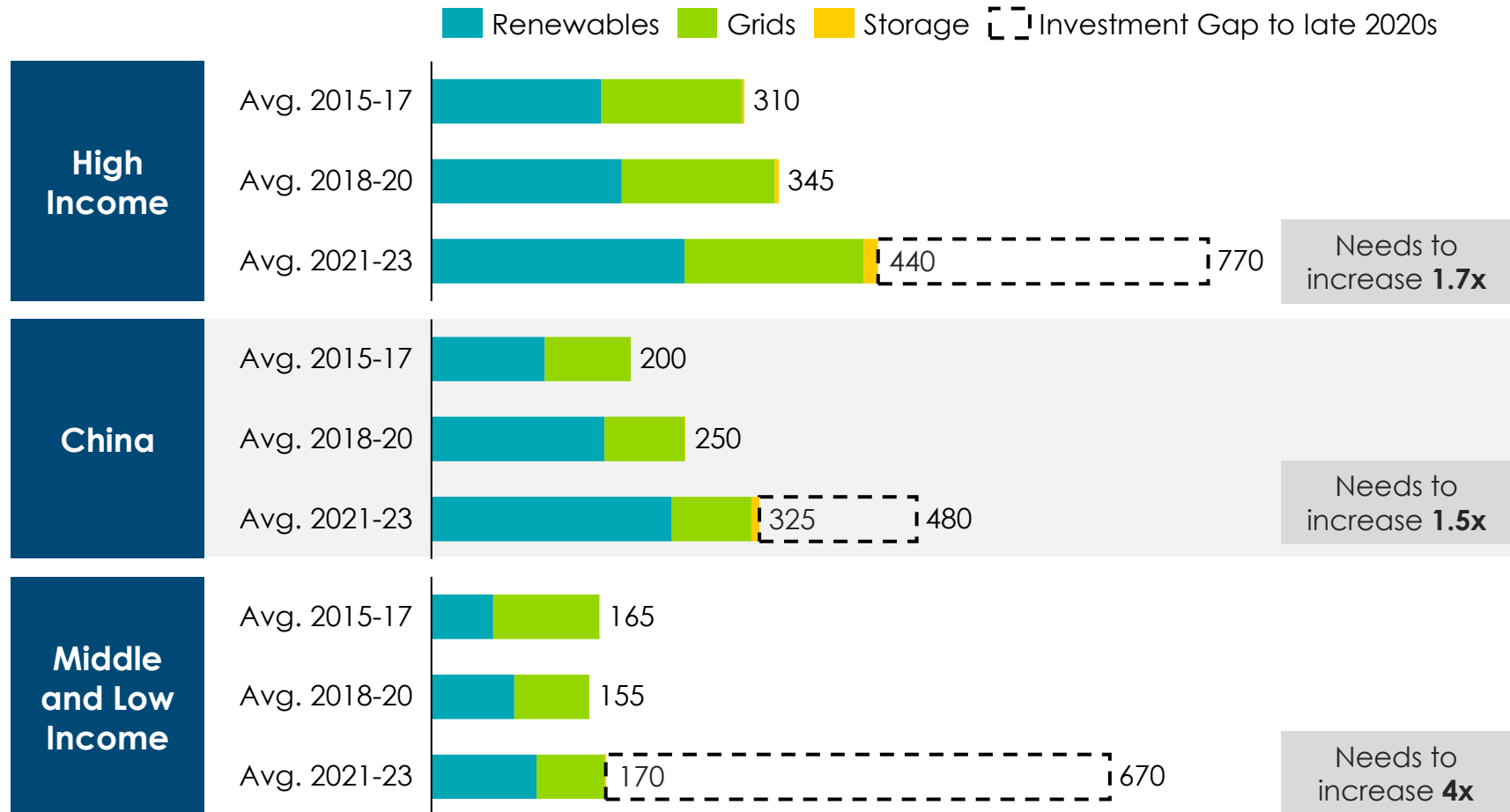
Source: Systemiq analysis for ETC (2023); IEA (2023), *World Energy Investment 2023*.

Note: IEA estimates total clean energy investment will reach \$1.7 trillion this year, but this include some categories of consumer spending on EVs and investment in energy efficiency measures that ETC estimates do not include. On a like-for-like basis, the IEA's estimate for this year is around \$1.5 trillion.

Global investment levels hide huge disparities across countries – investments in power in middle and low income countries remain low, need to grow 4x by late 2020s

Power investment by region, 2015 – 2023

\$ billion per annum



Key drivers of growing investment in middle and low income countries:

- Solar in India
- Renewable deployment in Brazil
- Investments in the Middle East

Key challenges to scaling investment:

- High cost of capital
- Weak grid infrastructure and low/falling spending
- Rising input prices
- Macroeconomic factors (e.g., high interest rates in US/Europe/other key emerging markets)



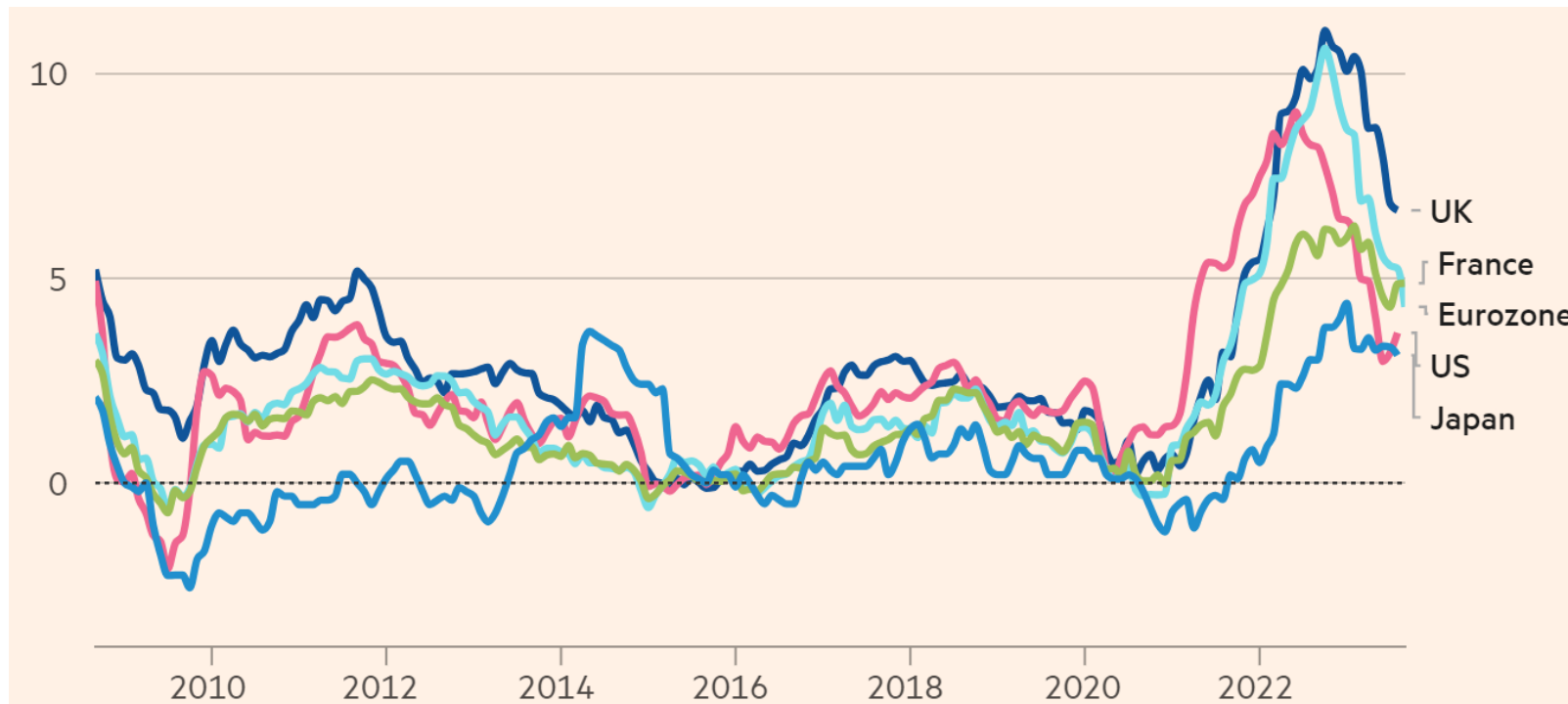
Source: IEA (2023), World energy investment

By 2030

There is a general inflationary effect after a long period of low target inflation rates...real interest rate rises may be here to stay

Inflation is much higher than prior averages, but has started to decline across the globe

Annual change in consumer price index, %

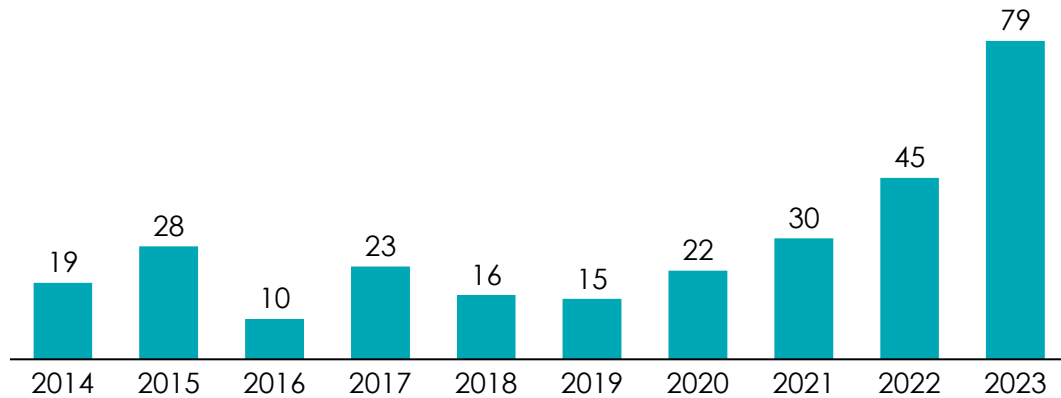


- After averaging ~2% since 2010, global shocks caused a **large unforeseen increase to inflation in 2022.**
- Inflation rates will return to around 2% targets eventually; but price increases will not be reversed.
- Increases in inflation have been managed through interest rate rises – unlikely that these will return to 2010s levels soon, **implying enduring real interest rate rises.**

Financiers and business are facing pushback on climate initiatives

ESG backlash and ESG Funds facing increasing restrictions in the U.S.²

Anti-ESG proponent Resolutions & Outcomes, 2023



- Number of **anti-ESG** shareholder proposals doubled within the **past 3 years**.
- ESG criticisms often stem from **perceptions of subjectivity, sacrificed returns, redundancy, distraction from key issues, and virtue signaling**

GFANZ faces scrutiny, sees some members exit



- **GFANZ**, under Mark Carney, **faces scrutiny for its disaffiliation from Race to Zero** and member **commitment to stricter policies**.
- In 2023, **significant insurers withdrew from the Net-Zero Insurance Alliance**

Progress in recognising the need for increased and new financing approaches has yet to turn into tangible action or dollars

Outcomes from COP28

- **New collective quantified goal** – replaces previous \$100bn political goal
 - Will be grounded in quantification of actual need + gaps in private sector investment
 - Details and terms to be finalised – will be a focal point of COP29
- **Loss and damage fund** – officially recognised the impact climate change will have on developing countries
 - \$770m pledged → would cover less than 1% of estimated annual needs
 - No obligation to pay into the fund – target may not be delivered
 - Lack of clarity on how money will be distributed

Other key developments

- **JET-Ps in Indonesia, Vietnam, South Africa and Senegal**
 - Challenges securing the pledged funding
 - Unclearly defined role for MDBs
 - Lack of in country technical support
- **World Bank reform**
 - World Bank's call to replenish IDA
 - Small reduction in leverage ratio – but only freeing up \$50bn in new lending over 10 years
 - Potential to increase callable capital?
- **Debt relief** is increasing up the agenda
- Increased focus on nature (e.g. through **TNFD**)

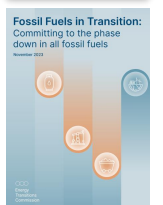
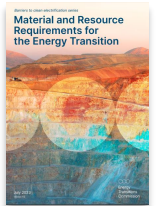


Q+A



ETC 2024 Webinars (UK time)

13 February 2024	13.00-14.30	ETC Webinar - Material and Resource Requirements for the Energy Transition
18 April 2024	13.00-14.30	ETC Webinar - Financing the Transition: How to Make the Money Flow for a Net-Zero Economy
11 July 2024	13.00-14.30	ETC Webinar - Streamlining planning and permitting to accelerate wind and solar deployment
12 September 2024	13.00-14.30	ETC Webinar - Better, Faster, Cleaner: Securing clean energy technology supply chains
07 November 2024	13.00-14.30	ETC Webinar - Fossil Fuels in Transition: Committing to the phase-down of all fossil fuels





Energy Transitions Commission

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