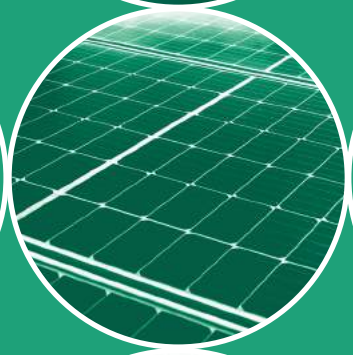
Financing the Transition:
How to Make the Money Flow for a Net-Zero Economy

Executive Summary

March 2023



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Energy Transitions Commission

Version 1.0

Financing the Transition:

How to Make the Money Flow for a Net-Zero Economy

The Energy Transitions Commission (ETC) is a global coalition of leaders from across the energy landscape committed to achieving net-zero emissions by mid-century, in line with the Paris climate objective of limiting global warming to well below 2°C and ideally to 1.5°C.

Our Commissioners come from a range of organisations – energy producers, energy-intensive industries, technology providers, finance players and environmental NGOs – which operate across developed and developing countries and play different roles in the energy transition. This diversity of viewpoints informs our work: our analyses are developed with a systems perspective through extensive exchanges with experts and practitioners. The ETC is chaired by Lord Adair Turner who works with the ETC team, led by Faustine Delasalle (Vice-Chair), Ita Kettleborough (Director), and Mike Hemsley (Deputy Director).

The ETC's *Financing the Transition* was developed by the Commissioners with the support of the ETC Secretariat, provided by SYSTEMIQ. This report constitutes a collective view of the Energy Transitions Commission. Members of the ETC endorse the general thrust of the arguments made in this publication but should not be taken as agreeing with every finding or recommendation. The institutions with which the Commissioners are affiliated have not been asked to formally endorse this briefing paper.

This report looks to build upon a substantial body of work in this area, including from the IEA, GFANZ, IRENA, BNEF, the Independent High-level Expert Group on climate finance chaired by Vera Songwe and Lord Nicholas Stern, and development finance experts such as the Blended Finance Taskforce.

The ETC team would like to thank the ETC members, member experts and the ETC's broader network of external experts for their active participation in the development of this report.

The ETC Commissioners not only agree on the importance of reaching net-zero carbon emissions from the energy and industrial systems by mid-century but also share a broad vision of how the transition can be achieved. The fact that this agreement is possible between leaders from companies and organisations with different perspectives on and interests in the energy system should give decision-makers across the world confidence that it is possible simultaneously to grow the global economy and to limit global warming to well below 2°C. Many of the key actions to achieve these goals are clear and can be pursued without delay.

Learn more at:

www.energy-transitions.org

www.linkedin.com/company/energy-transitions-commission

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Introduction

Global warming poses severe risks to communities and ecosystems this century. To limit it to 1.5°C, the world must reduce CO_2 emissions to around net-zero by mid-century, with a decline of at least 40% by 2030. Many countries and companies are therefore now committed to achieving net-zero by mid-century.

In a series of major reports over the last 6 years, the Energy Transitions Commission (ETC) has demonstrated how net-zero emissions can be achieved across the energy, building, industry and transport sectors of the economy.[1] Massive clean electrification must be at the core of decarbonisation pathways, combined with a range of complementary technologies, including clean hydrogen, sustainable bioenergy, and carbon capture and storage. In addition, as set out in the ETC's recent report *Mind the Gap*,[2] significant carbon dioxide removal will be required to drive net emissions down fast enough to meet the 1.5°C objective.

Achieving this technologically feasible transition requires large-scale investment and, in some cases, international financial flows.

Several organisations have analysed key aspects of the financing challenge. Reports by IEA, IRENA, BNEF and others have presented detailed estimates of the investment required to transition to a net-zero economy. The Independent High-level Expert Group on climate finance, chaired by Vera Songwe and Lord Nicholas Stern, has described the need for greatly increased financial flows to lower-income countries and recommended actions which could achieve this; and the Blended Finance Taskforce has proposed ways in which public development finance could leverage additional private finance.[3]

This report builds on and complements other analyses in three ways:

- It sets out the ETC's detailed estimates of investment need by sector and country income group.
- It seeks to define 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.
- It distinguishes between two conceptually different categories of financial flows:
    - **Capital investment in the technologies and assets required to create a net-zero economy.** In some cases, these investments will not occur without changes in policy which reduce risks and the cost of capital. But in principle these investments deliver a positive return to investors and lenders.
    - **Concessional/grant payments to pay for decarbonisation actions which will not occur fast enough without payments** to economic actors to phase out (or phase down of load factors) exiting coal plants earlier than is economic, end deforestation, and remove carbon dioxide from the atmosphere.

Capital investment needs, source of finance and required actions

In relation to the first category of required finance our key conclusions are that:

- Around $3.5 trillion a year of capital investment will be needed on average between now and 2050 to build a net-zero global economy. Of this, 70% is accounted for by investment in low-carbon power generation, transmission and distribution, which underpins decarbonisation in almost all sectors of the economy.
- This $3.5trn a year is offset by a fall in required fossil fuel investment of about $0.5trn a year on average to 2050, leaving a net investment need of $3trn a year. In middle- and low-income countries, much of this investment would be required to support economic growth even in the absence of a climate change challenge. However, the required scale of capital mobilisation and reallocation will not occur without strong real economy policies, plus specific finance sector related actions.[4]

1 For example, see ETC (2020), *Making Mission Possible: Delivering a net-zero economy and reports in the Making Mission Possible series.*

2 ETC (2022), *Mind the Gap : How Carbon Dioxide Removals Must Complement Deep Decarbonisation.*

3 For example, see IEA (2022), *World Energy Outlook 2022*, IRENA (2021), *World Energy Transitions.* Outlook 2021, BNEF (2022), *New Energy Outlook 2022,* and The Independent High-Level Expert Group on Climate Finance (2022), *Finance for Climate Action.*

4 The $3.5 trillion represents a mixture of gross and net investment, where our approach varies by sector. In the energy producing sectors (which account for almost three-quarters of the total), estimates are gross investment, but a share of this would be required anyway to expand electricity generation regardless of decarbonisation. In other sectors, where possible, we have sought to estimate the net incremental investment. Please refer to the main report for more detail.

- The scale up of investment required differs by country income group. In high-income economies and China, annual investments to build a net-zero economy will need to reach roughly double 2021 levels by 2030. In middle- and low-income countries, a four-fold increase is required by 2030.

- In all countries, well-designed real economy policies must create strong incentives for private investment in the energy transition. Key policies include various forms of regulation, targeted fiscal support for the development and initial deployment of new technologies, and carbon pricing.

- In high-income countries, the vast majority of finance will come from private financial institutions and markets if well-designed real economy policies are in place. Yet even in these economies, public financial institutions will need to play a role in financing specific types of investment, such as first-of-a-kind technology deployments, shared infrastructure (e.g., hydrogen and carbon capture utilisation and storage (CCUS) transport and distribution networks), and residential buildings retrofits.

- Voluntary action by financial institutions to adopt and implement net-zero commitments can play a powerful supporting role in driving capital reallocation. Financial regulation should support effective voluntary commitments by mandating clear disclosure of emissions, climate-related risks and emission reduction strategies.

- In some middle- and low-income countries, private financial flows alone cannot ensure adequate investment given the challenges created by high actual or perceived macroeconomic risks, inadequate domestic savings and other factors which increase the cost and reduce the supply of private finance. A significant increase in international financial flows to some lower income economies is therefore required; as the Songwe-Stern report has argued, this requires a major increase in the scale of finance provided by Multilateral Development Banks (MDBs), together with changes in MDB strategy and approach which can help mobilise greatly increased private investment.[5]

Concessional/grant payments

Distinct from, and in addition to the capital investment needs described above, three main categories of concessional/grant payments will be needed if the world is to cut emissions fast enough to limit global warming to 1.5°C.[6] By 2030, these payments could amount to:

- Around $25-50bn per annum to achieve early phase-out of existing coal assets, with the need for these payments declining to zero by 2040.

- Around $130bn per annum, but potentially far more, to end deforestation by 2030.

- Around $150bn per annum to fund carbon removals, primarily via Nature Based Solutions such as reforestation initially, but with an increasing role in the 2030/40s for engineered solutions such as Direct Air Capture of Carbon plus Storage (DACCS).

These payments could be financed by carbon credits purchased within voluntary or compliance markets, philanthropic funding, and high-income countries.

For coal phase-out, the financing challenge looks manageable, and specific projects/programs will often combine investment in new technology alongside payments to help phase out the old. In the case of deforestation, however, the scale of payments required to offset the economic incentive to deforest is so large that concessional/grant payments cannot be the primary means to end deforestation, but will need to play an important role to avoid deforestation, as part of a suite of actions, while more fundamental policy changes can be put in place.

This report covers in turn:

1. The net-zero financing challenge.
2. Real economy policies to unleash investment.
3. Financial sector actions required in all countries.
4. Additional actions required in middle- and low-income countries.
5. How to finance concessional/grant payments.

5 The Independent High-Level Expert Group on Climate Finance (2022), *Finance for Climate Action.*

6 In some cases concessional/grant payments will also be required to deliver a just social transition by supporting workers and communities facing large scale and regionally focussed employment losses, but this report does not provide estimates of how much these could be. Recent estimates suggest the cost of targeted programmes and safety nets could reach $500-100bn a year in middle and low income countries by 2030. See The Independent High-Level Expert Group on Climate Finance (2022), *Finance for Climate Action.*

Energy Transitions Commission

FINANCING THE TRANSITION: CAPITAL INVESTMENT

Two distinct forms of financial flow are required for the energy transition:

CAPITAL INVESTMENT

$3.5 trillion a year to 2050 globally

+

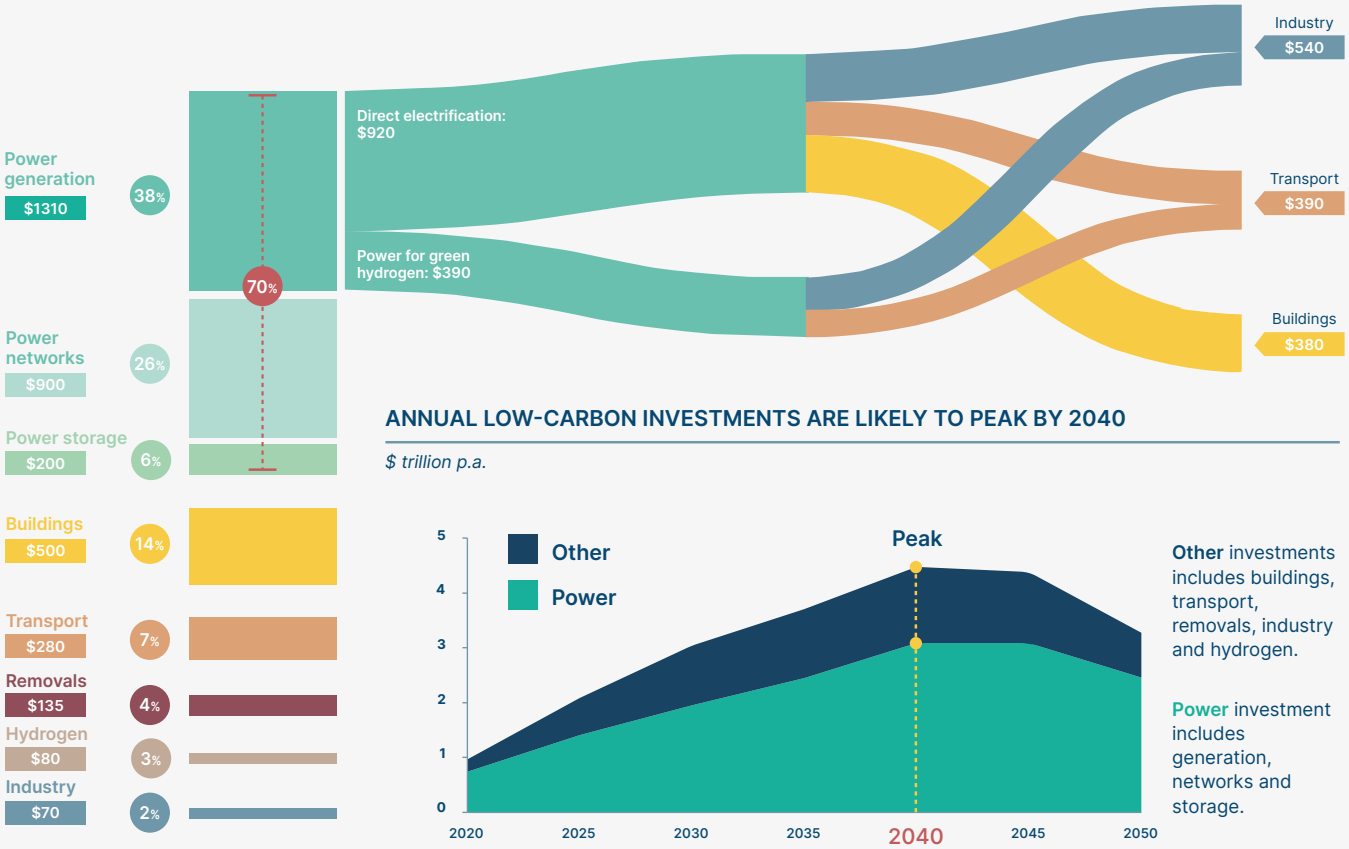
CONCESSIONAL/ GRANT PAYMENTS

>$300 billion a year by 2030 in middle and low income countries

Capital investment: where should investment flow?

INVESTMENT IN LOW-CARBON POWER = 70% OF TOTAL INVESTMENT, SPURRING DECARBONISATION IN OTHER SECTORS

$ billion p.a. 2021-2050



ANNUAL LOW-CARBON INVESTMENTS ARE LIKELY TO PEAK BY 2040

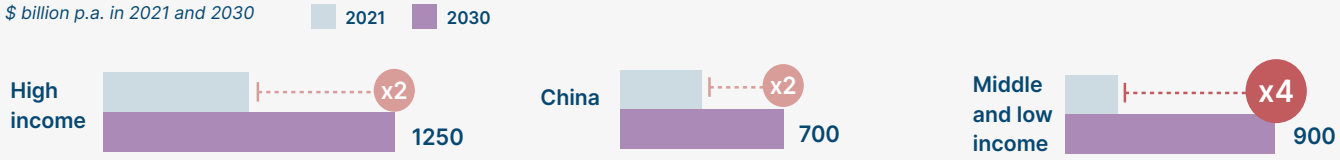
$ trillion p.a.

Other investments includes buildings, transport, removals, industry and hydrogen.

Power investment includes generation, networks and storage.

INVESTMENT IN MIDDLE AND LOW INCOME COUNTRIES NEEDS TO INCREASE 4-FOLD BY 2030

$ billion p.a. in 2021 and 2030



$3 trillion — Clean investment (minus declining fossil fuel investment)

1.3% — Equivalent to 1.3% of global GDP a year to 2050

x3 — Scale up needed by 2030 globally

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FINANCING THE TRANSITION: CONCESSIONAL/GRANT PAYMENTS

Two distinct forms of financial flow are required for the energy transition:

CAPITAL INVESTMENT

- Spending by businesses or public sector on assets, technology, infrastructure
- Delivers future returns

CONCESSIONAL/ GRANT PAYMENTS

- Required where there is no economic incentive
- Does not deliver a return or payback

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

PAYMENTS REQUIRED TO ACHIEVE 3 CRITICAL OBJECTIVES BY 2030 IN MIDDLE AND LOW INCOME COUNTRIES (EX. CHINA)

EARLY COAL POWER PHASE OUT

Payments required where coal remains competitive with renewables

CO_2 p.a. avoided by 2030	$ bn p.a.
2 Gt	$25-50

AVOIDING DEFORESTATION

Payments required to protect the forest frontier and address root causes of deforestation

CO_2 p.a. avoided by 2030	$ bn p.a.
4.6 Gt	$130 at least

could be significantly higher without diet change

CARBON DIOXIDE REMOVALS

Removals only possible if someone pays for them

CO_2 p.a. avoided by 2030	$ bn p.a.
3.6 Gt	$100

to fund CDR through natural climate solutions (NCS)

IN HIGH INCOME COUNTRIES AND CHINA

- Accelerated coal phase out in China could cost $20-50bn a year over the next 10-15 years – but this cost will not be borne by external concessional/grant finance
- Remaining tropical forest land exists almost exclusively in middle and low income countries
- Payments for CDR from engineered and hybrid solutions (e.g., direct air capture) could reach $50bn a year by 2030

Where will the finance come from?

OVER $300BN A YEAR COULD BE RAISED THROUGH CARBON MARKETS, PHILANTHROPY AND INTERGOVERNMENTAL TRANSFERS

$ billion p.a.

Carbon markets	80	**Maximise participation of corporates in voluntary carbon markets** – e.g., 1.7 Gt/year of credits at an average cost of $45-50 tCO_2
Philanthropists	75	**Mobilise more action from philanthropists** – increasing share of philanthropic capital devoted to climate mitigation from 2% to 10%
Intergovernmental transfers	205	**Intergovernmental transfers of climate-related funding** – if high income countries met the UN's aid target (0.7% of Gross National Income) and devoted half to climate
Total	360	**But without diet change, concessional/grant payments to end deforestation could be significantly higher**

Chapter 1

The net-zero financing need – capital investments and concessional/grant payments

1.1 Global investment requirements: a manageable macro-economic challenge

We estimate that around $110 trillion in capital investment will be required between 2021 and 2050, implying an average annual level of $3.5trn per year.[7] This is offset by an average annual reduction of $0.5trn in fossil fuel investment, to give a net figure of $3trn per annum.[8] This is equivalent to around ~1.3% of prospective global gross domestic product (GDP) over the next 30 years.

By far the largest element within that total is the investment needed in the power system to support a dramatic increase in electricity generation and use, which underpins decarbonisation in almost all other sectors of the economy. Key elements between 2021 and 2050 are:

- **Power sector - $2,400bn per annum (70% of total)** with $1,300bn to develop zero-carbon power generation capacity, $900bn to extend, upgrade and replace transmission and distribution networks, and $200bn to improve grid flexibility, including through investment in battery and seasonal storage capacity.

- **Hydrogen - $80bn per annum (3%):** This includes $40bn to develop large scale global production of green hydrogen, to produce greenfield blue hydrogen and retrofit grey hydrogen, and $40bn to build pipelines, refuelling stations, import and export terminals, and storage capacities.

- **Buildings - $500bn per annum (14%)** including $230bn to retrofit buildings (e.g., with better insultation), $130bn to install renewable heating (e.g., solar thermal water heating) and $150bn to install heat pumps.

- **Transport - $280bn per annum (7%):** This includes $130bn per annum to develop the charging and refuelling infrastructure required to support uptake of electric road transport, $70bn in sustainable aviation production plants and new hydrogen and battery-electric aircraft, and $40bn to decarbonise shipping with investment in ammonia or methanol synthesis, storage and bunkering infrastructure, and new/retrofitted ships.[9]

- **Industry - $70bn per annum (2%)** including $10bn to decarbonise steel using technologies such as hydrogen-based direct reduced iron (DRI) facilities and carbon capture and storage (CCS), $10bn to apply CCS to cement plants, $40bn to develop and integrate CCS, pyrolysis and other technologies in chemical industry processes and $10bn to build and deploy low-carbon technologies at aluminium smelters and refineries.

- **Removals - $135bn per annum on average (4%):** This covers the investments required to make possible both Nature Based Solutions which sequester carbon (e.g., land acquisition for reforestation projects) and engineered solutions (e.g., the construction of direct air capture plants).[10] These investment costs will be made possible by concessional/ grant payments, discussed further in Section 1.2.

At the global macroeconomic level, it is clearly feasible to achieve the net $3 trillion a year of capital investment described in this report. This amounts to around 1.3% of possible global GDP over the next 30 years, and a significant part of this investment – particularly in the power sectors of middle- and low-income countries – would be needed in any case to support economic growth independent of any climate change objectives.

Moreover, this high investment need does not represent a long-term "cost" to the economy or imply a significant long-term reduction in living standards. Instead, the investments needed – particularly in the power system – represent both a major private investment opportunity and an attractive investment for society as a whole.

Zero-carbon electricity systems (whether renewable or nuclear) are characterised by high upfront capital costs but far lower operating cost than fossil fuel-based systems. As a result, the transition to a net-zero economy will entail a period of higher investment (reaching a peak of about $4trn around 2040-45 and declining thereafter), offset by increasing savings from reduced operating costs, primarily arising from reduced fossil fuel use. Depending on the fossil fuel price assumed, this saving could average $0.4-0.8tr per year between now and 2050, reaching $2-3tr per annum by 2050 and continuing thereafter [Exhibit 1].[11]

7 Figures referenced throughout the report are expressed in nominal prices, in line with the approach taken by others such as the IEA. They do not include the cost of finance.

8 The $0.5 trillion is the difference between current investment in fossil fuels ($0.8tr) and projected average annual investment in fossil fuels 2021-50 ($0.3trn). Source: BloombergNEF (2022), *Counting Cash in Paris Aligned Pathways – analysis based on IEA Net Zero scenario.*

9 Some published estimates for the transport sector are significantly higher since they include the purchase of electric vehicles (whether passenger autos or trucks). We exclude these since: (i) the cost premium of EVs over ICE vehicles will decline and potentially disappear, at which point there will be no incremental cost above business as usual; (ii) passenger auto purchase is considered as consumption rather than investment within national income accounts.

10 ETC (2022), *Mind the Gap: How Carbon Dioxide Removals Must Complement Deep Decarbonisation.*

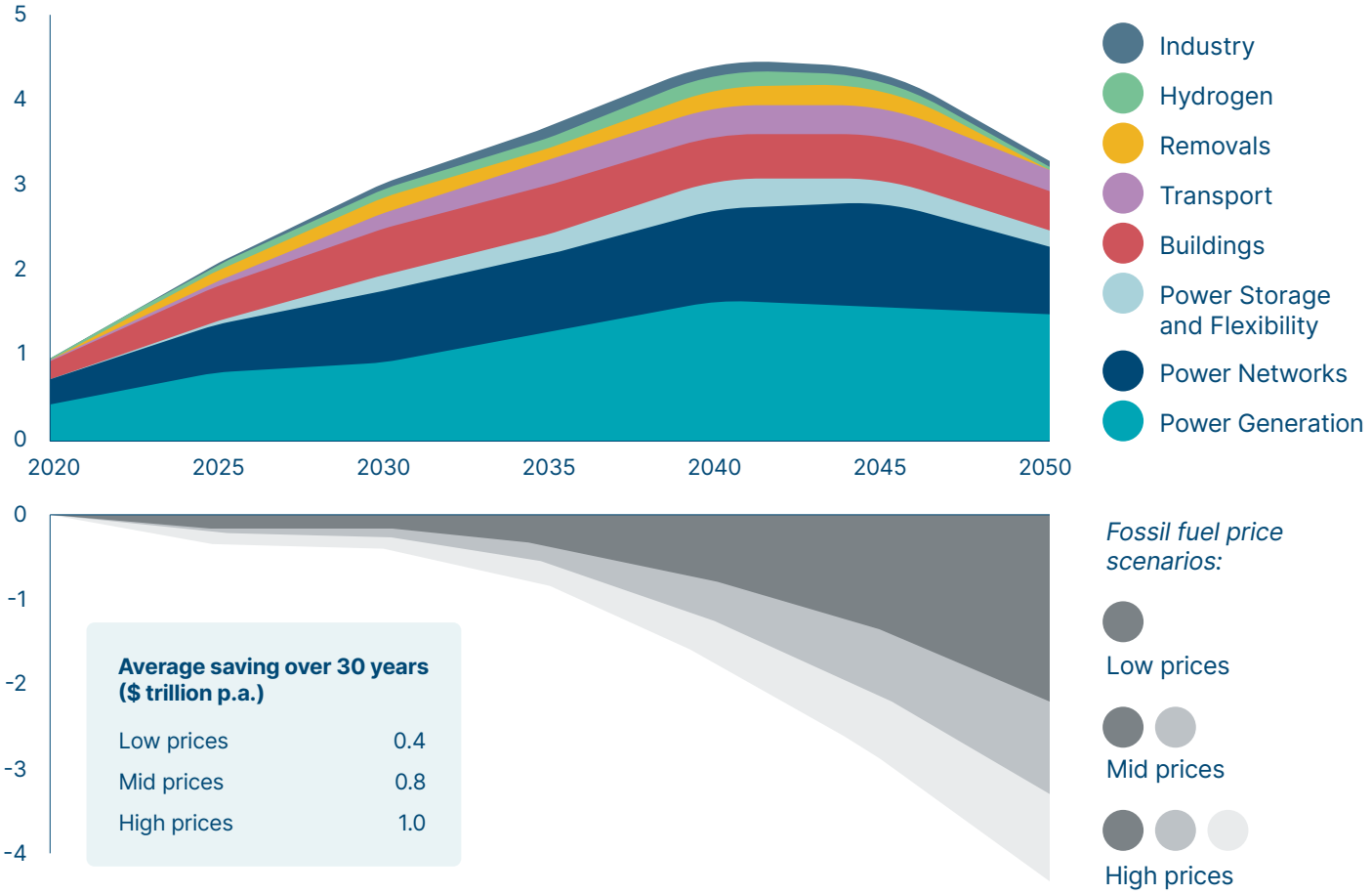
11 This is an average of potential savings under the low-price and mid-price scenario.

Exhibit 1

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

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

$ trillion



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 2046. 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.

In addition, the transition to a net-zero economy will deliver:

- **More predictable and less variable energy costs** than in a fossil fuel dominated energy system. This increased stability reduces risks and can lower the cost of capital for investments in energy infrastructure.

- **Greater energy security:** A renewable power system offers a way out of import dependency for some of the countries which are major net-importers of fossil fuels.[12]

- **Increased jobs in the period of transition:** The IEA estimates that the energy transition will create a net gain of 25 million jobs by 2030.[13]

However, while the investments required are macro-economically feasible and deliver an attractive return, they still imply that a dramatic increase in total investment and a major reallocation of capital must be achieved during the 2020s. At the global level, total investment per annum in the late 2020s could amount to 7% of total global investment in 2025 but with a significant variation by country income group [Exhibit 2].

- In high-income countries, required investment could amount to $1,250 billion per annum in the late 2020s. This is about double current levels, and equal to around 7% of likely total economy-wide investment in these countries in 2025.

- In China, additional investment could reach $700 billion per annum. This also implies a doubling of current low-carbon investments, but would amount to a lower share (~5%) of China's total investment in 2025; this reflects China's very high economy-wide investment rate of over 40% of GDP.

- Investments in middle-income countries in the late 2020s could amount to $875 billion per annum, implying a four-fold increase in low-carbon investment.

- Investments in low-income countries during the late 2020s, at just $25bn per annum, are small relative to the other country groups, but are larger as a percentage of their GDP and investment. This implies that significant international financial flows into lower-income countries will be needed to make this level of investment possible.

Over the subsequent decades, high-income countries and China will account for a declining share of global low-carbon investment and will reach peak investment levels earlier than middle- and low-income countries, whose investment needs will continue to grow strongly into the 2040s.

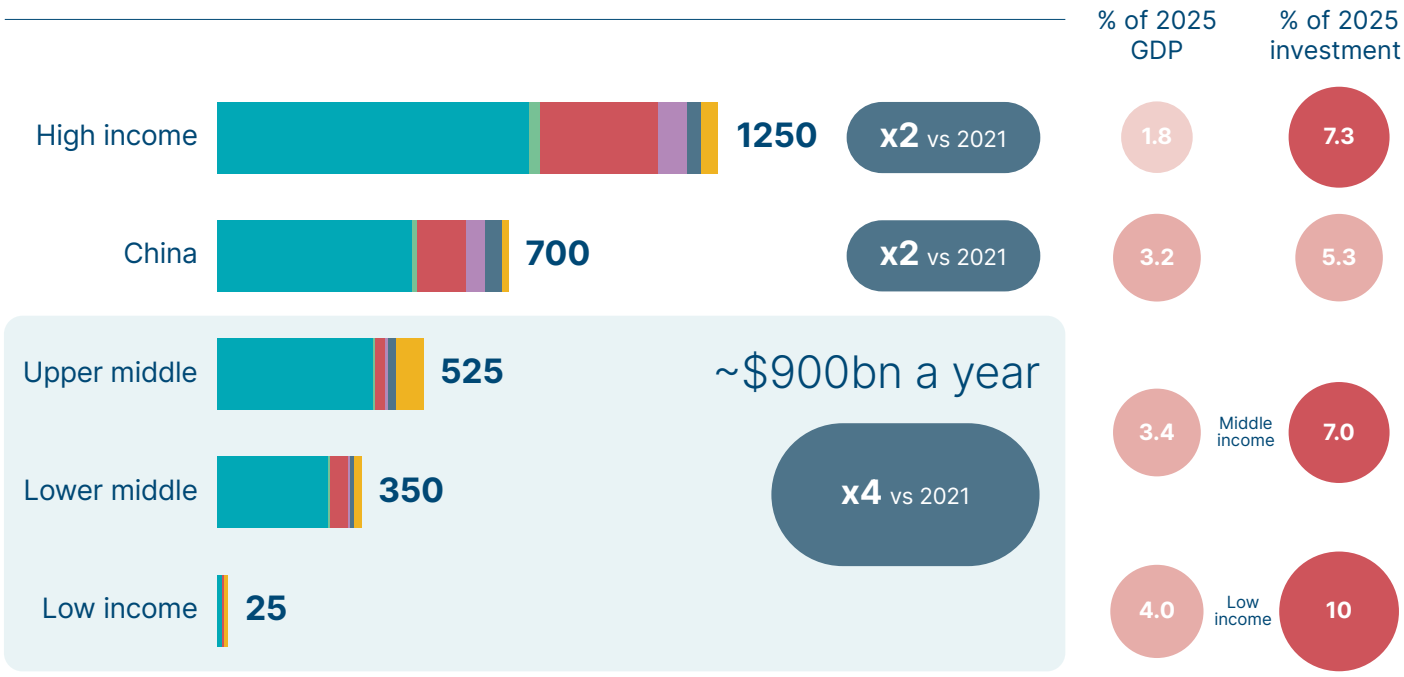
12 IRENA (2022), *World Energy Transitions Outlook 2022.*
13 IEA (2022), *World Energy Outlook 2022.*

Exhibit 2

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

$ billion p.a.



SOURCE: SYSTEMIQ analysis for the ETC (2022); SYSTEMIQ (2021), *Investments for green recovery and transformational growth 2020–30: Technical Note*; IMF (2022), *World Economic Outlook October 2022*.

1.2 Concessional/grant payments

The ETC's pre-COP27 *Degree of Urgency* report highlighted two key areas where current progress on emissions reductions falls far short of what is needed to stay on a 1.5°C compatible path - these are early phase-out of existing coal power generation and ending deforestation.[14] Our *Mind the Gap* report showed that carbon removals would be required, in addition to rapid emissions reductions, if the world is to cut net emissions fast enough to limit global warming to 1.5°C.[15]

Technological change, well-designed real economic policies and innovative financing mechanisms can contribute to solving each of these three challenges. But in each case, some form of concessional/grant payments will be required to induce asset owners or potential project developers to take actions for which there is no private market incentive.

- Existing coal plants will close or reduce capacity utilisation once the cost of new renewables falls below the marginal cost of generation. Some form of payment will be required to induce closure or lower capacity utilisation in those cases where coal is still the cheapest option on a marginal cost basis.

- Rising demand for key commodities (e.g., meat and palm oil) creates strong private incentives for deforestation; concessional/grant payments will likely be required to offset the economic incentive to deforest.

- Carbon dioxide removals do not give a private return; someone has to pay for them.

The required level of such payments is highly uncertain. We estimate that required concessional/grant payments to middle- and low-income countries could total at least $300 billion a year in 2030:

- Around $25-50bn per year to phase out coal early – these payments would then decline over the 2030s, towards zero by 2040.

- Around $130bn per year to end deforestation by 2030, but potentially much higher unless the demands which drive deforestation can be reduced – for instance, through a shift to plant based diets or the development of synthetic meat.

- Around $100bn a year to fund carbon dioxide removals from natural climate solutions in middle- and low-income countries. These payments would increase gradually to 2050. They would provide the revenue flow required to provide a return on the capital investment costs for Nature Based removals discussed in Section 1.

The potential sources for these required financing flows are discussed in Section 5.

The transition to a net-zero economy will also create other categories of stranded assets and require other forms of payments for removals, but which do not require or justify external finance of a concessionary/grant form. In particular:

- Like all processes of economic change, the energy transition will create stranded assets and losses for some existing asset owners; coal power plants will become uneconomic to run once new renewables are cheaper than the marginal cost of coal, and some oil and gas reserves will become uneconomic and will have to be written off in the face of declining demand. But there is no need for concessional/grant payments to ensure that these assets become uneconomic.[16]

- Earlier-than-economic coal exit may be required in some high-income countries and China, but relevant country governments should manage that challenge. There is no case for international concessionary/grant finance to support high- or upper-middle-income countries meet their climate commitments.

- Our *Mind the Gap* report projected that a significant scale up of "engineered" solutions (e.g., direct air capture) will be required to meet climate goals, potentially requiring $50 billion per annum payments by 2030, increasing to over $500bn by mid-century.[17] But these payments will primarily be made by companies in high- and middle-income countries to project developers. They will be required to enable companies to achieve net-zero emissions, offsetting the 5-10% emissions which cannot be eliminated by within-company action; this should be mandated via some combination of compulsory targets, carbon taxes and emissions trading schemes.

14 ETC (2022), *Degree of Urgency: Accelerating Action to Keep 1.5°C on the Table.*
15 ETC (2022), *Mind the Gap: How Carbon Dioxide Removals Must Complement Deep Decarbonisation.*
16 Nor is there any general "climate justice" case for compensating owners of stranded assets, many of which will be companies in high/middle income countries. Indeed any suggestion that owners of stranded assets will be compensated creates perverse incentives for continued investment in carbon emitting fossil fuels.
17 ETC (2022), *Mind the Gap: How Carbon Dioxide Removals Must Complement Deep Decarbonisation.*

Chapter 2

Real economy policies to unleash investment

At the global level, there are no fundamental macroeconomic impediments to achieving the level of capital investment required; and in all high-income countries, and many middle-income ones, private finance will deliver most of the required investment provided strong "real economy" policies are in place.

By "real economy" policies, we mean policies, such as carbon pricing or regulation, which do not operate via regulatory or other interventions in the financial sector, nor via the use of publicly supported financial institutions. These real economy policies create the conditions for private capital to support the energy transition by reducing avoidable risks and creating clear incentives. This chapter describes required real economy policies. Chapter 3 describes policy and other interventions specific to the financial sector.

Well-designed real economy policies maximise the potential role of private finance in four ways [Exhibit 3].

Exhibit 3

Real economy policies to unleash investment

Establishing a clear strategic vision to offer certainty to investors through clear medium-term targets and ambitious standards and regulations.

Addressing the green premium challenge through carbon pricing, contracts for difference, quantitative mandates, direct consumer subsidies, and public procurement which creates demand for low-carbon alternatives.

Reducing downside risks by minimising the variance of future returns, de-risking investment in early stage technologies, and implementing credible and consistent policymaking.

Removing supply side bottlenecks which can delay or prevent projects, for example streamlining planning and permitting, prioritising clean power generation and key infrastructure development, and supply chain development.

Establishing a clear strategic vision to offer certainty to investors through clear medium-term targets and ambitious standards and regulations, such as:

- Commitments to the total decabonisation of electricity systems by, for instance 2035 (as is the case in the UK and US), and quantitative targets for renewable capacity or generation.
- Firm legislated dates for the total prohibition of light-duty internal combustion engine vehicle sales (e.g., by 2035 at the latest).
- Strong regulation of building or appliance energy efficiency.

Addressing the green premium challenge via:

- Carbon pricing which can create strong incentives for decarbonisation across multiple sectors. This should ideally be introduced in all countries, but if it is not, it must be complemented by border carbon adjustments mechanisms to protect internationally exposed sectors.

- "Contract for difference" (CFD) mechanisms which can be used to subsidise low-carbon producers in the early stages of deployment. These, or other more direct subsidies, have been used to stimulate the early phase of renewables deployment in many countries; they could also be applied to support other technologies, such as green or blue hydrogen or net-zero steel.

- Quantitative mandates to drive demand for low-carbon alternatives; for instance, requiring an increasing share of shipping and aviation fuels to come from net-zero sources, reaching 100% in 2050.

- Direct consumer subsidies, e.g., to households for heat pump installations.

- Using public and private procurement to create demand for low-carbon alternatives.

Reducing downside risks by minimising the variance of future returns. This can be achieved via for instance:

- Appropriate power market design, for instance, by giving investors the option of revenue certainty over a significant proportion of production through long-term contracts, which reduce downside risks in return for sacrificing upside potential (e.g., via symmetric CFDs).[18]

- De-risking investment in early stage technologies, R&D, and first-of-a-kind plants by guaranteeing revenues or utilisation.

- Ensuring that policymaking is credible and consistent, for example, by committing targets and initiatives to law and providing certainty on carbon price market design.

Removing supply side bottlenecks which can delay or prevent project development and implementation. Here national or regional governments can play important roles through:

- Streamlining planning and permitting systems for renewables development. The ETC's recent *Planning and Permitting* insights briefing finds that this could reduce project development times by more than half for wind and solar projects, while maintaining or strengthening social and environmental standards.[19]

- Playing a coordinating role in the development of decarbonisation plans for specific locations, where decarbonising "clusters" of activities spanning several companies and sectors may require the development of shared infrastructure (e.g., hydrogen or CO_2 networks).

- Developing a strategic plan for critical mineral supply, including encouragement to local production/processing where economic.

- Proactively identifying potential supply chain bottlenecks and developing strategies to overcome them, for example, via targeted support to specific sectors or appropriate strategies for skills development.

18 ETC (2021), *Making Clean Electrification Possible.*
19 ETC (2023), *Streamlining planning and permitting to accelerate wind and solar deployment.*

Chapter 3

Financial sector actions applicable in all countries

In most countries, most of the finance will come from private financial institutions if incentivised through well-designed real economy policy. Putting those policies in place is therefore a top priority. But even with well-designed real economy policies, and even in higher-income countries, investments in some sectors may be limited by material barriers to finance. This means that the optimal policy mix also includes:

Targeted roles for public finance, whether via direct fiscal expenditure/loans or via publicly owned development/ infrastructure banks. Appropriate, precise roles focus will vary by country, but in many it will include a focus on:

- First-of-a-kind technologies and business models: direct loans and tax incentives, combined with investment or guarantees provided by public development banks, can help investors overcome the high initial risks of such projects.

- Scaling up key infrastructure: public investment in, for example, hydrogen transport and distribution and EV charging networks, can help to accelerate private finance mobilisation by overcoming the "chicken and egg" challenge of how to sequence investment and demand.

- Residential building retrofits, particularly in some high-income and high-latitude countries, where decarbonising residential heating is a major challenge. Policies could include public grants and/or low cost loans to enable households to overcome the material financing barrier of significant upfront investment costs.

A supporting role for net-zero or other voluntary commitments. Many private financial institutions have made commitments to align their activities to a 1.5°C or other climate objective and/or to make them compatible with net-zero emissions by 2050. These commitments have been encouraged by initiatives such as the Net Zero Asset Owners Alliance, the Net Zero Banking Alliance and GFANZ.[20] These commitments can result in changed asset or lending allocations which drive the elimination or reduction of coal, oil or gas investment, increase finance of low-carbon power deployment, or which support credible transitions to net-zero by specific customer companies and sectors.

Making these commitments effective requires:

- Turning commitments into net-zero transition plans which outline goals, actions and accountability mechanisms to align a financial institutions' activities with a pathway to net-zero that delivers real economy emissions reductions.[21]

- Setting quantified targets for a suite of metrics, including total "financed emissions" which are directly or indirectly supported by the financial institutions investments, and the ratio of investment/lending which supports low-carbon energy production to that supporting fossil fuels.

- Identifying in particular how financial institutions can help finance the massive scale up of low-carbon power capacity, which will account for 70% of all the required investment to build a net-zero economy.

- For banks with significant real estate exposure, defining a clear approach to the funding of building construction and retrofits, including innovation in financial products (e.g., mortgage top-ups to pay for energy efficiency improvements).

- Identifying to what extent and how financial institutions can support decarbonisation efforts in lower-income countries, whether through financing new capital investment or through engagement in plans to phase out existing coal plants (see Chapters 4 and 5).

20 GFANZ (2022), *Financial Institution Net-zero Transition Plans.*
21 Ibid.

A supporting role for financial regulation to encourage and incentivise private financial institution reallocation of capital towards low-carbon investments. This should entail:

- Ensuring transparent disclosure of climate risks and strategies through financial disclosures.
- Ensuring that financial institutions assess and manage climate-related risks through scenario analysis and stress tests.
- Driving the development of standardised methodologies for calculating key metrics, such as financed emissions and the low-carbon/high-carbon investment ratio, with a possible evolution to mandatory and auditable disclosures.
- Prudential regulators and central banks could also explore whether they should play a more forceful role in driving capital reallocation e.g., by setting higher capital risk weights for loans to high-carbon projects or companies. There are pros and cons of doing this.

In addition, in China, there is a specific need to achieve a reallocation of capital investment away from excessive investment in real estate and related infrastructure construction.

Chapter 4

Additional actions required in middle- and low-income countries

For middle- and low-income countries, the investments outlined in this report are not just a necessary route to achieve net-zero emissions; they are also a necessary route to sustainable and inclusive growth and development. Decisive action this decade, which mobilises the right scale of and the right types of finance, is critical.[22]

In some middle-income economies, the barriers to low-carbon investment are not significantly more severe than in high-income countries, and the policies needed to address them are as described in Chapters 2 and 3 above.

But to different degrees, many middle- and low-income economies face additional challenges which increase the cost or limit the flow of finance required to achieve a rapid energy transition. These include:

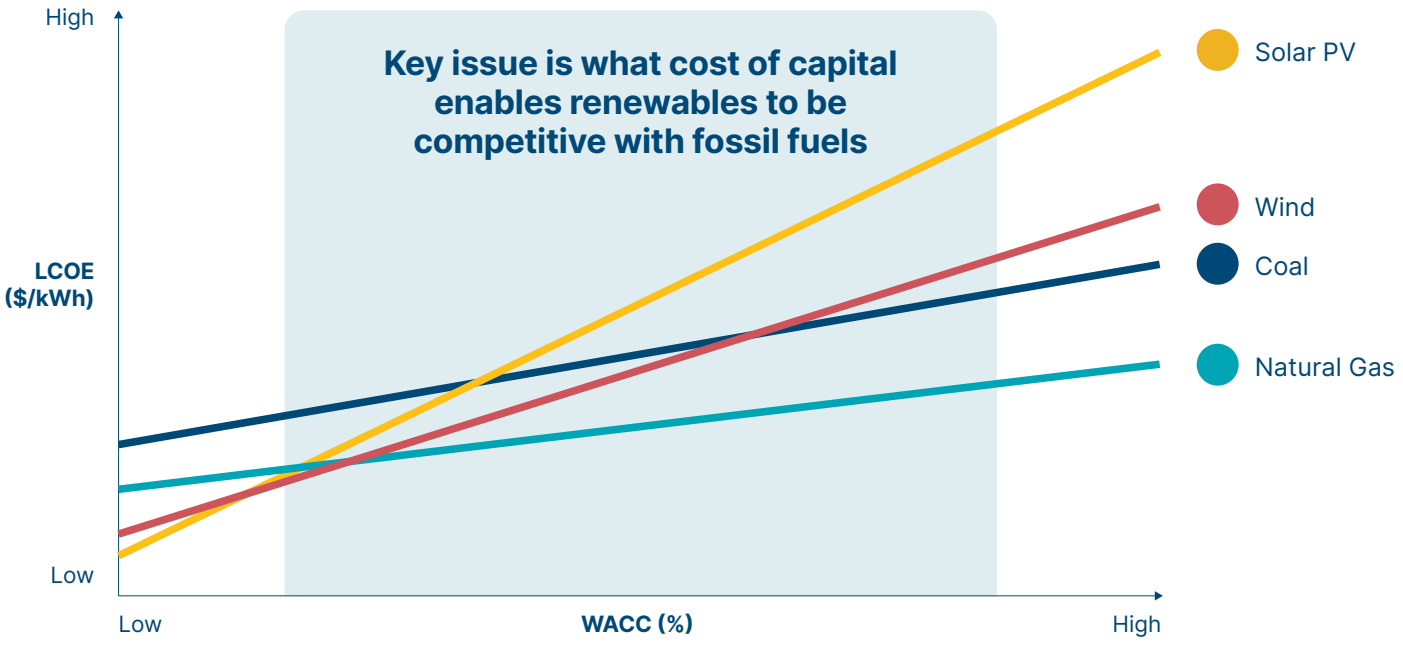
- Low domestic savings and undeveloped financial systems and capital markets, which limit the extent to which domestic capital denominated in local currency can be mobilised by the private sector.
- Past or present macro-economic or political instability which increase perceived risk, or small market sizes which limit external private sector finance and/or increase its cost.
- Weak government fiscal positions, which limit the scope to use public balance sheets to support investment.
- Project-specific risks, which can arise from weak policy or regulatory environments or the low credit worthiness of key potential counterparties, such as electricity distribution companies.

Exhibit 4

Competitiveness of wind and solar is very sensitive to the cost of capital, which is often 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).

22 The Independent High-Level Expert Group on Climate Finance (2022), *Finance for Climate Action.*

High upfront costs in clean electricity technologies make these factors particularly important impediments to clean power system development in some middle- and low-income countries. Because of these upfront costs, the relative economics of zero-carbon versus fossil fuel investments are heavily dependent on the weighted average cost of capital (WACC) [Exhibit 4]. The levelized cost of renewable electricity is therefore far higher in lower-income countries, which face a higher cost of capital than in higher-income countries.

Given these factors, there are many countries, particularly in the lower middle- and lower-income categories [Exhibit 2], where adequate investment will not occur without much larger flows of external finance at a lower cost of capital than currently occurs.

This capital mobilisation challenge has recently been analysed by the report of the Independent High-level Expert Group on climate finance chaired by Vera Songwe and Lord Nicholas Stern, which was published at COP27. One of the report's key conclusions is that adequate investment in middle- and low-income countries will require a much more significant role for Multilateral Development Banks (MDBs) in providing external finance, which can in turn help mobilise increased private investment.[23]

Estimates of current climate mitigation investment in middle- and low-income countries suggest that around $130bn per annum is provided by a combination of domestic public finance and private investment, with $25bn of direct lending from MDBs[24] and $10bn of external private finance mobilised as a result of that MDB lending.[25]

A dramatic increase will therefore be required to deliver the $900bn of investment per annum which the ETC estimates could be required in middle- and low-income countries by the late 2020s.

Mobilising this investment at an affordable cost and ensuring that it is invested well will require:

- **Increased mobilisation of domestic savings and private finance,** in particular to fund power system investments where revenue streams naturally arise in local currencies. Action is required across multiple dimensions:
    - Improved tax collection, including through carbon pricing, and reduced fossil fuel subsidies can increase fiscal resources.
    - MDBs playing a role in fostering the growth of local currency capital markets.[26]
    - And in some countries, such as India, large domestic companies which operate on a global scale, will play a major role in financing investment out of their retained earnings or from borrowings in local or global capital markets.
- **Increased lending from development finance institutions** (in particular, the MDBs) and other external finance at a low enough cost of capital to make energy transition investment profitable. This will require:
    - Increasing the financial capacity available to MDBs, whether through new capital subscriptions, agreement to treat callable capital as equity, or agreement to accept higher MDB leverage ratios. [27]
    - Increasing the proportion of MDB lending which is directed to climate mitigation investments; this should be expressed in specific-agreed targets.
    - Expanding the use of catalytic instruments, including guarantees and first loss equity where a development finance institution agrees to bear the first losses in an investment in order to catalyse the participation of private investors who would otherwise not have invested.
    - Increasing the targeted use of concessional lending and grants, which will be needed in some low-income countries to ensure that increased external finance of low carbon investment does not create unsustainable debt ratios.
    - Resources could also be made available to national governments via greater availability of IMF Special Drawing Rights, which provide external finance to governments at an interest rate in line with risk-free short-term rates in the developed world.[28]

23 The Independent High-Level Expert Group on Climate Finance (2022), *Finance for Climate Action.*

24 MDBs are able to mobilise credit at a lower cost than the private sector because their government shareholders provide equity capital without receiving a return and, even MDBs which offer finance at market rates are able to take on more risk (e.g., political) than the private sector.

25 Systemiq analysis for ETC based on data from CPI (2021), *Global Landscape of Climate Finance and Joint Report on MDB's Climate Finance 2020.*

26 For example, the European Bank for Reconstruction and Development's work to develop mechanisms for local currency lending in Uzbekistan to strengthen the private sector's role in the economy. See EBRD (2018), *Uzbekistan Country Strategy 2018-23.*

27 An Independent Review of Multilateral Development Banks' Capital Adequacy Frameworks (2022), *Boosting MDB's Investing Capacity.*

28 This idea has recently been formalised by the Bridgetown Initiative, developed by Barbadian PM, Mia Mottley, and her economic advisor, Avinash Persaud, and presented at COP27. World leaders will discuss the proposals at the World Bank Spring Meetings in April 2023.

- **An expanded MDB role in technical assistance and project development.** National governments must ensure that well-designed real economy policies are in place, set clear national strategies which provide the context for financial investment decisions, and explicitly identify and address any causes of high perceived/actual risk. MDBs need to play an expanded technical assistance role in advising national governments on these policies, strategies and actions, and must also be able to devote more resources to:
    - Proactively developing bankable projects rather than waiting to receive funding requests.
    - Work with the private sector to catalyse private finance, including in the form of blended finance.
- **Increased private financial flows to middle- and low-income countries.** For any specific financial institution, its investment in/lending to these countries will necessarily reflect its business focus, geographical footprint and relevant expertise. However, the scale of private financial flows will increase if financial institutions with relevant expertise:
    - Include specific commitments related to middle- and low-income countries in their net-zero strategy targets and objectives.
    - Invest to understand the scale and nature of the energy transition opportunity in different groups of middle- and low- income economies.
    - Actively develop project pipelines in specific chosen areas of technology or sector focus.
    - Identify where they can profitably invest on a standalone basis and where they should build relationships with MDBs to help design and implement blended finance approaches.

Chapter 5

Financing concessional/grant payments

As Section 4 discussed, MDBs and other institutions, supported by well-designed national policies will be required to lower the cost of capital (i.e. the required rate of return) in some middle- and low-income countries. But in all countries, the capital investments described in Section 1.1 can deliver a positive rate of return.

Concessional/grant payments are different. They are needed precisely in those circumstances where there is no financial incentive to take the required action. Someone must pay to make the mitigation actions economic.

The scale of the required concessional/grant payments can be reduced by technological development, well-designed policies and changes in consumer behaviour which can for instance:

- Reduce the cost of renewables generation below the marginal cost of running coal plants, thus making it economic to retire them. Policies which support large-scale deployment of renewables, develop supply chains, and make it easier for renewables to connect to the grid, can speed progress to this tipping point.

- Remove fossil fuel or electricity price subsidies which favour existing coal generation at the expense of renewables.

- Reduce demand for products which drive deforestation, such as palm oil or red meat, and government action to make deforestation illegal.

However, even with maximum conceivable progress along these dimensions, significant concessional/grant payments will be needed to reduce emissions fast enough to meet climate targets.

Flows already occurring or committed are by far insufficient to achieve the results needed.

- "Just Energy Transition Partnerships" (JET-Ps) are being developed to help support early coal exit. The South Africa partnership has identified $98bn in financial requirements over five years, with an initial $8.5bn currently being mobilised.[29] The Indonesian partnership will mobilise $20bn over the next 3-5 years.[30] This compares with our estimate of $25-50bn required per annum over 10 to 15 years in middle- and low-income countries (excluding China). Hybrid project and financing structures which seek to simultaneously close-down high-carbon assets and invest in new lower-carbon assets could significantly reduce the requirement,[31] but significant further financial support will be required.

- $19.2bn, between now and 2024, has been pledged by high-income countries to help end deforestation but this compares with our estimate of around $130bn per annum required between now and 2030.

- Estimates suggest that the value of voluntary carbon credits purchased rose from $350m in 2020 to $1bn in 2021 and $1.2bn in 2022.[32] Only a small subset of that is devoted to financing carbon dioxide removals, where we estimate a need for $100bn per annum this decade to achieve the scale of removals described in the ETC's *Mind the Gap* report.[33]

The crucial question is therefore how to produce a dramatic increase in the scale of concessional/grant payments. There are three main possible sources:

- The purchase of carbon credits by companies, whether voluntarily motivated or mandated. One estimate suggests that purchases could reach 1-1.7 Gigatonnes per year by 2030, which at an average cost of $45-$50 per tonne could raise $45-80bn per annum.[34] Another estimate suggests up to $190bn per annum by 2030.[35] Given that total CO_2 emissions in 2030 will likely exceed 30 Gt, with a significant proportion accounted for by major companies which are the most likely credit purchasers, a volume of 1-2 Gt by 2030 is not incredible. Achieving that would require a dramatic increase in the number of companies committed, not only to a rapid reduction in their own emissions to reach net-zero by 2050, but also to buy credits to offset their remaining emissions in each year from now to 2050.

- Grants from philanthropic foundations. If 10% of philanthropic finance was directed to climate mitigation (up from 2% today), $75bn per annum could be available.[36]

29 UK Foreign, Commonwealth and Development Office (2022), *Press release - South Africa Just Energy Transition Investment Plan: joint statement.*
30 UK Cabinet Office (2022), *Press release – Indonesia Just Energy Transition Partnership Launched at G20.*
31 See, for example, Asian Development Bank (2021), *Energy Transition Mechanism.*
32 Trove Research (2022), *Review of the Voluntary Carbon Market.*
33 ETC (2022), *Mind the Gap: How Carbon Dioxide Removals Must Complement Deep Decarbonisation.*
34 BNEF (2022), *Long-term Carbon Offsets Outlook.*
35 FOLU (2022), *Prosperous land, prosperous people: a story of scaling finance for nature-based solutions in Kenya.*
36 Climate Works Foundation (2021), *Funding Trends 2021: Climate Change Mitigation Philanthropy.*

- Greatly increased support from high-income countries. For example, if high-income countries met the UN's target for official development assistance (ODA) at 0.7% of gross national income (GNI), and devoted half of this to climate-related objectives, and three-quarters of this to climate mitigation, this would deliver $200bn per annum.[37] Given the need for all countries to reduce emissions to net-zero by mid-century, these payments must deliver emissions reductions in addition to those the purchasing country is already committed to meet in its national determined contributions (NDC), rather than being presented as a means to deliver the NDC.[38]

Combining these different sources could in theory deliver the scale of concessional/grant payments required [Exhibit 5], but the required increase is daunting and may be impossible to achieve. In particular, in the case of deforestation, concessional/grant payments to offset the economic incentive to deforest would be so large that such payments cannot be the primary means to end deforestation. The scale of these payments raises the question of whether available money would be better spent in other ways e.g., directly supporting governments which are willing and able to impose deforestation bans. Regardless of their exact role, they will, however, need to play an important role to avoid deforestation, as part of a suite of actions, while more fundamental policy changes can be put in place. This is explored in more detail in our *Supplementary report on the costs of avoiding deforestation*.

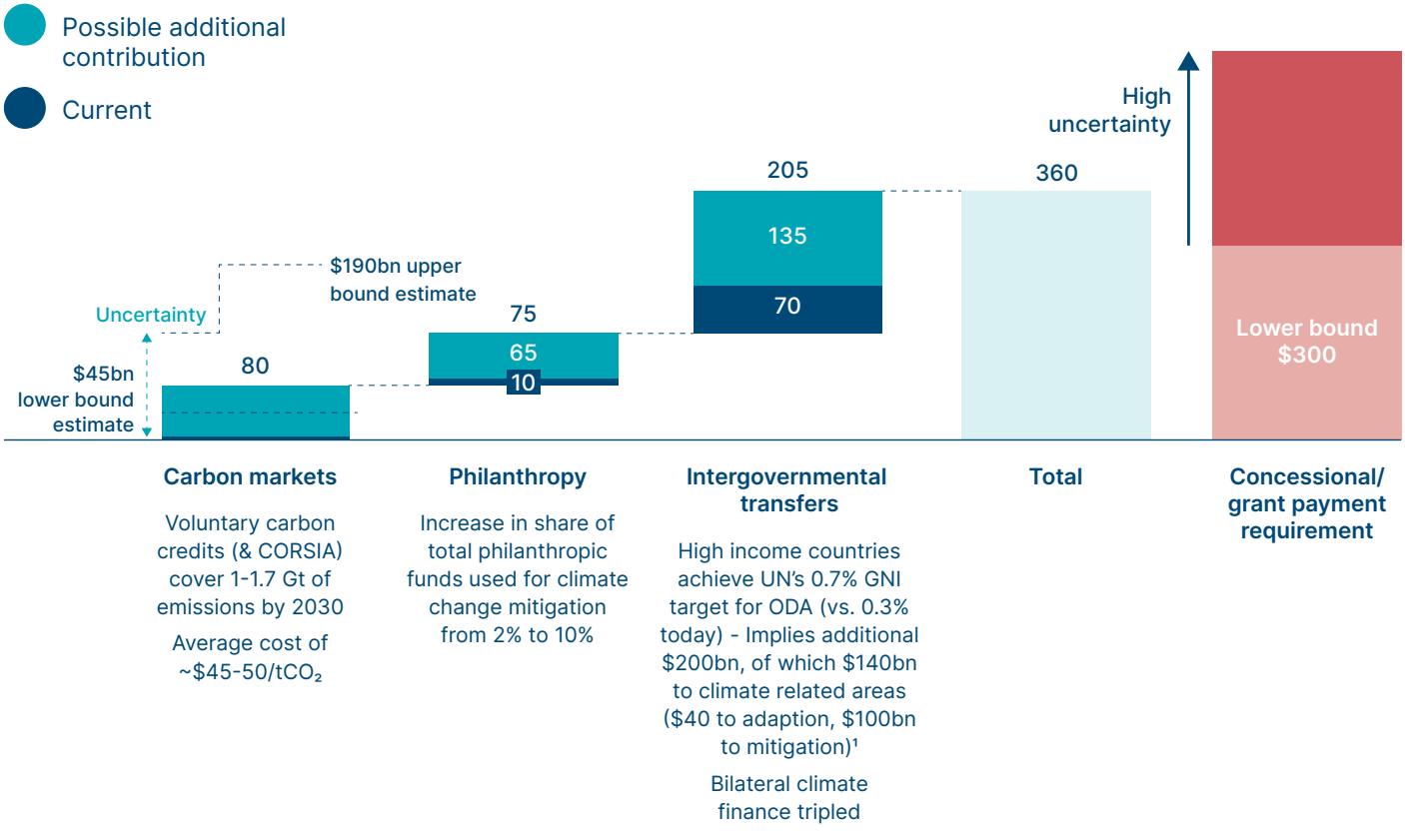
Exhibit 5

Three key sources of finance to scale concessional/grant payments to prevent deforestation, phase out coal power early, and scale carbon removals

Illustrative scenario for financing concessional/grant payments in middle and low income countries by 2030

$ billion p.a.

ILLUSTRATIVE SCENARIO



SOURCE: Systemiq analysis for the ETC (2023); ETC (2022), *Mind the Gap*; Bhattacharya, A. and Stern, N. (2021), *Beyond the $100bn*; OECD (2021), *ODA Data and Trends*; Climateworks Global Intelligence (2021), *Climate change mitigation philanthropy*; BNEF (2022), *Long-term carbon offsets outlook*; FOLU (2022), *Prosperous land, prosperous people: a story of scaling finance for nature-based solutions in Kenya*.

NOTE: (1) 50% of total Official Development Assistance (ODA) to climate related projects, and 75% to climate mitigation; (2) Current voluntary carbon market funding is estimated at ~$1bn.

37 The remaining 25% is assumed for climate adaptation, noting that around 25% of current climate-focused ODA has both a climate mitigation and adaptation objective.

38 ETC (2022), *Mind the Gap: How Carbon Dioxide Removals Must Complement Deep Decarbonisation.*

Energy Transitions Commission

FINANCING THE TRANSITION IN THE 2020s

2030 TARGETS

CAPITAL INVESTMENT — **$3 trillion** a year by 2030 globally, including:

CONCESSIONAL/ GRANT PAYMENTS — **>$300 billion** a year by 2030 in middle and low income countries, including:

$2000bn — Power
- 1.5x increase in global electricity use
- Wind and solar ~40% global generation
- Scaling storage and flexibility deployment

$550bn — Buildings
- Heating increasingly electrified
- Building retrofits significantly under way

$200bn — Transport
- EVs near 100% of new car sales in high income countries, 50%+ in lower income countries

$25-50bn — Early coal phase out
- 2 $GtCO_2$ avoided p.a. by 2030

>$130bn — End deforestation
- 4.6 $GtCO_2$ avoided p.a. by 2030

$100bn — Natural climate CDR solutions
- 3.6 $GtCO_2$ avoided p.a. by 2030

Critical priorities to scale up capital investment

EIGHT ACTIONS FOR THE 2020s

ACTORS: Leading actors / Supporting actors

Critical action

		POLICY-MAKERS/ REGULATORS	PRIVATE SECTOR	FINANCIAL INSTITUTIONS	DEVELOPMENT FINANCE INSTITUTIONS (e.g. MBDs)
REQUIRED IN ALL COUNTRIES	1 **Well designed real economy policy** (Critical action) • Establish a clear strategic vision • Reduce downside risks • Bridge green premiums • Remove supply-side bottlenecks	■			■
	2 **Targeted role for public finance** • Residential building retrofits • First of a kind technologies • Scale up key infrastructure	■			
	3 **Net-zero commitments of financial institutions** • Targets for the net-zero transition (e.g. investment ratios) • Innovation in financial products • Investment strategies in key sectors + lower income countries		■	■	
	4 **Supporting role for financial regulators** • Disclosure of climate risks and strategies • Management of climate risks	■		■	
REQUIRED IN MIDDLE AND LOW INCOME COUNTRIES	5 **Increased mobilisation of domestic savings** • Improve tax collection + reduce fossil fuel subsidies • Growth of local currency capital markets • Financing from retained earnings	■	■	■	■
	6 **Significant scale up in Multilateral Development Banks (MDBs) and external finance** • Expand financial capacity • Targeted use of catalytic instruments • Increase share of lending to climate mitigation	■			■
	7 **Expanded role for MDBs** • Help countries develop supporting policies • Proactively develop bankable projects • Mobilise private finance	■			■
	8 **Private sector commitments** • Develop relationships with MDBs • Understand scale of opportunities + develop project pipelines		■	■	

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Financing the Transition:
How to Make the Money Flow for a Net-Zero Economy

Executive Summary

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Energy Transitions Commission

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