

SCALING

FOR ZERO-CARBON HEAVY INDUSTRY
AND HEAVY-DUTY TRANSPORT

INVESTMENT



HOW TO REACH **NET-ZERO**
INSIGHTS SERIES



In its 2050 long-term strategyⁱ, the **European Commission called for a climate-neutral Europe** and laid out several scenarios on how to achieve this objective. In parallel, analyses from the Energy Transitions Commissionⁱⁱ, Industrial Transformation 2050ⁱⁱⁱ and others have demonstrated the technical and macroeconomic feasibility of achieving net-zero carbon emissions from the energy and industry system by mid-century, including in the harder-to-abate sectors of the economy.

The transition to zero-carbon energy and industry systems will require significant investment over the next 30 years, across the power, buildings, transport and industry sectors. Our assessment is that about **€150 billion incremental investment would be required per year until 2050** to achieve a deep decarbonisation of the economy, on top of the €622 billion per year already projected in a base case scenario, representing a c.25% increase.

In aggregate terms, **the buildings and power sectors concentrate the bulk of the required investment** (€340 billion and €220 billion per annum respectively). In comparison, incremental investments required in transport and industry appear to be small (about €6 billion per annum each). Indeed, the decarbonisation of heavy industry and heavy-duty transport will rely significantly on electrification (either directly, or indirectly through the use of hydrogen and hydrogen-based fuels), resulting in a likely doubling of investment needs in the power sector compared to a base case.

Awareness and appetite for sustainable investment are rapidly increasing^{iv}, but, to date, green finance discussions have focused primarily on the power sector, passenger transport infrastructure and energy efficiency improvement in buildings. By contrast, **heavy industry and heavy-duty transport constitute the next frontier of low-carbon investments**, an uncharted territory for many stakeholders.

Although the aggregate investment required in those sectors is relatively limited, three major barriers lie in the way of a shift from high-carbon to low-carbon investment in the harder-to-abate sectors:

- The **difficulty to assess** whether investments in these transitioning sectors are compatible with a carbon trajectory in line with the Paris agreement – in particular in equity finance;
- The **absence of business case** for low-carbon materials/services today, due to higher cost of low-carbon technologies and lack of consumer demand;
- The **disconnect between the approach to risk of mainstream investors and the risk-return profile of these investments**, even in the presence of a positive business case.

The Action Plan on Financing Sustainable Growth developed by the European Commission to reorient capital flows to sustainable investment responds only partially to these challenges. We have identified **three major action areas** to scale up investment in the transition to net-zero in harder-to-abate sectors – which might actually be relevant for other sectors of the economy as well:

- **Establishing a dialogue between industry players and their financiers, sector by sector**, so that they educate each other on transition pathways, agree on appropriate tools to assess sustainability of assets/projects, and jointly develop tailored financial products;
- **Creating initial markets for low-carbon materials/services** through a combination of regulation and voluntary business action to establish a positive business case;
- **Ensuring that public finance truly plays its role in de-risking** investments in the low-carbon transition, **without exonerating private finance** from reviewing its own approach to risk management.

SETTING THE SCENE

Scale and nature of investment required for the energy transition

Investment in a business-as-usual scenario

Our assessment, based on a range of existing studies, is that total investment across the power, buildings, transport and industry sectors in Europe could reach **€622 billion per annum on average between 2020 and 2050 in a base case scenario**. This is already a 17% increase from today's investment in those sectors, which is around €530 billion per annum. The projected €622 billion investment break down into:

- About €310 billion in buildings, in particular new commercial property buildings as well as the refurbishment of existing buildings^v;
- €194 billion in transport infrastructure, with more than half going to road construction and maintenance (€110 billion) and the rest distributed between rail (€67 billion), airports (€11 billion) and ports (€6 billion)^{vi};
- €113 billion in power, including electricity generation, transmission and distribution^{vii};
- €5 billion in industry, for regular retrofits at existing plants^{viii}.

Investment in a deep decarbonisation scenario

We estimate that **the incremental investment required to achieve a deep decarbonisation of the European economy could be around €150 billion per annum between 2020 and 2050**, representing a c. 25% increase on the base case, with the bulk of additional investment required in the power sector:

- **In buildings**, the incremental investment to deeply renovate the existing building stock in order to achieve significant energy efficiency improvement and decarbonise heating could represent €30 billion per annum^{ix}. This represents a 10% increase on base case investment and confirms that **the building sector is the sector that requires the biggest investments in Europe**, with €340 billion per annum needed in a deep decarbonisation scenario.
- **In the transport sector**, our assessment is that **about €6 billion per annum on average would be required to deploy electric charging infrastructure** for passenger vehicles as well as buses and trucks^x. Some new charging/refuelling infrastructure will also be required at train depots (for hydrogen trains), ports and airports, but the scale of these investments is likely to be lower given the more limited number of charging/refuelling points required. Even a €10 billion per annum investment need would add only 5% to base case investment in transport.
- **In industry**, total investment required in industrial plants to reach net-zero carbon from industry could be between €9-11 billion per annum, depending on the mix of decarbonisation routes used^{xi}. In addition, €1-2 billion per annum could be required to build up the necessary carbon transport and storage infrastructure. Overall, **the incremental investment compared to a base case could be in the order of €6-7 billion per annum, representing a doubling of investment in the European industry**.
- **The most significant increase in investment needs to achieve a deep decarbonisation of the European economy lies in power**. Indeed, across all energy-consuming sectors, decarbonisation will be driven to a large extent by electrification (either direct, like for light-duty transport, or indirect, for instance using hydrogen as source of high heat in heavy industry). Additional investment required to meet this increased power demand, as well as manage a more flexible grid, **could exceed €100 billion per annum^{xii}**. This represents two-thirds of total incremental investment required to decarbonise the European economy and would mean **doubling investments in the power sector** compared to base case projections.

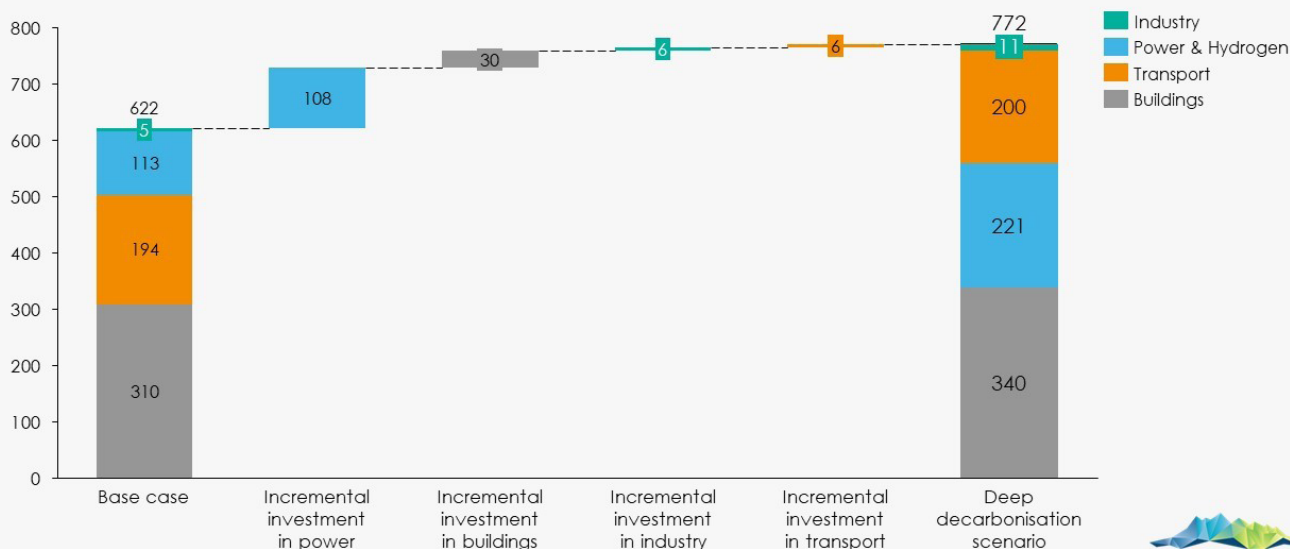
Nature of investments and costs in the European energy transition and financing implications

The type of investments required across the power, buildings, transport and industry sectors will vary significantly, implying different financing models:

- **In the power sector**, where the biggest step-change in the pace of investment is required, most investments will be **large-scale infrastructure investments**. Renewable power is increasingly cost-competitive with fossil fuels-based power generation. However, the economics of renewables are crucially dependent on the cost of capital, due to high upfront capital costs followed by minimal operating costs. It is therefore essential that governments reduce risks for investors by providing greater certainty on future electricity prices through appropriate power market design.
- By contrast, **in the buildings sector, investments are highly distributed**: decision-making and financing is often carried out at the level of the building owners. High upfront costs, long payback periods and split incentives between owners and tenants can annihilate the theoretical long-term positive returns from retrofitting. Historically, progress in the buildings sector has therefore been slow. Focus should be put on developing financing mechanisms that offset upfront capital costs and creating scale by aggregating fragmented investments.
- **In transport, incremental investment will be dedicated to developing the charging and refuelling infrastructure** for light-duty road transport, heavy-duty road transport, rail, shipping and aviation, with a probable role for public-private partnerships. Beyond investment in infrastructure, however, **most of the cost of the low-carbon transition will be faced by fleet owners and operators**: the total cost of ownership of low-carbon vehicles is likely to stay higher than the prevalent high-carbon alternative for the next 5-10 years in road transport and rail, and for several decades in shipping and aviation – due to higher capital cost of new vehicles, retrofitting cost for long-lived assets, and sustained higher operational expenditures.
- Finally, **in industry, low-carbon investments will mostly take the form of retrofitting of existing plants and build-up of greenfield low-carbon plants**. These investments will be accrued **on the balance sheets of individual companies**, who will have to face a sequence of additional costs over the next three decades: higher innovation expenditures in the 2020s (to develop and bring to market decarbonisation technologies still in the labs), high financing costs for first-of-a-kind industrial-scale plants starting in the 2030s, accelerated depreciation of their high-carbon assets in parallel, followed by sustained higher capex intensity and higher opex (as low-carbon technologies are likely to remain costlier than the prevalent high-carbon ones)^{xiii}.

The scale of incremental investment required in industry and transport is dwarfed by the scale of incremental investment required in power

Total average volume of investment needed in a deep decarbonization scenario in Europe
€ billion per year



Source: SYSTEMIQ analysis for the Energy Transitions Commission, 2019

FRAMING THE DEBATE

What hinders investments in low-carbon industry and transport?

Although the low-carbon transition represents an investment increase of c. 25% on base case in Europe, there is broad agreement to consider that **the scale of investment required is not a challenge in itself** – and even less so in industry and transport where the total numbers are lower than €15 billion additional investment per annum in total –, **the challenge is to deploy capital at scale and at pace**. Through our exchanges with finance and industry players, we have identified three major obstacles to investment scale-up in the transitioning heavy industry and heavy-duty transport sectors.

Difficulty to identify Paris-compatible investments

The transition of heavy industry and heavy-duty transport towards zero carbon emissions is still mostly uncharted territory for mainstream finance players, who acknowledge their struggle to assess whether investments in these transitioning sectors are in line with the Paris agreement. It is indeed more **difficult to distinguish “green” investments from “brown” investments** in sectors where the transition will span several decades given major uncertainties on transition pathways, in particular on the pace of the transition, the technologies that will eventually prevail and how transitional solutions might play out (with risks of lock-in and/or stranded assets).

This challenge is particularly vivid for equity finance, given that companies are likely to have a diverse portfolio of assets with different levels of progress towards decarbonisation and different levels of exposure to transition risks. Despite the expansion of climate-related financial disclosure, it remains **difficult to interpret data, assess and compare corporate strategies** due to the lack of standardisation in the information made available by individual companies and the difficulty to define desirable carbon emissions targets through time for each company^{xiv}, assess whether discreet projects add up to a trajectory consistent with those targets, and anticipate how innovation will reshape market structures.

Absence of business case

The prerequisite to any investment is the existence of a business case. In the harder-to-abate sectors of the economy, this means that **the prerequisite to any low-carbon investment is the existence – or the anticipation – of a demand for low/zero-carbon products and services**.

However, with the probable exception of road transport, the shift to low/zero-carbon technologies in these sectors is likely to entail both higher CAPEX and higher OPEX for a sustained period of time. This would increase significantly the B2B price of materials and mobility services^{xv}.

First movers could lose competitiveness vis-à-vis their competitors unless buyers are willing to pay a premium price for low/zero-carbon products and services. Creating greater certainty on market prospects, either through regulation or through voluntary purchase commitments, is therefore essential to incentivize investment.

Disconnect between approach to risk and risk-return profile

Mainstream investors are on a journey: their approach is progressively shifting **from avoiding climate-related risks** (physical, reputational, market risks) **to actively contributing to financing the climate transition**. But this shift in attitude also implies a rethink of their approach to risk. Given uncertainties on both technologies and markets, **the risk-return profile of investments in low-carbon heavy industry and heavy-duty transport does not match the criteria of most of mainstream banks and asset managers**, especially in the early stages of the transition and when considering new market entrants. Meeting financing needs in these transitioning sectors might therefore require a dialogue with major investors (pension funds, sovereign funds, high net worth individuals...) on their approach to risk, a loosening of some regulatory barriers, and a greater role for public finance to de-risk private investment.

MOVING FORWARD

How to enable an investment scale-up in European industry & transport

The **Action Plan on Financing Sustainable Growth** developed by the European Commission to reorient capital flows to sustainable investment responds only partially to these challenges. Its primary goal is to strengthen sustainability disclosure and mainstream sustainability criteria into risk management, while ensuring the quality of what is qualified as “sustainable investment”. These steps are essential prerequisites, but are unlikely to be sufficient to drive increased financial flows in the harder-to-abate sectors of the economy, as they still predominantly play to an “avoiding risks” approach rather than an “enabling the transition” approach to sustainable finance.

However, the **EU Sustainable Finance Taxonomy** currently in development as part of the Action Plan will become an important common tool for investors to identify sustainable investment opportunities across a larger spectrum of sectors than today, going beyond power and stepping into the heavy industry and heavy-duty transport sectors. The specificities of these sectors where the low-carbon transition will be progressive have indeed been carefully addressed in the taxonomy: a dichotomic “green vs. brown” approach has been avoided and the importance of the “greening of” currently high-emitting sectors has been emphasised. This taxonomy would be even more effective if it is integrated in rating systems.

Beyond the taxonomy, we have therefore identified three major action areas to scale up investment in the transition to net-zero carbon in harder-to-abate sectors – which might actually be relevant for other sectors of the economy as well:

Establishing a dialogue between industry players and their financiers

Improving the literacy of the finance community in the transition of harder-to-abate sectors is key to help investors reach a more robust assessment of their portfolio and to foster greater creativity in terms of financial products. Establishing a dialogue, sector by sector, between industry players and their financiers can considerably accelerate this process. It can also enable a harmonisation of the finance community's approach to sustainable investment in a given sector, potentially facilitating scale-up. The Poseidon Principles^{xvi} developed in the maritime industry constitute a pioneering example of such a dialogue. Similar approaches should be encouraged in other sectors, with the quadruple objective of:

- **Improving the literacy of the finance community** on the specificities of the transition in the sector;
- **Building a track record** of successful investment case studies to progressively reduce perceived risks and lower financing costs;
- **Developing tailored sustainable investment principles** (which should build on the EU Sustainable Finance Taxonomy, but could possibly go a step further in terms of level of ambition);
- **Piloting new financial products** adapted to the specificities of the sector.

Creating initial markets for low-carbon materials/services

Without a robust underlying business case, investments in the low-carbon transition of harder-to-abate sectors will stall. It is therefore essential to create a market for low/zero-carbon materials and mobility services to underpin these investments. Three different routes can be pursued to do so:

- Governments can **create a level playing field among competitors** by imposing similar regulations on all producers, either in the form of a carbon price, or in the form of carbon emissions standards. This approach, however, needs to either be applied on a global scale, or to be combined with border adjustments to be effective in sectors exposed to international competition.

- A potential approach for governments to circumvent this international competitiveness issue is to develop **regulations based on the lifecycle carbon emissions of consumer products** sold in a given region, regardless of the localisation of production. This could have positive spill-over effects on other markets exporting to or importing from that region. However, ensuring traceability of lifecycle carbon emissions of complex consumer products can constitute a very practical challenge.
- A **voluntary approach** could also be considered. If some market segments were willing to pay a premium price for low/zero-carbon materials or mobility services (to meet their own carbon emissions commitments or for marketing purposes), this would create a differentiated market. Different forms of buyers' commitments (buyers' alliance, offtake agreements...) could signal the existence of such a market and provide greater certainty to producers and their investors. Those initial markets could be found in public procurement and consumer discretionary sectors, especially premium/luxury market segments.

Ensuring that both private and public finance play their role in financing the transition

The race against climate change demands that **major investors (pension funds, sovereign funds, high net worth individuals...) take the responsibility to actively finance the transition** to low-carbon energy and industry systems. This implies revisiting their investment strategies and their approach to risk accordingly. In that context, there might be a case for:

- **Loosening some of the regulatory constraints** on private finance players, in particular prudential requirements for banks that actively invest in sustainable finance;
- **Incentivising sustainable finance at the level of central banks**, via climate-related stress-testing rules and green supporting factors, as currently discussed by the Network of Central Banks and Supervisors for Greening the Financial System.

However, given the risk-return profile of investments in transitioning harder-to-abate sectors, **risk-sharing models** will likely be indispensable to scale up investment, especially in the early stages of the transition. In that context, public finance must truly play its role in de-risking private investment.

- Different types of **blended finance instruments** will likely be needed in different sectors, in different geographies and at different stages of the transition – including subsidies, guarantees, insurance, and first loss capital. They will be particularly crucial in early stages of technology developments, for demonstration plants, for first industrial-scale investments and for infrastructure build-up.
- In the European Union, State Aid rule could rapidly constitute a bottleneck to appropriately support the low-carbon transition in harder-to-abate sectors. **A blanket exception to State Aid rule for all green investments** (as identified by the EU Sustainable Finance Taxonomy) could therefore be considered.

REFERENCES

ⁱ European Commission (2018), *A Clean Planet for all. A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy* (COM/2018/773)

ⁱⁱ Energy Transitions Commission (2018), *How to reach net-zero carbon emissions from harder-to-abate sectors by mid-century*

ⁱⁱⁱ Material Economics (2019), *Industrial Transformation 2050 – Pathways to Net-Zero Emissions from EU Heavy Industry*

^{iv} HSBC and East&Partners (2018), *HSBC Sustainable Financing and ESG Investing report*

^v Source: Paul Mitchell Real Estate Consultancy & Eurostat (2015) for current investment. Assuming 1.3% annual growth rate for the period 2020-2030.

^{vi} Source: Oxford Economics and Global Infrastructure Hub (2017)

^{vii} Source: Oxford Economics and Global Infrastructure Hub (2017)

^{viii} Source: Material Economics (2019), *Industrial Transformation 2050 – Pathways to Net-Zero Emissions from EU Heavy Industry*

^{ix} Source: BPIE (2011), *Europe's buildings under the microscope – Using the “Deep renovation” scenario*

^x Indicative estimation: €1.9 billion per year for passenger car charging infrastructure (0.5 cars per capita, 10 slow chargers and 5 fast chargers for 100 cars), and €4.5 billion per year for trucks and buses charging infrastructure (33 slow chargers and 2 fast motorway chargers for 100 vehicles).

^{xi} Source: Material Economics (2019), *Industrial Transformation 2050 – Pathways to Net-Zero Emissions from EU Heavy Industry*

^{xii} Indicative estimation: €56 billion per year for electricity generation (wind and solar mix to generate extra 4,300 TWh/year). €24 billion per year for electricity transmission (US\$500 per kW capacity added to the system – no distribution cost). €4 billion per year for hydrogen production (75% electrolysis, 25% SMR+CCS), €17 billion per year for battery purchase (to shift 15% of EU daily energy), €7 billion per year for CCS/U equipment.

^{xiii} Material Economics (2019), *Industrial Transformation 2050 – Pathways to Net-Zero Emissions from EU Heavy Industry*

^{xiv} Defining a desirable carbon emissions trajectory for a given company is made more difficult by the multiplicity of global emissions scenarios that one could refer to, and the trickiness of translating these scenarios into sector-level and company-level trajectories. The leading methodology to do these calculations is the Science Based Target methodology. Further details on: <https://sciencebasedtargets.org>

^{xv} For details on the impact of decarbonisation on B2B prices, see Energy Transitions Commission (2018), *How to reach net-zero carbon emissions from harder-to-abate sectors by mid-century*

^{xvi} Further details on the Poseidon Principles, a global framework for responsible ship finance: <https://www.poseidonprinciples.org>

HOW TO REACH **NET-ZERO** INSIGHTS SERIES

The **Energy Transitions Commission (ETC)** is a diverse coalition of global leaders from across the energy landscape: energy producers, energy-intensive industries, equipment suppliers, investors, non-profit organizations and academics from the developed and developing world. We aim at accelerating the transition to low-carbon energy systems providing prosperity to all, by using our unique voice and our original research to inform policymakers and private sector decision-makers.

In 2018, the ETC published the report "**Mission Possible: Reaching net-zero carbon emissions from harder-to-abate sectors by mid-century**", which demonstrated that it is technically and economically feasible to bring carbon emissions from heavy industry and heavy-duty transport down to zero globally by mid-century, without relying significantly on offsets from the land use sector. This report was followed, at European level, by the report "**Industrial Transformation 2050**", focusing on the decarbonisation of heavy industry, with the support of a consortium of organisations, including the ETC.

Building on these visions of a future that is both desirable and possible, the ETC is now exploring **what policies and business initiatives could accelerate the transition** to net-zero carbon emissions in Europe. We are convening a series of high-level discussions, under Chatham House rule, to explore specific areas of intervention with selected policymakers, experts, industry and finance executives. This insights series summarises the **key takeaways** of these discussions. The ETC Commissioners have not been asked to formally endorse these conclusions.

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