How to finance the energy transition?

A major challenge in the fight against global warming

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The fight against global warming means aiming for a carbon-neutral economy by 2050. Europe, like many countries, has made this a top priority. However, the energy transition needed to achieve this goal is proving to be costly. Many incentive and support programmes have been put in place. Are they effective? Has Europe made the right choices? This article brings together information to help assess these questions.

The global picture

The International Energy Agency (IEA) says it is possible to decarbonise the global economy by 2050. The means to achieve this are well known. It involves replacing fossil fuels with low-carbon electricity (from renewable or nuclear sources) or sustainable biomass, while reducing consumption (by improving the energy performance of buildings and industrial processes) and capturing residual emissions. Individual behaviour also needs to become more moderate, which does not mean degrowth, since the IEA bases its net zero 2050 scenario on a 2 billion increase in the world's population and a doubling of global GDP.

However, this transformation will require a cumulative investment of around $100 trillion by 2050 (IEA's 'Net Zero by 2050' report, 2021). **This represents an annual investment of around $4 trillion per year, or 4% of global GDP (Figure 1).**

This figure may seem exorbitant, but who would not devote 4% of their income to what is necessary for their survival? If we must devote 4% of GDP to our defence, it is no less vital for our future to invest an equivalent amount in the fight against global warming. Furthermore, the IEA believes that the consequences of global warming would have a much greater negative impact on global GDP if nothing were done.

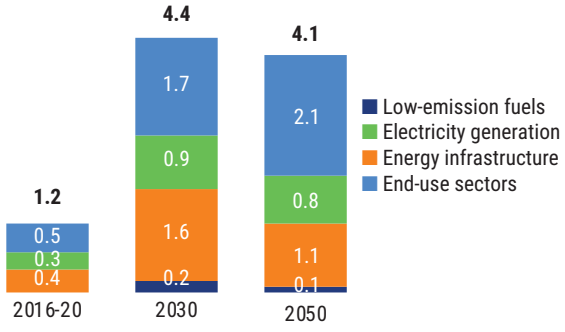

Fig. 1: **Annual investment (in trillions of dollars) required in Net Zero-aligned equities.** *Source: Net Zero by 2050 (IEA 2021).*

The key question is how to finance such an investment. This means redirecting investment towards low-carbon technologies and significantly increasing investment in the energy sector. However, even in France, banks still finance fossil fuels more than low-carbon energies, although we are seeing a gradual decline in investment in fossil fuels and continued growth in renewables. This shift must be accelerated.

Furthermore, the necessary investments cannot be made by industry alone. They must be supported by an appropriate regulatory framework and public policies that provide incentives.

The situation in Europe

According to the Draghi report, an additional €750 to €800 billion per year in investment from the European Union (EU) is needed to boost growth, stimulate innovation, support transition (including energy transition) and close the productivity gap, representing 4.4% to 4.7% of the EU's GDP.

The European Union has committed to taking this report into account, and numerous funding instruments have already been put in place, including:

- **ERDF** (European Regional Development Fund), amounting to approximately €226 billion over the 2021–2027 period, financing in particular energy efficiency, renewable energy and clean transport infrastructure;
- **REPowerEU**, launched to reduce dependence on Russian fossil fuels and accelerate the energy transition, which benefits from €225 billion in loans through the Recovery and Resilience Facility (RRF) and €20 billion in grants, financed by the Innovation Fund and the sale of emission allowances under the Emissions Trading System (ETS);

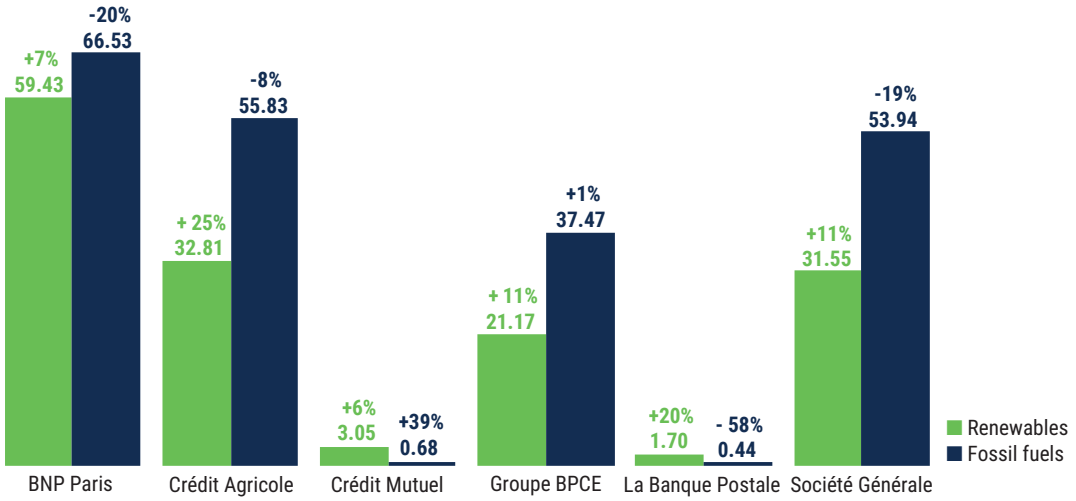

Fig. 2: **2021–2024 funding amounts (in billion USD) provided by French banks to renewable and fossil energies, and annual trends over the period.**
Source: Data from the study Banking as Business as Usual, Reclaim Finance (September 2025).

- the **Just Transition Mechanism** (JTM), endowed with €19.2 billion and increased to €55 billion with revenues from the carbon market, to support regions and workers affected by the transition by financing reskilling, training and green infrastructure;
- **InvestEU**, which mobilises €45 billion for green projects, particularly in cities and SMEs;
- **Horizon Europe**, with a budget of €95.5 billion over seven years (2021–2027), supporting research and innovation in clean technologies through its "Climate, Energy and Mobility" cluster.

Taxation or tax credits?

Environmental taxes can both generate new revenues to finance the ecological transition and send a price signal to households and businesses, encouraging them to shift towards solutions with a lower environmental impact. **They currently generate around €350 billion in annual revenues in Europe, representing approximately 2.5% of European GDP.**

The "recycling" of these taxes into the energy transition could, in theory, finance a large part of it. This is even more necessary as excessive taxation can have the opposite effect to the intended goal, by reducing companies' capacity to invest in decarbonisation while also threatening their competitiveness.

The **United States** has taken the opposite approach to taxation by implementing tax credits and other support for companies investing in decarbonised energy. The IRA (Inflation Reduction Act) allocated 400 billion US dollars (USD) in funding for measures related to clean energy, climate, and energy efficiency between 2022 and 2031, including 271 billion USD in tax credits and approximately 145 billion USD in grants, loans, or direct expenditures. Clean energy investments in the United States therefore increased by 37% over the period from July 2022 to June 2023, according to a report by MIT/Rhodium Group. It is possible that the Trump administration could challenge this funding, but the IRA has demonstrated the effectiveness of such an incentive system.

In **France**, the "Ecology, Sustainable Development and Mobility" mission has a budget of 19.55 billion euros in 2025, to which tax expenditures of around 8.63 billion euros are added. It notably finances support for renewable energies, backing for nuclear power (studies, installations), the promotion of clean vehicles and fuels, the renovation of public buildings, energy-efficient renovations, and the well-known MaPrimeRénov scheme for households. It also includes more specific measures, such as accelerated depreciation for low-emission heavy goods vehicles or green ships. A tax credit is also planned for the purchase of sustainable aviation fuels for international flights, but it still needs approval from the European Commission.

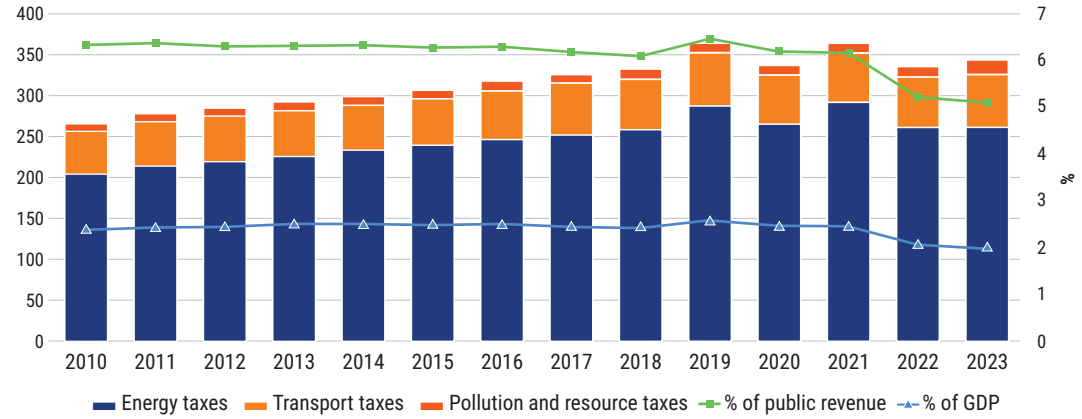

Fig. 3: **Evolution of environmental tax revenue in the European Union between 2010 and 2023, in billion euros and as a percentage of GDP and total public revenue.**
Source: Eurostat

Earmarking of ETS

The European Union Emissions Trading System (EU-ETS) is not simply a system for taxing greenhouse gas emissions. It is a cap-and-trade system that sets a maximum annual emissions ceiling for the activities covered. This ceiling is continuously reduced in order to meet the European Union's objectives.

In a market where allowances are becoming scarce, the price of quotas tends to rise, and since 2013, the EU-ETS has generated more than 200 billion euros in revenue, reaching 30 billion euros in receipts in 2023 (Figure 5).

Part of these revenues is retained by the EU to fund the Innovation Fund and the Modernisation Fund, but three-quarters of the proceeds go to Member States through an auctioning system. France thus receives 6% of the EU-ETS revenue for stationary and maritime installations and 11% for aviation, amounting to around 2 billion euros per year in 2025, including approximately 200 million euros for aviation.

The creation of a new ETS (EU-ETS2), covering buildings and road transport from 2027, will further increase the weight of European ETS, with significant economic and social impact. This is why the EU has planned, in parallel, the creation of the Social Climate Fund (SCF) to mitigate its impact on the most vulnerable. This fund will have a budget of 86.7 billion euros over the period 2026–2032, drawn from the revenues of both ETS.

The economic impact of such a system, increasingly heavy and restrictive, sharply raises the question of returning the revenues generated to support the decarbonisation of the sectors concerned.

Since June 2023, Member States are required to use 100% of the revenues collected (or the equivalent in financial value) to support climate action and the transformation of the energy sector.

These are overall figures based on Member States' reporting, as there is no traceability between the revenues collected and the expenditures made. The industry and the aviation and maritime transport sectors are, moreover, the poor relations in this redistribution. The European Commission has taken some steps towards a direct return of the amounts paid by aviation, with a reserve of 20 million free allowances over the 2024–2030 period to cover part of the increase in fuel prices associated with the obligation to carry sustainable aviation fuels (SAF) arising from the ReFuelEU regulation. However, this represents only one fifth of the additional cost generated by this regulation.

Under the initiative of the French Transport Minister, the

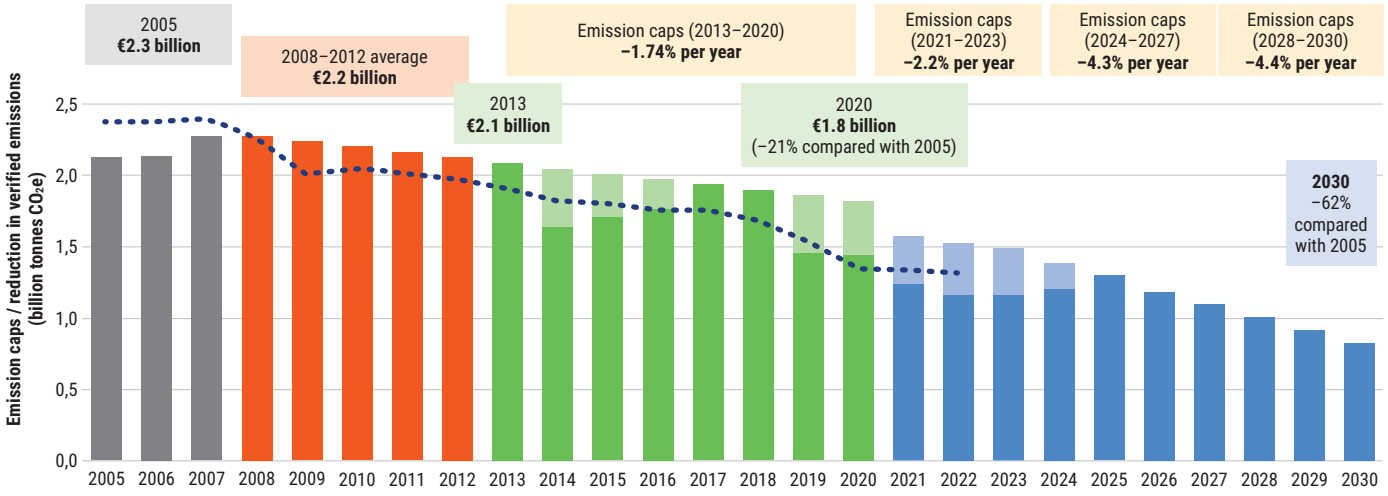

Fig. 4: **Emission cap set under the European ETS compared with verified emissions. Figures include the maritime transport sector from 2024 and a linear reduction factor of 4.3% over the 2024–2027 period and 4.4% from 2028 onwards.**
Legend: coloured bars for allowances and dashed line for verified emissions.
Source: Commission Report of 19.11.2024 COM(2024) 538 final.

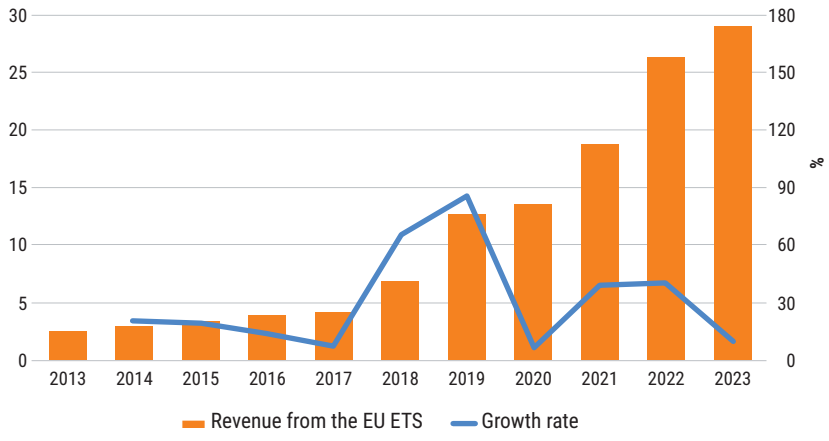

Figure 5 : **Évolution du total des revenus (en milliards d'euros) provenant de l'EU-ETS entre 2013 et 2023.**
Source : Eurostat.

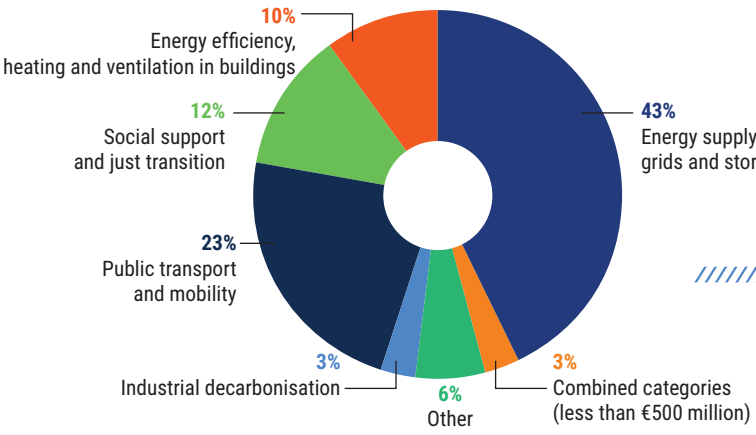

Fig. 6: **Breakdown, by category, of revenue from the auctioning of ETS allowances in 2023, according to the Member States' report.**
Source: Commission Report of 19.11.2024 COM(2024) 538 final.

Interministerial Maritime Committee (CIMer) proposed in May 2025 that the €90 million from carbon quotas for maritime transport in France be earmarked for a fund supporting the sector's decarbonisation, but only 30 million were finally agreed in the budget for 2026.

Support for Research and Innovation

Support for research and innovation in decarbonisation technologies is strategic for reducing emissions while developing a future-oriented industry that is both competitive and environmentally responsible. Europe contributes through various funds, which are then channelled into the financing of national projects in the form of industrial demonstrations, prototypes, pilot projects, and so on.

France has established its own programme (France 2030) with a budget of €54 billion over five years to develop a French supply of small modular nuclear reactors (SMRs), become a leader in green hydrogen and renewables, produce nearly 2 million electric or hybrid vehicles in France by 2030, and decarbonise aviation (low-carbon aircraft and sustainable fuels). France also has a research tax credit (*Crédit d'Impôt Recherche, CIR*), which is arguably one of the most powerful R&D support mechanisms in Europe and should certainly be maintained despite budgetary constraints.

Public–Private Partnerships

With IPCEIs (Important Projects of Common European Interest), Europe has created a tool to support certain strategic industrial projects that could not have been financed otherwise due to Europe's strict state aid rules.

Notably, the IPCEI on Batteries brings together France, Germany, Italy, and Poland to create a European electric battery sector to counter Asian dominance, with participation from Saft (Total), PSA (Stellantis), BASF, and BMW, for a total budget of €6 billion (public + private).

Similarly, the IPCEI on Hydrogen includes 14 projects selected in France to develop green hydrogen for industry and heavy mobility, with French public support of €2.1 billion.

Contracts for Difference (CfD)

Contracts for difference are undoubtedly one of the best tools for the energy transition, as they provide security for both investors and consumers through a guaranteed price.

This mechanism notably allowed France to obtain the European Union's approval for an €11 billion programme aimed at supporting the development of offshore wind energy. ●

Europe and its Member States have established a wide range of financing tools for the ecological transition. However, these tools are scattered across multiple initiatives and are not tied to clear industrial strategies. Moreover, they fluctuate from year to year depending on the budget laws, which does not provide the necessary visibility for long-term investments.

The high level of taxation imposed by Europe and its Member States also risks increasing consumer prices and depriving European industries of the means to invest in this transition, unless the revenues generated are redirected towards the necessary actions.

EdEn proposes a clear return (at least 50%) of EU ETS revenues to each of the sectors concerned, in the form of support for innovation, investment, or price management.

In general, a balance must be struck between the taxes levied and the support provided, whether through grants, tax credits, CfDs, etc. to create a genuine leverage effect on the ecological transition that goes beyond the price signal.

Only by putting these financing measures in place will Europe and its Member States be able to achieve their climate goals.