



# Landscape of Climate Finance in France

Edition 2023

Paris,  
February 2024

Authors: Hadrien **Hainaut** | Maxime **Ledez** | Maia **Douillet** | Solène **Metayer**



---

**I4CE** is a non-profit research organization that provides independent policy analysis on climate change mitigation and adaptation. The Institute promotes climate policies that are effective, efficient and socially-fair. The 40 experts engage with national and local governments, the European Union, international financial institutions, civil society organizations and the media. The work covers three key transitions – energy, agriculture, forest – and addresses six economic challenges: investment, public finance, carbon pricing, development finance, financial regulation and carbon certification.



[www.i4ce.org](http://www.i4ce.org)

---

The report was prepared with the support of the French Ministry for Ecological Transition and Territorial Cohesion, the French Ministry for the Energy Transition, and the French Ecological Transition Agency (“ADEME”). The information and opinions presented in this report are the sole responsibility of the authors.



# SUMMARY

I4CE's Landscape of Climate Finance is an overview of climate investments made by households, companies and public authorities. Such investments include retrofitting buildings, purchasing electric vehicles, installing renewable energy, as well as paying for rail, cycling and urban public transport infrastructure.

## In France, climate investments reach €100 billion but remain insufficient

Climate investments by households, companies and public authorities reached €100 billion in 2022. Compared with 2021, investments in electric vehicles, renewable electricity generation, electric grids and retrofitting of buildings have increased. Rail infrastructure and nuclear power investments remained stable. Early data show climate investments increasing in 2023 as purchases of electric vehicles rose.

**€100 billion**

invested in climate action in France in 2022, in the buildings, transport and energy sectors

**€58 billion**

more to achieve climate targets in the national low-carbon strategy

Further investments are needed, however, to significantly reduce greenhouse gas emissions. The draft scenario of the French national low-carbon strategy (Stratégie nationale bas-carbone, SNBC) gives a first insight into climate investment needs. Compared with 2022, each year between 2024 and 2030 an additional €58 billion will be needed to meet climate investment targets. The needs are concentrated in retrofitting of buildings, electric vehicles and railways.

## A third of climate investments are funded by the public sector

While most climate investments are made by households and companies, public authorities financed a third of expenditure in 2022. The share of public funding varies widely depending on the sector, from 17% for low-carbon vehicles and renewable energies to 92% for transport infrastructure. It includes national and local government expenditures, loans and holdings by public banks, and the resources of public housing authorities and infrastructure management companies. In addition, the government has a stake in companies such as EDF and SNCF, and regulates corporate investment in the electricity and gas networks.

As a result of the COVID-19 recovery plan adopted at the end of 2020, government spending on climate action increased in the sectors studied in 2021 and 2022, but early data show

a sharp fall in 2023. A large part of this decline is due to the levelling off in 2022 of public service electricity charges (Contribution au service public de l'électricité, or CSPE) against high electricity and gas prices, and has no impact on funding of new projects. However, early data show public spending on railways, cycling infrastructure, urban transport, building retrofitting and electric vehicles remaining stable in 2023, while the costs of these projects are rising. The 2024 budget, presented in autumn 2023, provides for an increase in expenditure across the broader scope of ecological planning.

## Powerful support, with some adverse headwinds

Regulation has provided powerful support for climate investments, notably at the end of 2020, when car manufacturers were required to sell more electric vehicles to meet an average emissions threshold for new vehicles in Europe. Likewise, recent environmental building regulations (RE 2020) require better insulation and integration of renewable energy sources in new buildings. However, recent regulations, such as the obligation to renovate poorly insulated homes and tertiary sector buildings, and the creation of low-emission mobility zones, are encountering difficulties in their application, and have yet to significantly boost climate investments.

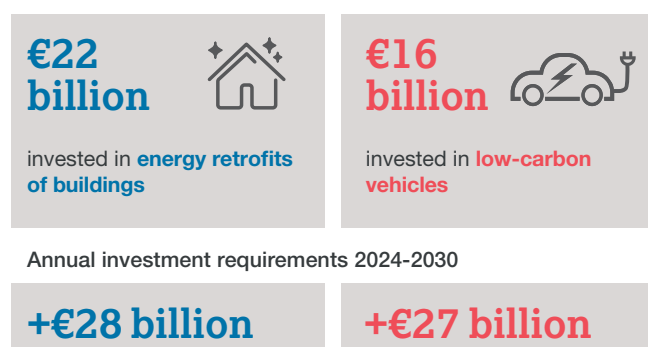
In 2022, the rise in energy prices has accelerated household investment in solar power for self-consumption, electric vehicles, heat pumps and wood-burning appliances. But these opportunistic purchases reflect immediate price conditions rather than long-term planning. By contrast, companies adopted a wait-and-see approach, not redirecting their investments as much towards energy efficiency in buildings or renewable energy production.

Climate investments have seen their prices rise faster than the national average. Whereas during the period 2011-2019, the costs of renewable energies and electric vehicles fell due to economies of scale, the inflationary wave at the end of 2021 has affected all climate investment sectors. The unanticipated rise in costs, which reached 9% in 2022, has led to many investment projects being questioned or delayed. Data for 2023 are expected to show prices of renewable energies and electric vehicles rising much more slowly. Prices of buildings and infrastructure projects will continue to increase.

Above all, climate investments are increasingly suffering from tighter credit conditions. While public budgets, households and companies have benefited from the period of falling interest rates, their sharp rise since 2021 is weighing on new projects and gradually increasing the average cost of debt. For households, this means fewer opportunities to invest and higher financing costs when the opportunity arises. The economic model of major renewable energy, railways or nuclear energy projects is particularly sensitive to the cost of financing.

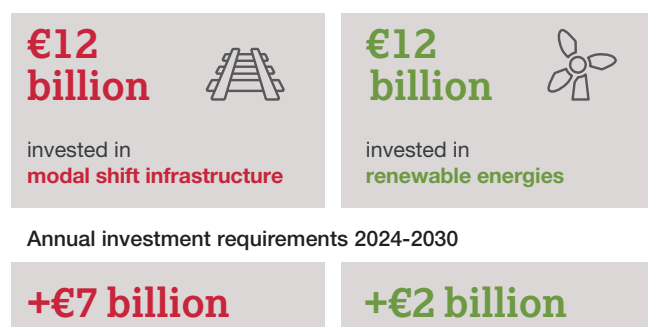
## ■ Main trends in four key sectors

Annual investment in energy retrofitting of buildings is rising, reaching €22 billion by 2022, but the proportion of deep renovation remains low. Subsidies for home retrofitting and recovery plan funding for public building retrofitting have sustained investment after a decline during the pandemic. Purchases of older properties, which are a prime opportunity for deep renovations, are declining as bank lending rates rise. The draft scenario of the national low-carbon strategy targets more deep renovations, particularly in energy-intensive buildings, requiring an additional investment of €28 billion per year between 2024 and 2030.



Investment in low-carbon vehicles, particularly electric vehicles, is growing rapidly, reaching €16 billion in 2022, driven by the momentum created by the European regulations that entered into force in 2020, as well as by national subsidies and regulations. The extended range of batteries and the growing density of the recharging network are contributing to the rise of electric vehicles purchases. However, demand for electric light and heavy goods vehicles is still low. The gradual electrification of all segments would lead to additional investment of €27 billion per year between 2024 and 2030.

Investment in railways, cycling lanes and urban transportation increased slightly in 2022, reaching €12 billion. Deployment of major projects, such as the Grand Paris Express and the Seine Nord Europe canal, has contributed to the increase in investment. Investment requirements for 2024-2030 amount to €6.5 billion above the 2022 level, while public support for the sector is expected to decline slightly in 2023.



Investment in renewable energies rose sharply to €12 billion in 2022. This record level can be explained by the dynamism of offshore wind power projects and the increase in installation of photovoltaic panels for self-consumption of solar power. Investment in renewable gas and heat is stable. Although the rise in the price of fossil gas has made these projects more profitable, their cost has risen sharply due to shortages of materials. Annual investment needs in this sector are estimated at an additional €2 billion, with the rapid increase in the rate of installations being offset by the anticipated fall in equipment costs.

## ■ In 2024, the government will have to lay out its strategy for financing the transition

In 2024, the government will have to introduce its multiannual strategy for financing the ecological transition (Stratégie pluriannuelle pour le financement de la transition écologique, SPFTE). This will provide an opportunity to better identify the public and private funding that will be needed to bring the country's investments up to the level of its climate objectives. The I4CE Landscape already provides a solid basis for this strategy.

# INTRODUCTION

Today's investments shape tomorrow's economy, and eventually determine tomorrow's greenhouse gas emissions. Investment, to put it short, is spending to build things that last. Today's houses, cars, railways, factories, farms and power plants are the product of decades – sometimes centuries – of investment. Yet, their contribution to our prosperity overwhelmingly relies on fossil fuels, emitting greenhouse gases along the way. To reconcile our economies with climate goals under the Paris Agreement, we need to replace most of our current equipment and infrastructure with sustainable alternatives – *i.e.*, climate investments. This transition will not happen overnight. Rather, each year's climate investment is a step towards our mid-century climate targets. And each year, the question becomes: are we taking the right step?

Every year since 2014, I4CE's Landscape has analysed investments in France, measuring past efforts and exploring future needs. The annual results come with context, on successful policies and lessons to draw from mistakes. The study also estimates how much future investment is required to achieve our climate goals. Lastly, it tracks investments in fossil-fuel equipment, which are supposed to decline as their climate alternatives become widespread.

Crucially, investment is an outcome of finance. Securing subsidies, loans or guarantees is often a condition for projects to go ahead. And while climate finance first emerged as a

point of negotiations between countries, I4CE joined other think tanks in Europe in looking at climate finance in a national context. In France, we analyse how climate investments are funded, we estimate the respective share of public budgets and private finance.

By linking climate investment with public and private finance, I4CE's Landscape helps France and its government turn climate investments into a means to deliver on its climate goals. In 2023, a milestone report to the Prime Minister by Jean Pisani-Ferry and Selma Mahfouz called on the government to act – with additional public funding – to increase climate investment across many sectors. In 2024, the government will unveil its multi-year strategy to fund the transition, marking an opportunity to use the Landscape as a basis for debate.

A study such as the Landscape is only valuable if updated every year. We revise many publicly available sources with up-to-date modelling and data on prices. Our short-term forecast of climate investment warns policymakers about current headwinds, allowing them to change course in time. This report describes the methodology and key results of the Landscape. It is meant for people who would like to know more about climate investments in France, and those who wish to launch a similar study in their own country. It is a partial translation of our full 2023 edition in French.

## CAUTION

The results presented in this report replace those in the previous editions of the Landscape. From one edition to the next, the results are revised according to changes in sources, method or scope. Thus, the results presented in this edition are based on a constant method for the entire period studied.

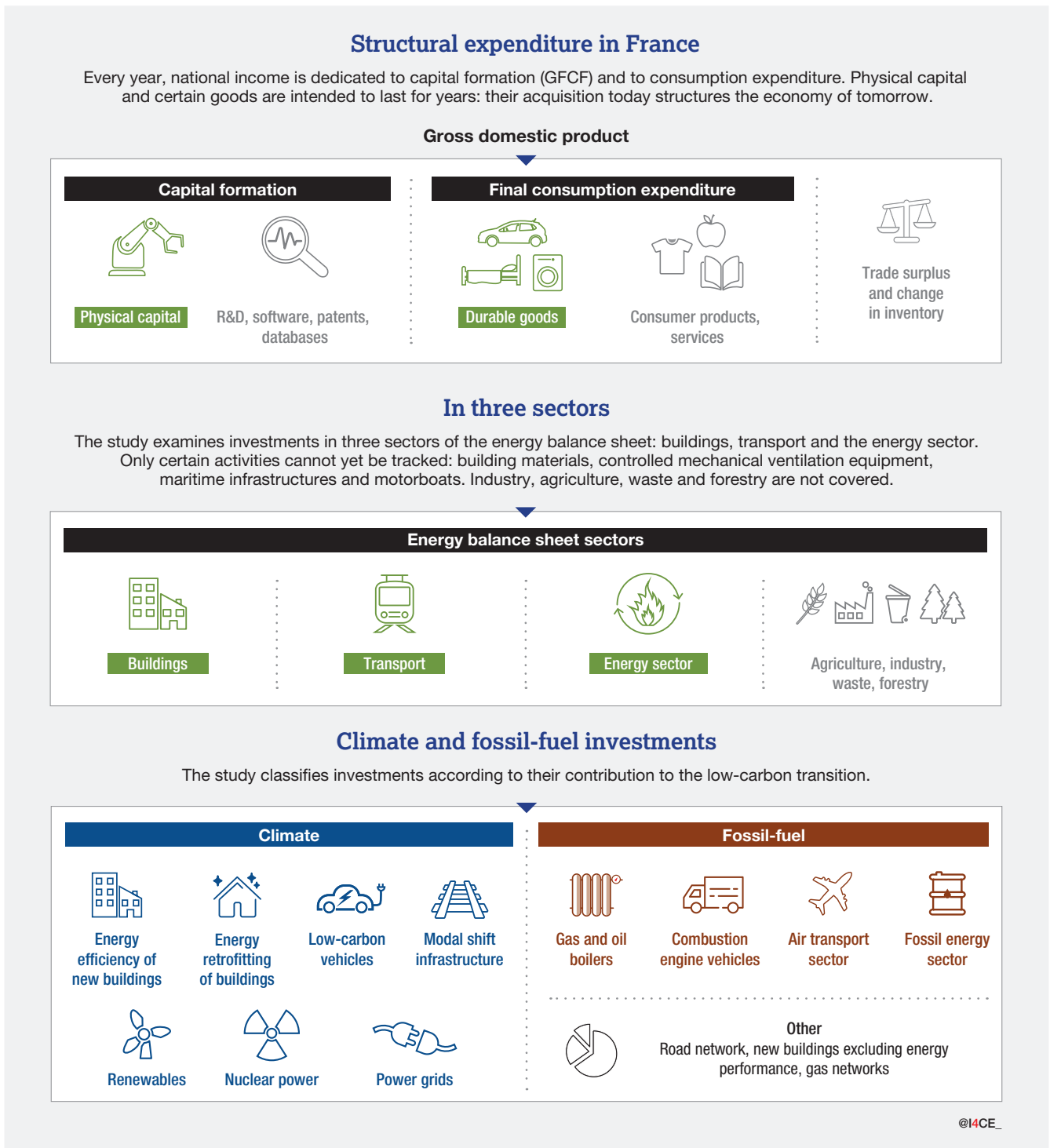
# CONTENTS

<b>METHOD</b>	<b>5</b>
Measuring climate and fossil-fuel investment	6
Financing climate investments	9
Estimating investment requirements	13
Sectors in I4CE's Landscape	15
<b>RESULTS</b>	<b>16</b>
Climate investments in France: uneven progress	16
Financing climate investments	22
Fossil-fuel investments have been falling since 2019, but could still rebound	28
Accelerating climate investments to stay on course for the 2030 targets	32
<b>REFERENCES</b>	<b>38</b>
<b>APPENDICES</b>	<b>39</b>

# METHOD

The Landscape measures climate and fossil-fuel investments in France between 2011 and 2023, and documents their short-term outlook. It compares current investments with needs, based on the draft scenario of the national low-carbon strategy.

**FIGURE 1. THE LANDSCAPE OF CLIMATE FINANCE'S SCOPE**



## Measuring climate and fossil-fuel investment

### Definition of investments

The Landscape examines:

- gross fixed capital formation (GFCF), *i.e.*, in national accounts, expenditure on the acquisition of tangible and intangible assets (Eurostat, 2013). The notion of assets implies that expenditures will provide goods or services for more than a year, which distinguishes them from consumer goods. The assets covered by the study are physical equipment such as buildings, transport and network infrastructure, boiler houses and power plants, which will be used to produce goods and services for more than one year.
- consumption of goods considered durable, in the sense that they provide services to consumers for more than one year. This includes purchases of new vehicles by households.<sup>1</sup>

### Measuring investment

Investments are recorded at their acquisition cost. These costs correspond to CAPEX (capital expenditure) in company accounting or project financing. They are given here exclusive of tax for companies and public authorities, and inclusive of tax for households.

Depending on the sector and the accounting policies applying to it, expenditures involved in acquiring and commissioning equipment may cover such costs as preliminary studies, obtaining administrative authorizations, surveys, acquiring machines or equipment, civil engineering, and labour inspections. However, investment costs exclude interest paid during the construction phase and, more generally, the cost of project financing. This corresponds to the concept of overnight costs, especially in the calculation of the cost of electricity generation (LCOE, see IEA, 2020).

Depending on the sector and the national accounting policies, the reference date for costs can be the date of work carried out (construction or energy retrofitting), of registration (vehicles), or of equipment installation (renewable energies). For the biggest projects, such as transport infrastructure or nuclear power plants, the costs are spread over several years depending on the progression of fixed assets in business accounting. For some equipment, we do not know the prices charged for the most recent years. In this case, we use the French National Institute of Statistics and Economic Studies (Institut national de la statistique et des études économiques, INSEE) price index for the sector.

### Reporting past and future investments in today's currency

Investments made since 2011 are observed at current prices, that is, the prices on the date the investment was made. But over the years, the value of the currency in which the investments were made erodes with inflation. Neutralizing the effect of inflation makes it easier to measure the real financial effort required to make investments.

As for future investment requirements, they cover the quantities of equipment that will need to be deployed, as well as certain price expectations. These expectations relate to sectoral phenomena specific to energy transition activities, independent of developments in the economy as a whole. For example, when our sources anticipate that batteries will cost less in the future, they mean that their price will fall relative to other products in the economy. In other words, price expectations do not reflect the price level of the overall economy, but the gap between future prices in a sector and overall inflation.

To make it easier to compare past and present climate-related investment with future needs, and to account for the effects of inflation, we report all investment expenditure in today's currency, in other words in constant currency. To do this, we divide the current expenditure for the historical period by the chain-linked price index of gross domestic product, also known as the GDP deflator, provided by INSEE (2023). To calculate the GDP price index, we chose 2022 as the base year. For the base year, the GDP price index is equal to 1, which implies that investments in current and constant currency are equivalent.

Unlike capital expenditure, the financial accounts of each public institution are reported as they appear in budgets, that is, in current euros. This choice enables a better correspondence with the orders of magnitude in budget debates but requires us to consider increases in expenditure in relation to price growth, which reflects both global inflation and the variation in prices specific to the sector of intervention.

### Distinguish between volumes and prices to find out if more equipment is being installed

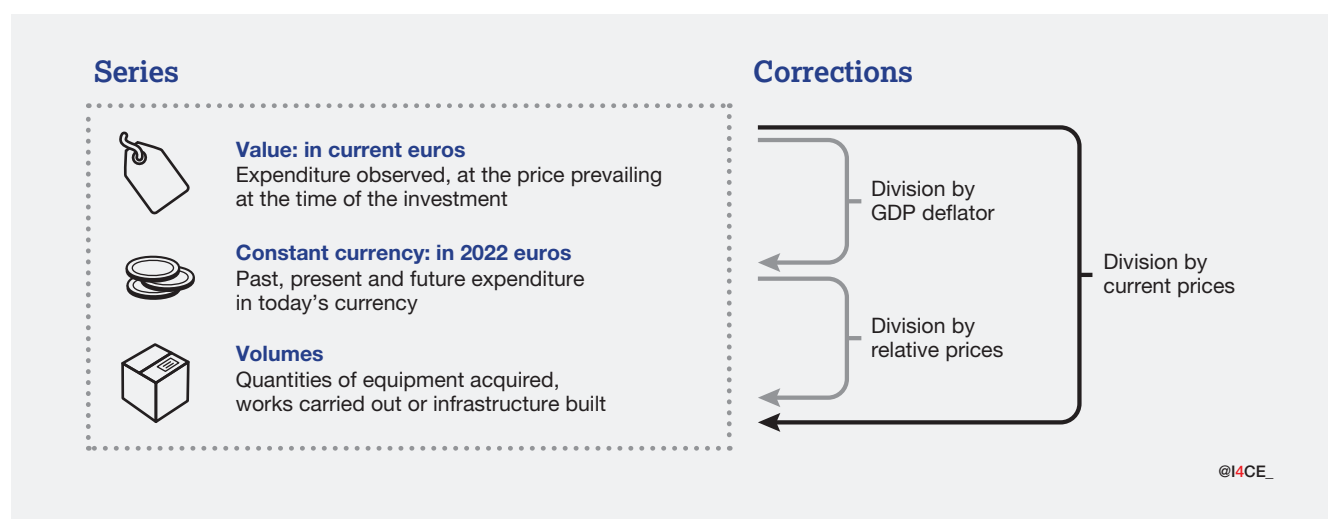
Capital expenditure describes equipment put into service, works carried out or infrastructure built, for a certain price. But prices can vary over time. Their evolution reflects both inflation and sectoral trends, which can cause prices in a sector to vary more or less quickly than overall inflation. This second component is called relative price. The level of inflation in the current year and the relative price of an item of equipment can therefore be added together to form the current price of that item.

Since equipment prices vary over time, the challenge is to measure how much equipment has been installed year after year. For a sample comprising 89% of investments made in 2022, we know either changes in unit prices (68% of investments) or changes in sectoral price indices (21% of investments). However, for investments where unit prices are known – and in contrast to the ideal split between volume and price according to the INSEE (2018) – the volumes presented in our study do not take into account changes in the quality of equipment or its composition. For example, the average price of electric vehicles is not adjusted for the relative share of different vehicle ranges, or for increases in battery life.

<sup>1</sup> When made by companies and governments, these purchases form part of GFCF.



FIGURE 2. AMOUNTS OBSERVED IN THE LANDSCAPE DATA



Appendix 2 shows changes in climate and fossil-fuel investments in current euros and distinguishes between volumes and prices for a large proportion of investment items. Appendix 3 compiles the changes in volumes and prices in indexes.

## ■ Sectors covered

Economic activities are grouped into sectors according to the nomenclature of their energy use and the level of their greenhouse gas emissions in the “climate plan” format that serves as a reference for the French National Low-Carbon Strategy (SNBC) and France’s main energy scenarios.

The Landscape covers:

- the building sector, which includes investment in the construction, maintenance and improvement of housing and commercial buildings;
- the transport sector, which includes investment in transport infrastructure and vehicles;
- energy, which includes energy extraction, transformation, transportation and distribution.

In these sectors, some activities are not yet covered by investment records, such as building materials, controlled mechanical ventilation equipment, maritime infrastructure and motorboats.

The agriculture, industry, centralized waste treatment and land use sectors are not covered in this study as lack of data makes it difficult to identify investments. In the agricultural and industrial sectors, only decentralized renewable energy production (e.g. agricultural methanization, industrial biomass) is included (under energy). Industrial investment in the production of capital goods in France, such as wind turbines, photovoltaic panels and batteries for electric mobility, is not covered.

Finally, the study does not document investment in research and development, or in climate change adaptation.

## ■ Climate and fossil-fuel investments

**Climate investments** contribute to reducing greenhouse gas emissions in France, and concern:

- energy performance of new buildings, *i.e.* investments that limit the energy consumption and emissions of new homes and commercial buildings;
- energy renovation of private and social housing, and public and private tertiary buildings;
- low-carbon vehicles, plus electric, gas or hydrogen recharging infrastructure;
- modal shift from fossil-fuel vehicles to public transport and cycling, requiring investment in infrastructure (railways, bus lanes, cycle lanes) as well as the associated rolling stock;
- production of renewable electrical or thermal energy, and creation and extension of heating networks;
- nuclear power generation;
- strengthening electricity grids and connecting them to low-carbon electricity generation and recharging stations.

**Fossil-fuel investments** concern the production, distribution and consumption of coal, oil and natural gas in France. These investments delay the transition, because they prolong the consumption of fossil fuels and compete with low-carbon alternatives.

The distinction between climate and fossil-fuel investments considers the characteristics of the equipment and is based on:

- the French National Low-Carbon Strategy (SNBC, 2020);
- the Multi-Year Energy Plan (PPE, 2020);
- the nomenclature of the France Finance Verte (Greenfin) label;
- the criteria set out by the Climate Bonds Initiative;
- the criteria of the reports by the EU Technical expert group on sustainable finance (TEG 2020), prefiguring the EU taxonomy for sustainable activities;
- the report on the environmental impact of the state budget (2022);
- the environmental accounts (Eurostat, 2016 and 2017);
- ‘Marchés et emplois de la transition énergétique’ (2022), a study by the French ecological transition agency (ADEME).

Sometimes, for the same piece of equipment, the reference documents differ on the criteria to be considered, or they formulate criteria based on different characteristics of the equipment studied. In general, we prefer definitions for which there are consistent data for the entire study period (2011-2022). Appendix 1 details the references taken from the various documents.

### The main sources of information

The Landscape of Climate Finance aggregates publicly available information on climate and fossil-fuel investments. Most of the information concerning climate investments is taken from the annual market review for energy efficiency

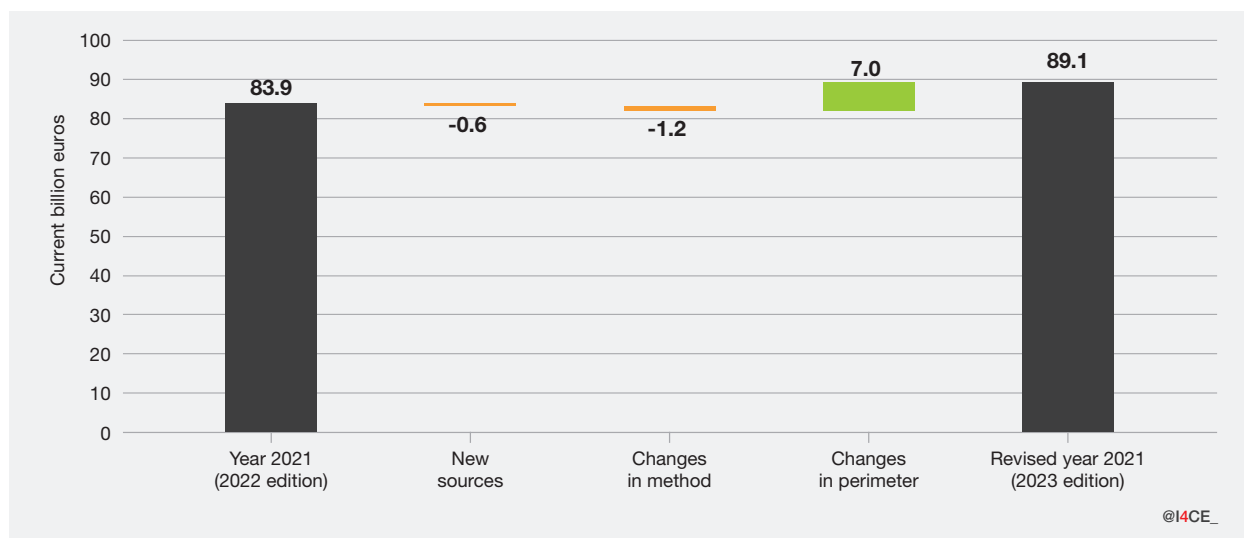
and renewable energy equipment (“Marchés et emplois de la transition énergétique”) published yearly by ADEME.

Additional data is taken from the national accounts of the building sector (Compte du Logement), from the SITADEL database and from the transport accounts (Bilan Annuel du Transport) of the Sustainable Development Ministerial Statistical Department (SDES, Service de la Donnée et des Etudes Statistiques) at the French General Commission on Sustainable Development (CGDD, Commissariat Général au Développement Durable), as well as from the economic reports of the French Building Federation (FFB, Fédération Française du Bâtiment). The ADEME and French National Housing Agency (ANAH) budgets were examined based on the documents supplied by both agencies. The main sources for each investment record are set out in Appendix 2.

#### BOX 1. METHOD CHANGES IN RELATION TO THE 2022 EDITION

This new edition of the Landscape of Climate Finance revises the amounts presented in the previous edition, to the tune of an additional €5.2 billion in current terms for 2021. This revision includes new data sources, changes to the method of recording investments, and a revised scope. The new method applies to the entire 2011-2023 period, so the results presented in this edition are based on a constant method.

**FIGURE 3. VARIATIONS BETWEEN THE 2022 AND 2023 EDITIONS - IMPACT ON CLIMATE INVESTMENTS IDENTIFIED IN 2021**



Several new climate investments are included in the scope: the acquisition of low-carbon rolling stock, and of metros and trams in the Île-de-France region. We also documented and reported the modernization of public lighting within the energy renovation of tertiary buildings. For the first time, we have also taken into account investment in the production of biofuels. For electricity networks, investments in reinforcement and connections are referenced in the climate investment series.

On the fossil fuel side, we revised the accounting method for thermal rolling stock, such as diesel locomotives. In addition, low-efficiency energy renovation measures, previously counted as fossil fuels, are now included in other investments.

### Estimates for 2023

In this study, we give a provisional estimate of climate and fossil investments in 2023. To do this, we have drawn on the first available data: monthly, quarterly or half-yearly investment

statements, forecasts by professionals in the sector, provisional budgets by project developers, such as for public transport, and investment schedules for major ongoing projects.

## Financing climate investments

This edition of the Landscape combines two approaches to analysing the financing of climate investments. The first approach measures climate-related expenditure in public budgets. The second approach looks at investment from the

point of view of project promoters and for a given year, in order to understand what combination of financing tools enables project promoters to achieve their objectives.

### TWO APPROACHES TO DOCUMENTING INVESTMENT FINANCING

Public financing accounts	Funding raised by project developers
<b>Tracking climate-related expenditure in public budgets</b>	<b>Understanding the financing mix that makes climate investments possible</b>
<p><b>Method:</b></p> <ul style="list-style-type: none"> <li>• Selection of budget expenditure or accounting commitments within the Landscape perimeter</li> <li>• Annual monitoring</li> <li>• Possible double counting, because of transfers between public institutions</li> </ul>	<p><b>Method:</b></p> <ul style="list-style-type: none"> <li>• Matching financing to climate investments (€1: €1)</li> <li>• Photographic approach, for a given year</li> <li>• Calculation of the public share net of double counting</li> </ul>
<p><b>CAUTION: FOR A GIVEN YEAR, THE TWO APPROACHES MAY DIVERGE WHEN:</b></p> <ul style="list-style-type: none"> <li>• the investment takes place before or after the year of the expenditure,</li> <li>• the same funding is channelled through several intermediaries (double accounting),</li> <li>• some financing covers more than just investment.</li> </ul>	

These two methods are a prerequisite for a forward-looking reflection on the financing of climate investments. Starting from the current financing as seen by project developers, we can design new financing combinations that meet the need to invest more for the climate, or that distribute efforts differently between public and private bodies. These combinations have repercussions on public budgets, forming a multi-year financing trajectory, subject to the divergences identified above. This forward-looking analysis will be used in future editions of the Landscape of Climate Finance.

### Public financing accounts

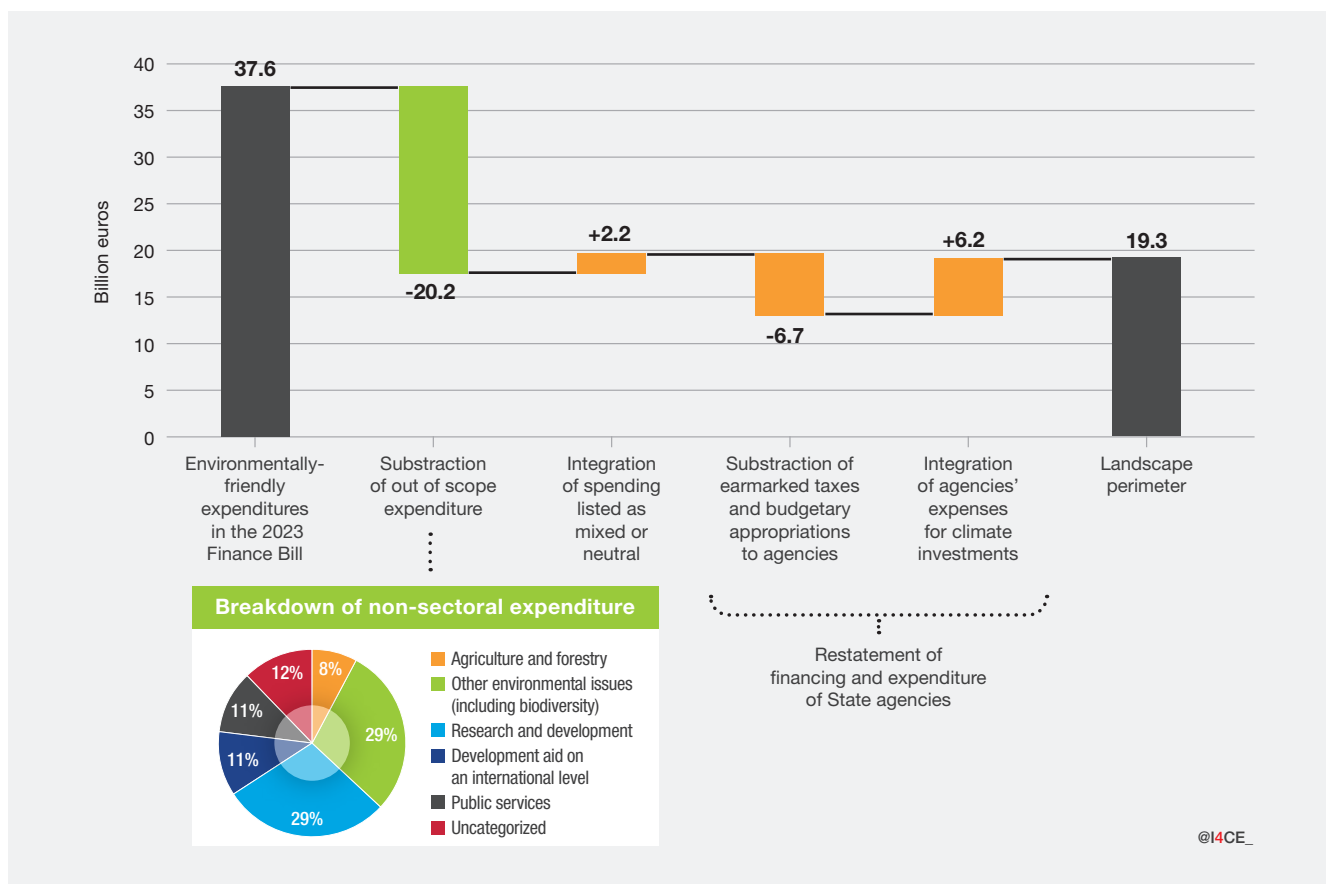
In this approach, we track climate-related expenditure by public institutions: the central government; regional and local authorities; as well as loans from public banks: Caisse des Dépôts Group and the European Investment Bank. The amounts reported correspond to the scope of the Landscape, *i.e.* climate spending in the building, transport and energy production sectors. In fact, they are often lower than the amounts reported by public bodies for a wider range of sectors.

### The central government

We are reporting €19.3 billion in central government spending on climate investments in 2023. The government itself identifies €37.6 billion in environmentally friendly spending in its report on the environmental impact of the budget, also known as the Green Budget (Budget vert), an Appendix to the Finance Bill (French State, 2022, p.22). This discrepancy can be explained by several adjustments:

- Some State expenditure presented in the Green Budget falls outside the Landscape's sectoral scope. This includes spending on research and development, agriculture and forestry, other environmental issues such as water management and biodiversity, and international aid.
- Because they relate to climate investments in the Landscape, we are also including expenditure classified as mixed or neutral in the green budget, in particular the assumption by the State of the debt burden of the national rail network (SNCF Réseau), and the vehicle conversion bonus.
- Finally, the State's budgetary framework does not describe all the expenditure from which project developers benefit for their climate investments, in particular that of public agencies. Rather than taking the budget appropriations and earmarked taxes paid by the State to the main agencies, we report the expenditure of these agencies in support of climate investments. This restatement concerns ADEME's Fonds Chaleur, MaPrimeRénov' operated by ANAH, and the financing of modal shift infrastructure by the French agency for the financing of transport infrastructure (Agence de financement des infrastructures de transport de France, AFITF).

FIGURE 4. FUNDING FOR CLIMATE INVESTMENT IN THE GOVERNMENT'S 2023 BUDGET



In addition, unlike the green budget in the 2023 Finance Bill, which reports on the expenditure entered in the initial Finance Act for the year 2022, the expenditure for the year 2022 published in Landscape corresponds to executed expenditure, taken from the Finance Settlement Bill for 2022.

### Regional and local governments

Regional and local governments finance climate investments in several ways:

- They invest in their own buildings and equipment. They renovate their buildings, install photovoltaic panels, construct new buildings, and electrify their vehicle fleets.
- They invest on behalf of their constituents, developing urban spaces to build cycle paths, install public electric charging stations, or produce biomethane in waste collection and treatment facilities.
- They subsidize investment by other project developers. In particular, they finance investments made by the transport organizing authorities. These include the mobility organization authorities (autorité organisatrice de la mobilité, AOM) and transport operators, such as RATP, as well as network managers, such as SNCF Réseau in the case of rail, in their respective territories. This funding covers urban public transport, rail and river transport. The funding they provide to other bodies, particularly in the transport sector, is derived from data aggregated at national level, from the Annual Transport Report (SDES, 2022). Public funding, operating subsidies and contributions to rail tolls are not taken into account in this estimate.

Regional and local governments also provide climate financing that we have not quantified in this edition of Landscape. This may take the form of support for households that acquire electric or natural gas vehicles, for example by exempting them from registration tax. They can also take stakes in companies that invest in energy efficiency and renewable energies. This is particularly the case for renewable electricity and gas project companies and social landlords (providers of social housing). These kinds of support are not reported here due to the lack of sufficiently complete data.

Local climate investment and financing reported in the Landscape do not come from a compilation of local governments budgets, nor from their green budgets, but from investments first estimated on a sectoral basis, then allocated to local governments according to different distribution methods.

### Public banks

For public banks, we report the loans and investments of two banking groups: the Caisse des Dépôts Group (CDC) and the European Investment Bank (EIB).

The CDC Group brings together the Caisse des Dépôts public institution (including Banque des Territoires and asset management), Bpifrance, La Banque Postale, CNP Assurances and SFIL. Since 2020, financing for the ecological transition has been monitored at group level. This monitoring highlights €23 billion in financial flows for the ecological transition in 2022. From the total, we have selected €10.5 billion for the sectors covered by the Landscape. This selection does not constitute an assessment of the relevance of the

amounts reported by the CDC Group. The other flows include financing for decarbonization of industry, water management, preservation of biodiversity, and development of the circular economy, as well as purchases of green bonds, for which the sectors and the location of the underlying assets financed could not be identified. Amounts are reported on the date of signature for loans and on the date of commitment for investments.

We do not have all the details concerning the companies and projects financed by Caisse des Dépôts. Some financing in year N does not correspond to the year in which the climate investments were made. For example, some loans may refinance project developers for assets already commissioned several years earlier. In this case, the aim is to offer them more favourable refinancing terms, such as extending the maturity of debt and reducing financing costs, to give them more financing capacity to launch new projects.

For loans from the EIB and Caisse des Dépôts, we use the total financing reported by these banking institutions for new construction. Caisse des Dépôts reports amounts lent for exemplary new buildings, with certification or a label that is more demanding than the regulations. In the Landscape, the climate investments reported correspond to investments in the energy components of new buildings alone, such as insulation of facades, roofs, windows and heating equipment.

### Interpretation precautions

The funding provided by the various public bodies cannot be added together, as some funding is counted several times. For example, the State and the Banque des territoires have respectively granted subsidies to support local investment and loans to local governments to enable them to carry out climate investments on their own behalf or on behalf of their constituents.

In addition, public funding cannot be directly related to climate investments. In fact, some expenditure incurred during a year may relate to investments made previously. This is particularly true of certain tax credits and grants. The opposite situation also exists: bank loan commitments acquired in a given year may relate to investments made at a later date.

In addition, some expenditure only indirectly finances climate investment. For example, the State pays part of the rail tolls on behalf of contracted services such as TER and Intercités. These tolls partly cover network operating costs, and only the operating surplus is likely to finance investment.

Finally, it is impossible to say whether the efforts of one public institution are sufficient simply by comparing the total of their financing with that of other public bodies, because the national and local governments and public banks do not have the same areas of intervention, or the same skills.

## Funding raised by project developers

This approach matches funding to investment: for every euro of investment, there is one euro of funding. Investments are first allocated to project promoters, then funding is distributed according to four instruments and four sources.

### Project developers

Project developers are the institutions that make the investment. In most cases, they are the owners of the capital created by the investment operation. Their classification is based on the institutional sectors of national accounting and distinguishes:

- The central government as a project developer, that is, investing in its own buildings or its own fleet of vehicles.
- Local governments as project developers, investing on their own behalf or in certain public services on behalf of their constituents.
- Infrastructure managers, companies or public establishments responsible for developing, maintaining or operating transport infrastructure. This category includes SNCF Réseau, RATP, Société du Grand Paris and the mobility authorities (AOMs), which invest in urban public transport on behalf of local governments.
- Social landlords, a category that combines public, semi-public and non-profit institutions providing social housing. In principle, private landlords offering means-tested housing (tax exemptions, agreements with the national housing agency) should be counted as private households. In practice, in the absence of sufficiently detailed data and because they represent a small number of lessors, their investments are not distinguished.
- Companies as project developers, mainly non-financial companies investing in commercial buildings, transport and energy production. These may be special purpose vehicles (SPVs). Under national accounting conventions, publicly owned companies such as EDF, SNCF Mobilités and RTE are consolidated in this group.
- Households as project owners, that is, mainly in the construction of new homes or the renovation of existing homes, and in the acquisition of vehicles. In the building sector, we consider that households are the project owners, even when the work is carried out by private service providers, such as property development companies (construction) or building firms (construction and renovation), because households are the final owners of the new or renovated dwelling.

### Financing instruments

The instruments are grouped into four categories according to the nature of the commitments between the parties.

- Grants, subsidies and payments include funds paid to project developers without any financial consideration. Grants and subsidies include tax credits, where these are calculated on the basis of investment expenditure.
- Concessional debt includes loans designed to offer an advantage to the borrower in terms of rate, duration, payment terms or guarantees. In the Landscape, the concessional nature depends on the design of the instrument and the nature of the issuer, generally a public financial institution. In practice, the degree of advantage in relation to market conditions may vary over time depending on the economic situation. Zero interest rate loans such as the PTZ+ and eco-PTZ are attached to concessional debt even though they are distributed by commercial banks.

## METHOD

- Commercial debt represents loans, borrowings and bonds issued at open market rates. Terms and conditions (rates, maturity, guarantees) may vary from one instrument to another and according to the nature of the project developer.
- Self-financing describes the resources belonging to the project owner. These may be operating surpluses, capital contributions from a company's shareholders, or proceeds from the sale of property or financial assets. Self-financing can also refer to balance sheet financing, when a company organizes the use of debt not on a project basis, but across all its activities. For households, self-financing can mean using savings or income from the sale of a property. In the case of public project developers, self-financing refers to all resources that are not specific to the project, which may include loans or transfers.

In addition to these four instruments, there are two special cases:

- White certificates (Certificats d'économie d'énergie or CEE) issued by public authorities oblige suppliers of electricity, gas, heating oil and petroleum fuels to finance energy efficiency work. This transfer is similar to a subsidy, but it is not included in public budgets, which is why we count it separately.
- Guarantees are sometimes considered financing instruments in their own right, especially when they are issued by third parties, for example when a public bank guarantees a company's loan. More generally, most debt financing transactions involve various types of collateral. The apportionment method does not allow guarantees to be included in the investment total: when added to the amounts lent, the amounts sometimes exceed the sums invested. What is more, since guarantees relate to a risk, they are generally not disbursed, which distinguishes them from other financing. Nonetheless, guarantees on behalf of third parties appear in the financing accounts of public banks, and an analysis of investment financing by sector highlights the specific security conditions under which certain investments can obtain financing.

### Sources of financing

Funding provided to project developers is grouped by source. These are the public bodies presented in the financing accounts: the State and local governments on the one hand, and public financial institutions on the other, to which must be added companies and households, as well as banks and financial markets.

### Interpretation precautions

Financing as seen by project developers describes the financial resources gathered at the time the investment is made. This approach follows different logics depending on the sector. For example, MaPrimeRénov' is considered to finance household renovation work, even though it is paid out after the work has been carried out and involves pre-financing from the household's own funds.

The allocation of investments to financing follows certain accounting conventions. For large companies such as SNCF Réseau or EDF, cash flows are separated into three sub-groups: subsidies, net debt and self-financing. Debt includes the balance of new loans and bonds, repayment of old loans and bonds, and changes in cash and cash equivalents. Thus, when these companies issue large bonds but do not immediately invest all the proceeds, the contribution is spread over several years via cash consumption.

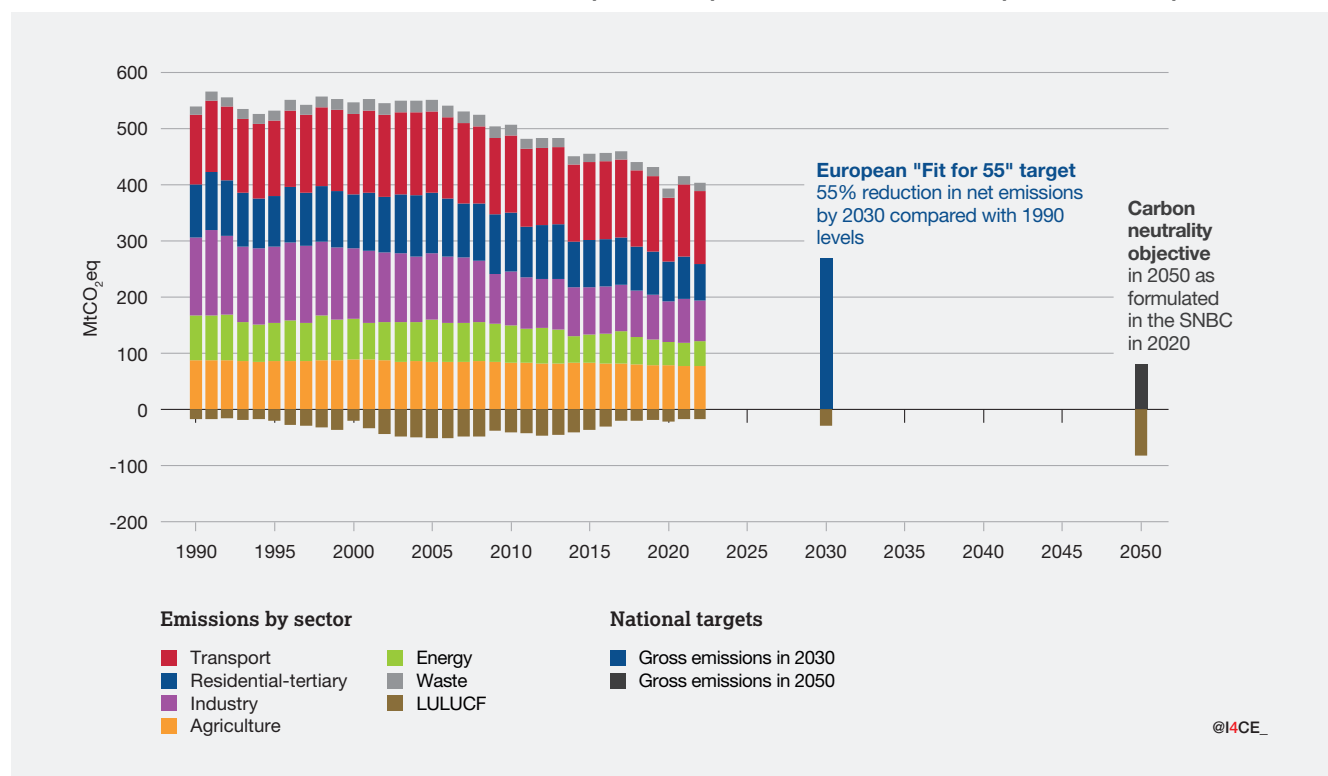
The financing presented here is therefore net of double counting, because from the point of view of the project developers, each euro of investment is associated with a source and an instrument of financing.

This simplified method is suitable for understanding, in order of magnitude, the importance of different methods of financing investment, including the share of financing from public sources. On the other hand, it does not shed light on the additionality of financing, that is, its propensity to generate investment. Consequently, the observed share of public funding does not necessarily correspond to a private/public leverage effect.

## Estimating investment requirements

### Climate objectives

FIGURE 5. GREENHOUSE GAS EMISSIONS IN FRANCE (1990-2022) AND NATIONAL TARGETS (2030 AND 2050)



LULUCF: Land Use, Land-Use Change and Forestry.

Source: based on CITEPA and SGPE.

France has set itself the goal of achieving carbon neutrality by 2050. This means reducing net emissions to zero by achieving a balance between the greenhouse gases emitted by human activities and those absorbed by carbon sinks. In 2020, the French National Low-Carbon Strategy set the level of emissions and sinks at around 80 million tonnes of CO<sub>2</sub>.

In July 2021, the European Union adopted the Fit for 55 objective: to reduce its net greenhouse gas emissions by 55% by 2030 compared with 1990 levels.<sup>2</sup> This new objective also constitutes the European Union's contribution to the Paris Agreement. Net emissions take into account the absorption of greenhouse gas emissions by carbon sinks: forests, other land, wood products and industrial carbon capture and storage. According to the Haut Conseil pour le Climat (2022), this new European objective should lead France to reduce gross greenhouse gas emissions by around 50% by 2030 compared with 1990 levels, and net emissions by around 54%. The future French National Low-Carbon Strategy (SNBC-3), expected in 2024, will specify these emission reduction targets.

### French national low-carbon strategy scenarios

Since 2022, the government has been drawing up the new French Energy-Climate Strategy (SFEC), which includes the French National Low-Carbon Strategy (SNBC), the Multi-annual Energy Programme (PPE) and the French National Plan for Adaptation to Climate Change (PNACC). The new SNBC will aim to halve gross greenhouse gas emissions by 2030 compared with 1990 levels (SGPE, 2023), while maintaining the objective of carbon neutrality by 2050.

The SNBC is based on two scenarios: the first anticipates the emissions associated with existing measures (known as the AME scenario) and the second assumes that additional measures are taken to achieve the climate objectives (known as the AMS scenario). The AMS scenario serves as the reference for estimating investment requirements. It is drawn up by the Energy and Climate Division (DGEC) of the French Ministry for Energy Transition.

<sup>2</sup> Previously, the target was to reduce emissions by 40% compared to 1990 levels.

As the complete revision of the SFEC will not be finalized until 2024, this edition of Landscape is based on the assumptions of the draft scenario of the SNBC. These assumptions are documented in the draft update of the integrated French National Energy-Climate Plan (PNIEC, 2023) and in the public consultation version of the energy section of the SFEC (PPE, 2023).

### Investment targets

Based on the assumptions of the draft SNBC, we identify the number and characteristics of facilities deployed to reduce emissions, for example: the number of homes renovated, wind or solar power capacity installed, transport infrastructure development or regeneration programmes. We draw on the expertise of modellers at the DGEC and other associated bodies, to accurately represent the economic transformation of each sector.

### Future prices

We assign unit prices to equipment. These prices are projected from their most recent observed levels, typically in 2022 or early 2023. Where recent sources do not specify the year for which they have observed prices, we assume that they relate to 2019.

Our projections for 2023 and beyond reflect the cost expectations expressed in several recent studies. In some sectors, prices are resuming their historic downward trend, driven by economies of scale and the rise of a global industry. This is particularly the case for the cost of batteries (BNEF, 2022) and photovoltaic panels (RTE, 2023). In other sectors, prices continue to rise in constant euros – faster than overall inflation. This is particularly true for public works and, to a lesser extent, construction (ART, 2023).

This approach makes it possible to establish the link between the transformations specific to each sector and their economic consequences. However, it does not include a macroeconomic analysis, that is, it does not allow us to measure the impact on supply and demand in the sectors studied, or any new market balances resulting from price changes.

### Investment requirements

The Landscape determines needs in relation to levels of investment observed in 2022. The investment target is based on average annual investment over the period 2024-2030. This means that, to achieve the climate objectives, investment must be at the target level on average over the period 2024-2030. Delays in investment can be made up by exceeding the target in subsequent years, and any investments above the target can be used to cover future difficulties.

We endeavour to establish trajectories that are comparable in terms of volumes and prices to those observed for the historical period, which leads us to make adjustments when comparing historical data with requirements (see Appendix 4).

In some sectors, achieving the targets does not require more spending, but involves changing the nature of the projects undertaken. For example, spending on energy renovation may be concentrated on comprehensive operations rather than phased works. When these differences cannot be measured quantitatively, we indicate them in the comments on the results.



## Sectors in I4CE's Landscape

The results are detailed for each sector of the study in the dedicated chapters, except for the road network, exploration and extraction of fossil fuels, the gas network and LNG terminals.

Energy Balance Sectors	Sectors	Climate investments	Fossil-fuel investments	Other investments
<b>Residential and tertiary</b>	Construction	Energy performance of construction	-	Construction excluding energy performance
	Maintenance and improvement	Energy retrofiting: efficient measures (excluding gas and oil boilers)	Gas and oil boilers	Related work and other maintenance and improvements
<b>Transport</b>	Road transport	Low-emission road vehicles, recharging infrastructure for alternative fuels	Combustion engine vehicles	Road network
	Other modes of transport	Infrastructure and equipment for modal shift: rail, urban public transport, cycling network and waterways	Airports and air transport equipment	-
<b>Energy branch</b>	Renewables	Renewable electricity, renewable heat, heating networks, biofuels	-	-
	Nuclear	EPR and major refurbishment	-	-
	Fossils	Carbon capture and storage	Electricity generated from fossil fuels Refineries and pipelines	-
	Networks and flexibility	Electricity grids Low-carbon hydrogen production Static batteries	LNG terminals	Gas networks

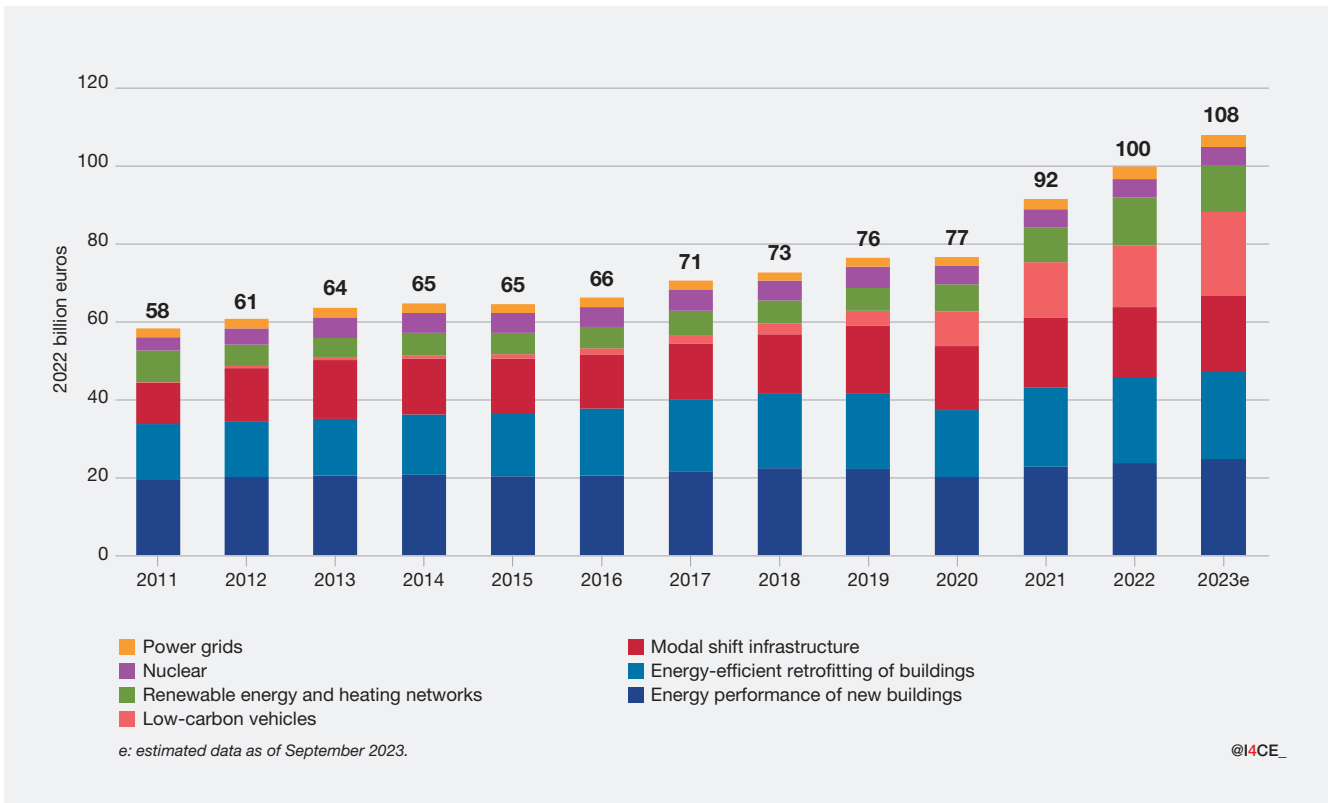
× **Not covered:** agriculture, industry, centralized waste treatment, land use, adaptation to climate change, research and development.

# RESULTS

## Climate investments in France: uneven progress

In France, climate investments have risen over the last three years, reaching the symbolic threshold of €100 billion. Stronger regulation and the COVID-19 recovery plan provided a boost in 2021, supported in 2022 by high energy prices and the timing of several major projects. In 2023, according to early data, the investment increase was concentrated in low-carbon vehicles and renewable energies, while other sectors remained stable or decline. Credit conditions, hitherto favourable to investment, tightened rapidly in 2023, weighing on the short-term outlook.

FIGURE 6. CLIMATE INVESTMENTS IN FRANCE BY SECTOR



### Climate investments pass the symbolic mark of €100 billion

By 2022, climate investments reached €100 billion, up 9% on 2021. Investment increased in energy retrofitting of buildings, low-carbon vehicles and renewable energies, while remaining stable or even decreasing in modal shift infrastructure and nuclear power.

Several factors explain the increase in climate investments. Major projects, such as offshore wind farms and the Grand Paris Express, were being rolled out with a view to their

commissioning. Above all, in response to the sudden rise in energy prices that began at the end of 2021, households and companies began to invest in heat pumps, electric vehicles and renewable energies, particularly solar photovoltaics for self-consumption. But these opportunistic investments were often dictated by current prices, rather than anticipation of future prices.

However, climate investment grew less rapidly in 2022 than in 2021, and the volume of equipment installed rose only slightly. This is because the increase in spending was mainly due to equipment prices, which rose because of the energy

crisis and supply difficulties. In addition, public support for climate investments increased less in 2022 than in 2021 (see **The central government**). As a result, investment in sectors dependent on public support, in particular energy-efficient retrofitting of housing and transport infrastructure, remained stable. Regulatory leverage also progressed at a slower pace: European vehicle regulations gave a strong boost to investment in cars and light commercial vehicles in 2020, but they will not strengthen further by 2024. Other regulations apparently favourable to climate investments, such as the tertiary sector eco-energy scheme or the obligations to electrify professional vehicle fleets, are not systematically followed by companies or local governments.

The catch-up period for projects interrupted by the COVID-19 crisis in 2020 is now largely over, and also explains the slowdown in growth in climate investments. Lastly, global inflation may have weighed on the financing capacities of both public and private project developers.

### **In 2023, climate investment slows in most sectors**

Based on information available in early 2024, we estimate that climate investments increased by 8% to reach €108.1 billion in 2023. The increase was concentrated in the deployment of electric and plug-in hybrid vehicles, which rises by €4.6 billion. This momentum was boosted by a larger network of electric charging points, public support for the purchase of electric cars, regulatory measures and longer battery life.

Other sectors on the rise include photovoltaic solar panels, particularly for self-consumption, and biomethane injection. Photovoltaic solar power is benefiting from the law on accelerating the production of renewable energy, which reduces the time required to appraise projects, and creates an obligation for companies and local governments to install panels on their buildings and above car parks.

Elsewhere, investment was stable or declining. Investment in energy-efficient retrofitting of buildings rose by just 3%, following sustained growth in 2021 and 2022. Public support for the work undertaken on behalf of households showed little change in 2023, and the new regulatory measures are not expected to generate any short-term momentum in the sector. In onshore wind power, investment was expected to fall in 2023, due to structural obstacles to the deployment of wind power projects, notably administrative procedures and legal proceedings.

### **In the short term, climate investments are threatened**

Rising interest rates increase the cost of new debt and, ultimately, the overall cost of debt for companies, households and public authorities. Yet all these kinds of investor take on debt to finance climate investments. This is particularly true in the construction sector, where we are seeing a fall in the number of building permits, which will have an impact on the number of building projects undertaken from 2024 onwards. For existing properties, the rapid rise in interest rates is also reducing the number of purchases. However, moving into a

new home is often an opportunity for households to carry out renovation work, particularly insulation work.

Several major projects, which have recently boosted investment, are slowing down in the short term. In offshore wind, investment is likely to decline in 2024. Once the Saint-Nazaire, Fécamp and Saint-Brieuc wind farms have been commissioned, or are scheduled to be commissioned, only three projects are likely to be under way between 2024 and 2025, with construction of the Dunkirk wind farm not due to start until 2026. In the nuclear sector, due to the commissioning of the Flamanville European Pressurized Reactor (EPR) in 2024 and a reduction in the volume of maintenance work in the existing nuclear fleet, as part of the Grand Carénage programme, investment will fall by 6% in the short term. In addition, EDF incurred heavy financial losses in 2022, which increased its indebtedness. In the medium term, this could slow down the investments needed to extend the existing plants and those planned for the construction of new generation capacity.

Renewable energy production projects are also encountering a slowdown due to administrative difficulties and increasingly long appraisal times, because of a lack of resources in the relevant departments, as well as local opposition. Opposition has increased with the deployment of renewable energy production infrastructure, particularly wind farm projects, both onshore and offshore, and large-scale methanization projects (CESE, 2022).

Finally, given the rising cost of equipment in several sectors of the energy transition, changes in public support will also determine the level of climate investments. For example, if the Fonds Chaleur budget is maintained at the same level between 2022 and 2023, the increase in the price of renewable heat production and heating network projects could reduce the number of projects supported. The issue of public funding is also crucial for modal shift infrastructure: faced with the rising cost of public works and their difficulties in raising additional debt, transport network operators are asking for increased support from public institutions to carry out their investments, as shown by the case of Île-de-France Mobilités.

### BOX. CLIMATE INVESTMENT INCREASES IN 2022 ARE DUE TO HIGHER PRICES RATHER THAN AN INCREASE IN THE NUMBER OF PROJECTS

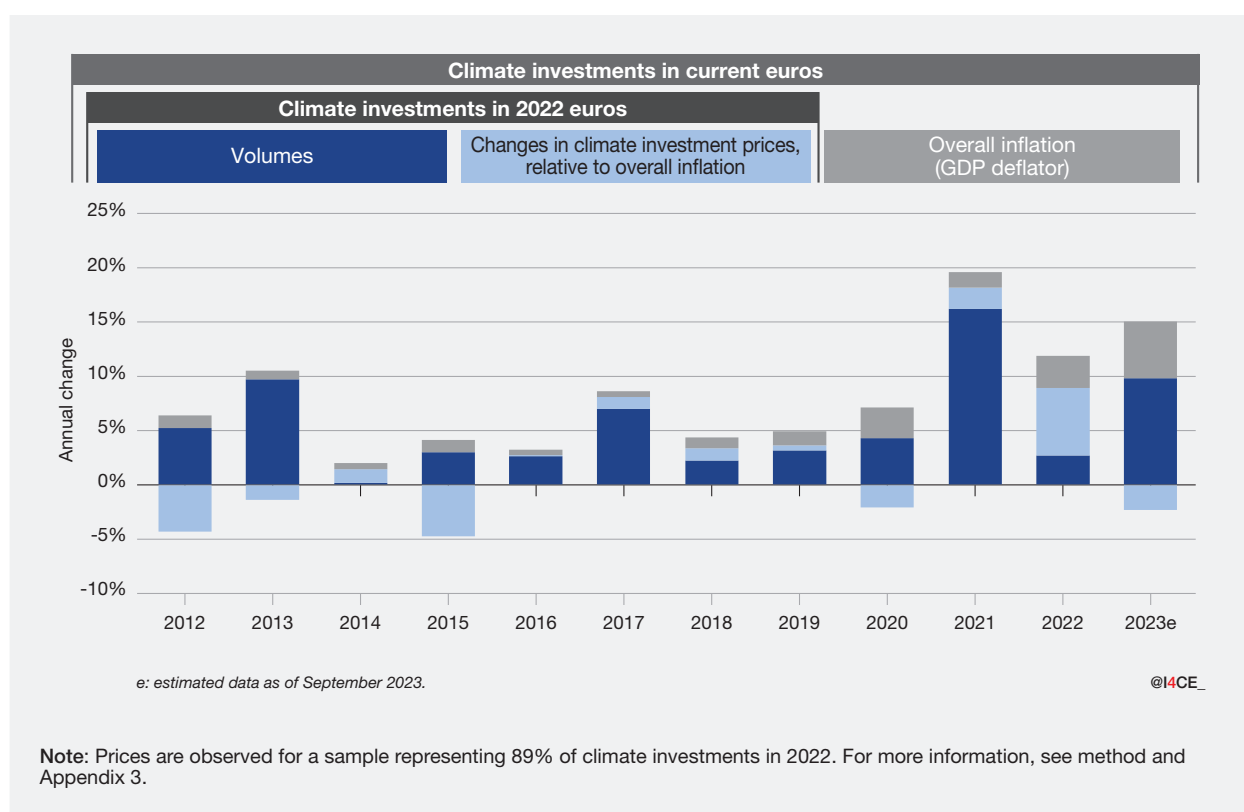
Between 2011 and 2021, most of the increase in investment was due to higher volumes of equipment installed, with prices showing little change on average over the period.

In 2022, the trends were reversed: relative prices rose by an average of 6%, and volumes by 3%. Equipment prices rose in all sectors, particularly in renewable energies, construction and transport infrastructure. The rise in prices in 2022 is the result of several factors, including the energy crisis, which led to a sharp rise in production costs, and supply difficulties, linked to the war in Ukraine among other things, for certain essential components in the energy transition sectors. If we look at climate investment in current euros, this rise in relative prices is in addition to overall inflation, which was 3% for 2022.

Part of the increase in volumes stems from the re-estimation of the cost of major projects since 2011. A number of major projects have cost much more than expected when investment decisions were made. For example, by the time it is completed, the Grand Paris Express is expected to cost almost twice as much as forecast (Senate, 2020), and the Flamanville EPR almost four times as much (Cour des Comptes, 2020). These additional costs account for a large part of the increase in volumes – around 1% of the total increase in climate investments in 2022.

In 2023, according to initial estimates, volumes increased by 10%. While inflation accelerated relative to 2022, relative prices were expected to fall by around 2%. Prices are starting to fall again in renewable energies, and to a lesser extent in low-carbon vehicles, while price rises are slowing in other sectors.

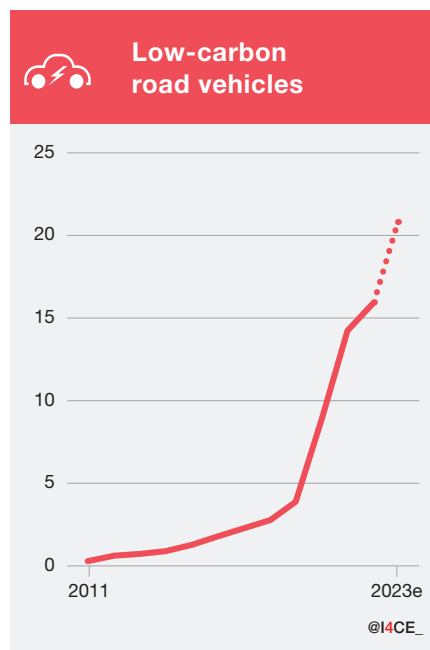
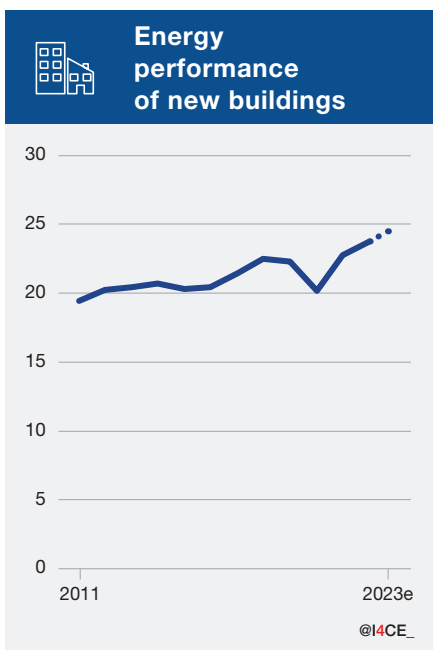
FIGURE 7. INVESTMENT TRENDS BY ACTIVITY AND PRICE FACTORS



## CLIMATE INVESTMENT IN 2022, ESTIMATES FOR 2023, KEY SHORT-TERM THREATS

(in billions of constant euros 2022)	Investments in 2022	Investment estimates for 2023	Short-term threats
Energy performance of new buildings	23.7	24.8 (+4%)	Slowdown in the construction demand in the short term as interest rates rise
Energy retrofitting of buildings	22.1	22.8 (+3%)	Fall in purchases of existing properties as interest rates rise
Low-carbon road vehicles	15.9	21.3 (+33%)	-
Infrastructure and equipment for modal shift	18.0	19.4 (+8%)	Rising interest rates, higher cost of works and increased need for public funding
Renewable energy and heating networks	12.1	12.2 (+1%)	Completion of a number of major projects, administrative difficulties and disputes over the commissioning of renewable electricity projects, matching of public funding to the rising cost of projects
Nuclear power	4.9	4.6 (-6%)	End of the EPR construction, and less investment in the Grand Carénage programme, EDF's high level of debt could hamper the financing of development projects
Power grids	3.1	3.1 (-1%)	-
<b>Total</b>	<b>99.9</b>	<b>108.1</b> <b>(+8%)</b>	-

Climate investment by sector



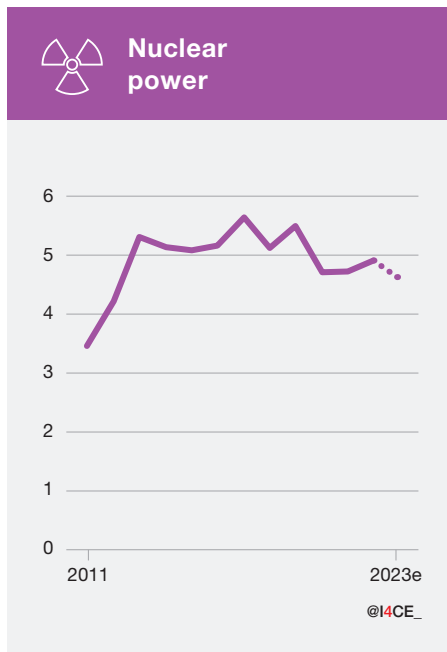
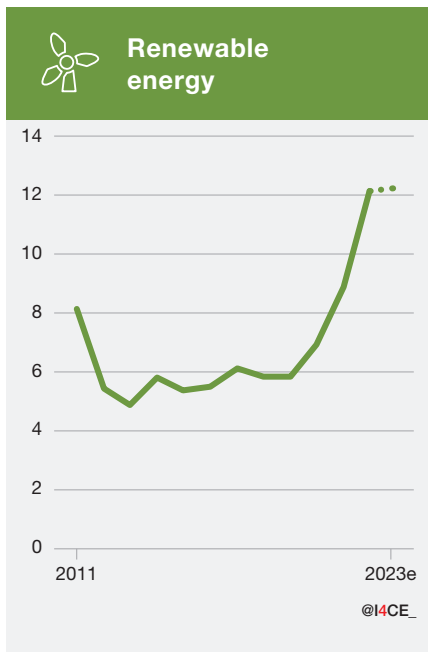
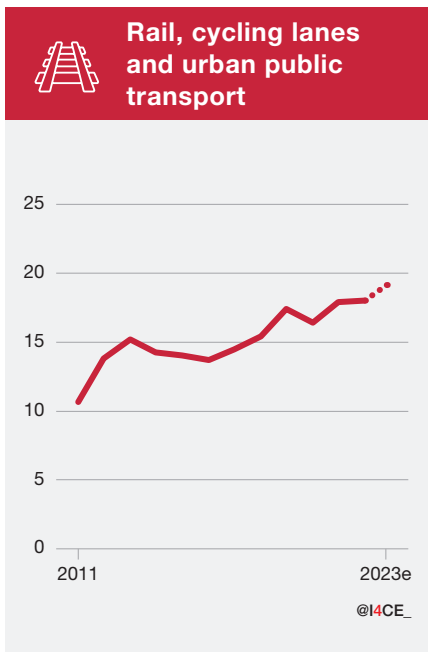
Investment in energy performance of construction increased between 2021 and 2023. This increase was driven by very favourable market conditions. Interest rates were low until the first half of 2022, giving households and companies greater financing capacity. The increase in demand for construction in 2021 and 2022 translated into growth in the number of building sites in 2022 and 2023. Prices have also contributed to the increase in investment, especially the rise in the price of materials. The roll-out of the progressive 2020 environmental regulations from 1 January 2022 has also increased the energy performance of new buildings.

There has been a slight increase in investment in energy-efficient renovation of buildings. The increase is concentrated in heat pumps and wood-burning heating appliances, due to public support for changing heating equipment and to rising energy prices. To protect themselves against potentially high energy bills, some households have chosen to change their heating system. The proportion of deep renovations carried out remains very low. The slowdown in sales of existing homes is likely to lead to a reduction in renovation.

Investment in energy retrofitting of social housing is also increasing, and on average the renovations are more efficient than those carried out in the private sector.

Energy retrofitting of commercial buildings is increasing slightly. The COVID-19 recovery plan has helped to increase the rate of energy retrofitting of public buildings, and the tertiary sector eco-energy scheme is beginning to translate into renovation work, although the extent of its effect is difficult to quantify. The recent rise in prices has not encouraged companies and local governments to undertake long-term renovation.

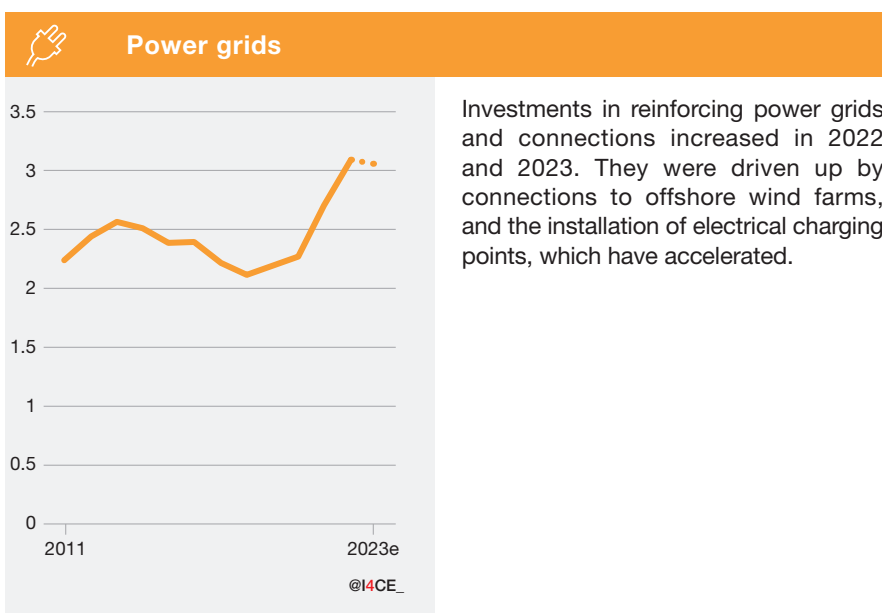
Investment in low-carbon vehicles is rising sharply. European regulations accelerated the momentum in 2020, and several factors are now at work. National regulatory measures are encouraging local governments and companies to register more low-carbon vehicles. In response to the rise in the price of diesel and petrol, companies and households are tending to move more towards electric vehicles. Longer battery life and a denser recharging network are contributing to increased investment. Although sales of electric heavy goods vehicles (HGVs) are increasing, they are still low, as the cost of using combustion-powered vehicles for long-distance transport remains lower than that of their electric equivalents.



In terms of volume, investment rose slightly in urban public transport, rail and inland waterway transport. The deployment of major projects, such as the Grand Paris Express and the Seine Nord Europe Canal, is contributing to the increase in investment. These sectors benefited from additional public support during the COVID-19 crisis, which has remained stable since 2021. Regulations on vehicle fleets have also led to an increase in registrations of electric and NGV buses. In 2022 and 2023, there was little increase in investment in bicycles.

Investment is rising as a result of ongoing offshore wind projects and the increase in the installation of self-consumption photovoltaic panels in response to rising energy prices. Investment in gas and renewable heat has been stable, due to the rising cost of materials, which has led some companies to postpone their projects, but also to little increase in public support through the Fonds Chaleur.

Investment in nuclear power is stable. This includes maintenance of existing plants, as well as the construction of the Flamanville EPR. The commissioning of the Flamanville EPR should reduce investment in the short term. EDF's financial position has been weakened by the measures taken to combat rising electricity prices and increased credit costs. State intervention is enabling EDF to continue its investment programme.

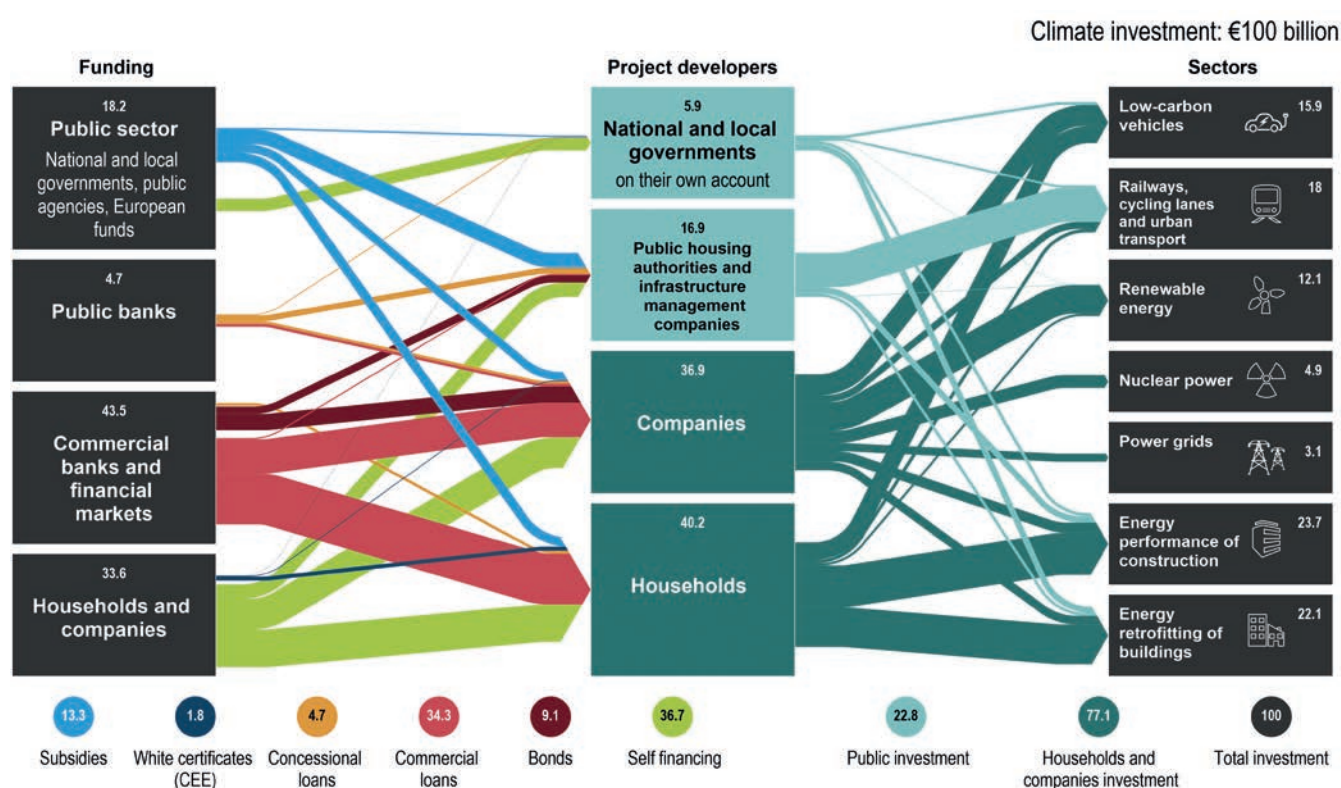


Investments in reinforcing power grids and connections increased in 2022 and 2023. They were driven up by connections to offshore wind farms, and the installation of electrical charging points, which have accelerated.

## Financing climate investments

In 2022, three-quarters of climate investments were undertaken by households and companies. Public authorities accounted for 34% of the funding mobilized by project developers. In the sectors covered by the Landscape, national and local government spending on climate action increased with the COVID-19 recovery plan launched at the end of 2020 but has grown little since. The funding provided by public banks is increasing.

### Climate finance in France at a glance



@I4CE\_

#### Reading precautions:

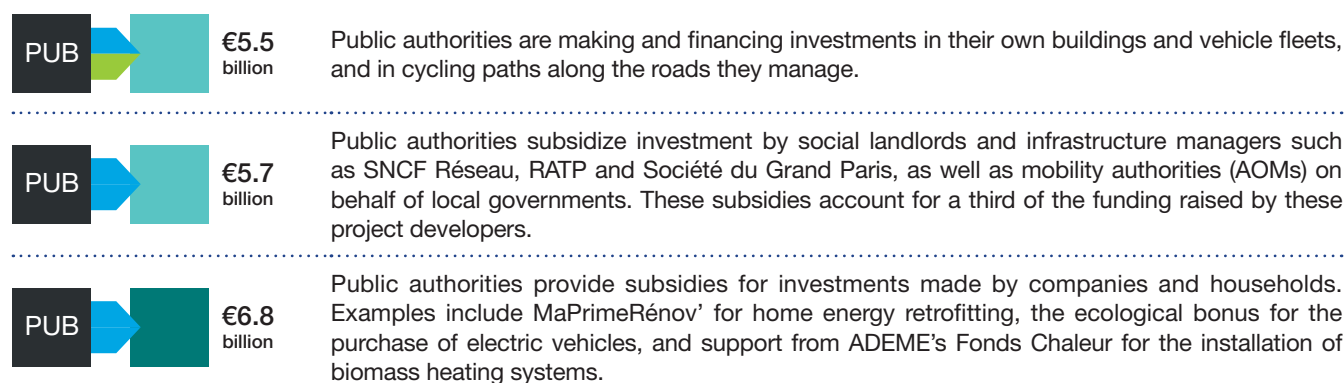
- On this diagram are represented the resources committed by project developers at the time of investment. Certain forms of financing that contribute to the profitability of the project during its operation, such as support mechanisms for renewable energies, do not appear on this diagram.
- The share of companies in total financing should be nuanced, as the Landscape does not include climate investments in agriculture and industry, sectors where the vast majority of investments are made by companies.
- The investments made by the State and local governments on their own account appear to be largely self-financed, as only project-specific subsidies are shown here. In reality, their self-financing includes transfers, for example from Europe to the State and from the State to local governments, tax resources and debt, in overall proportions that are not represented.



## Public funding in 2022

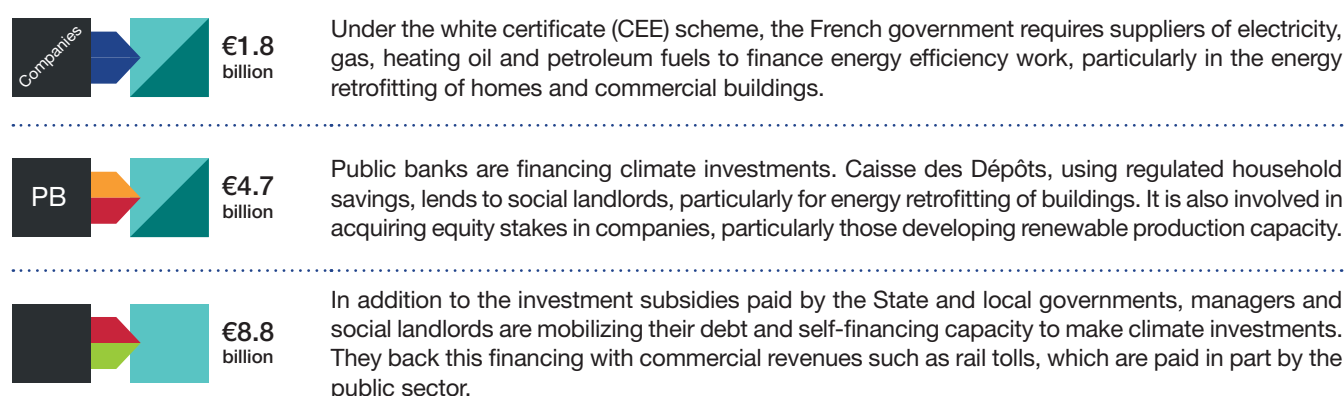
Public authorities are involved in financing climate investments through several channels.

### MAJOR PUBLIC INVESTMENTS AND SUBSIDIES TO HOUSEHOLDS AND COMPANIES



Together, these main subsidies and investments totalled €18.1 billion in 2022.

### OFF BUDGET EXPENDITURE



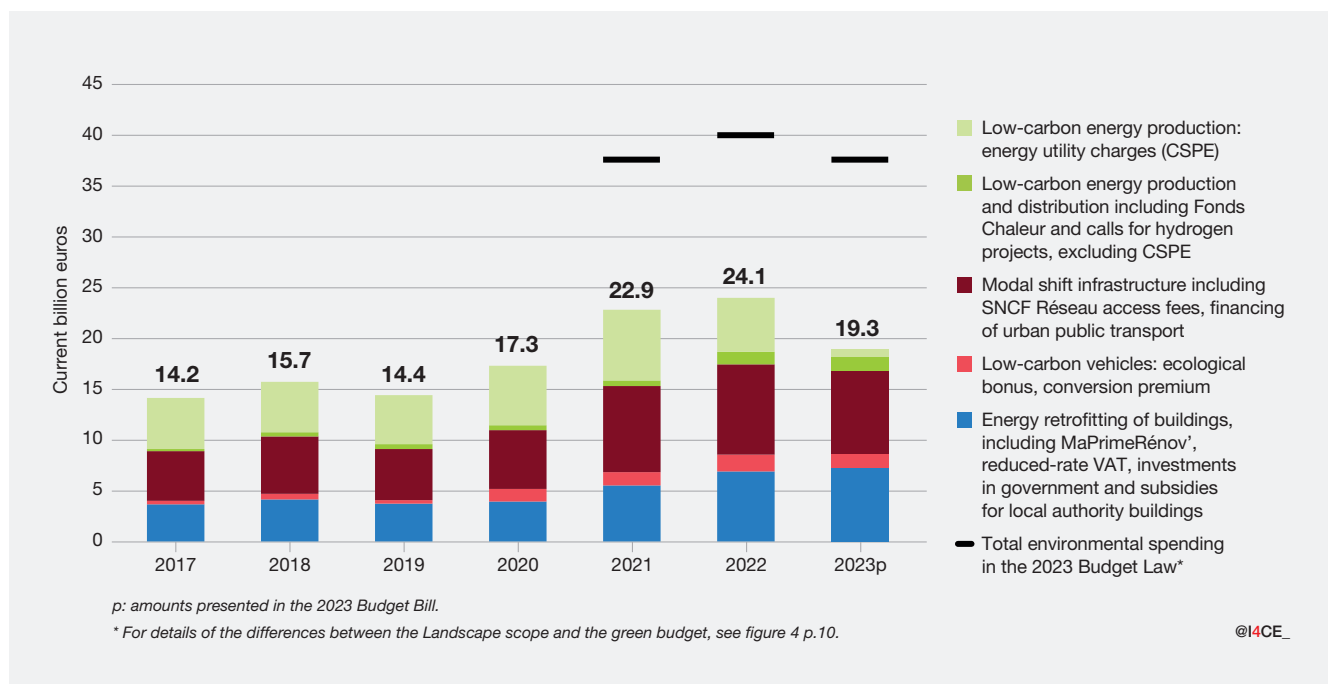
When extra-budgetary channels are added, the public authorities' share of climate investments reaches €33.6 billion.

### OTHER METHODS OF INTERVENTION

Not represented	In addition to the funding provided the year of the investment, public authorities are committed to providing long-term remuneration for certain investments. This is particularly true for the energy utility charges (CSPE), paid mainly to EDF to compensate for the difference between the market price and the regulated prices offered to renewable electricity producers. As a result, after reaching €2.5 billion in 2021, or 39% of revenues from the net generation of wind and solar electricity under the feed-in tariff (SDES, 2022), the wind and solar CSPEs fell in 2022 and 2023, against a backdrop of high electricity prices on the wholesale market.
Not quantified	Through its stake in the capital of commercial companies, the State provides a guarantee to the investments made by major companies, such as EDF's investments in nuclear power or SNCF's investments in rolling stock.
Not quantified	For power grids, in addition to the public shareholding, public authorities regulate investment made by network operators, allowing them to pass on the amortization of their investment to their network usage tariffs (TURPE).

## Government funding

**FIGURE 8. GOVERNMENT FUNDING FOR CLIMATE INVESTMENTS IN BUILDINGS, TRANSPORT AND ENERGY PRODUCTION**



Government funding for energy retrofitting of buildings, low-carbon mobility and low-carbon energy production accounts for around two-thirds of the public spending reported in the green budget in 2022. The rest of the spending corresponds to actions not covered in the Landscape. This includes spending to reduce greenhouse gas emissions in agriculture, on research and development, but also to meet other environmental challenges such as preserving biodiversity, combating air pollution and improving water management. Finally, there is spending to support international action, or to finance public services linked to the environment, such as meteorology.

In the sectors covered in this study, government spending on climate investment increased between 2019 and 2022, particularly under the COVID-19 recovery plan, which concentrated climate resources on modal shift infrastructure and energy retrofitting of buildings.

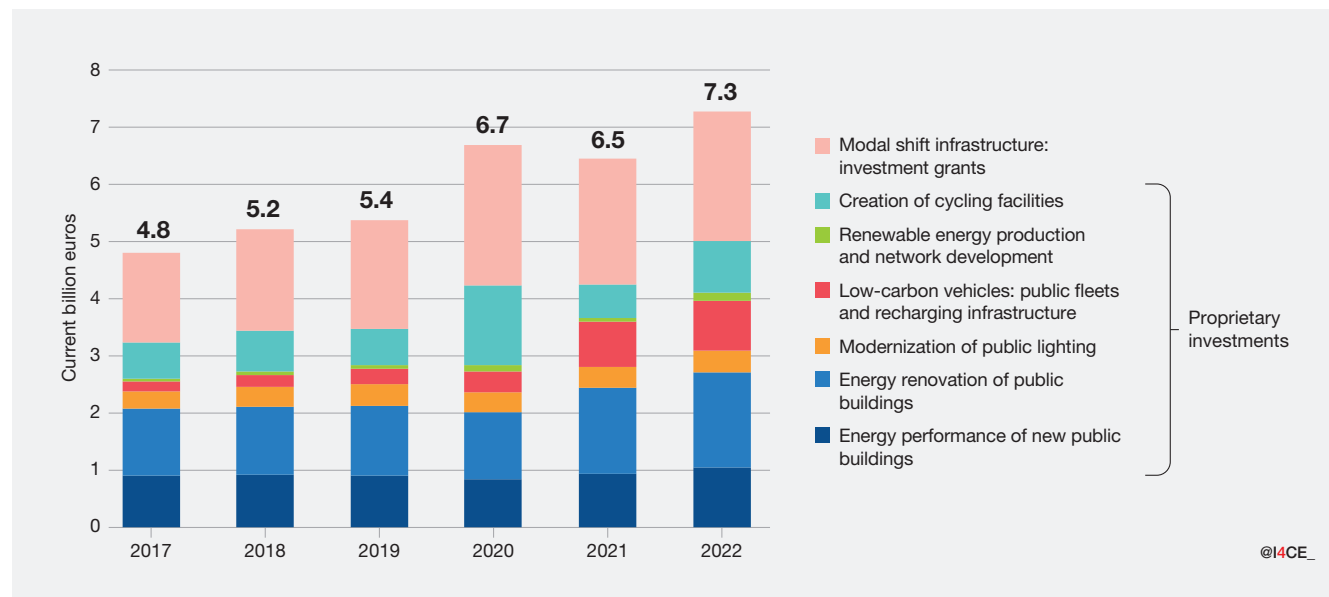
In 2023, government spending in the sectors covered by the Landscape was expected to fall sharply. Energy utility charges (CSPE) were reduced to zero by the rise in market gas and electricity prices in 2022, as the French State pays the difference between the market price and the contracted price afterwards. Although it involved a significant amount, this reduction in the CSPE was not immediately alarming for the financing of climate investments, since with the rise in market prices, it is consumers who are taking the place of the State in remunerating renewable energy producers. However, this situation is not sustainable, since the rise in market prices is such that the government has had to rein in consumer tariffs

as part of the tariff shield.

Except for CSPEs, forecasts for State expenditure in 2023 were broadly stable compared with 2022. In the area of transport infrastructure, actual expenditure could even be slightly higher than forecast, as was the case for financing through subsidies in 2021 and 2022. However, this slight increase in spending in current money terms is likely to be curtailed by the rise in the cost of equipment in the sectors in which the State intervenes, which reached around 12% between 2021 and 2023.

## Spending by local governments

**FIGURE 9. LOCAL AND REGIONAL GOVERNMENT FUNDING FOR CLIMATE INVESTMENTS IN BUILDINGS, TRANSPORT AND ENERGY PRODUCTION**



Between 2017 and 2022, climate investments by local and regional authorities increased, particularly from 2020 onwards. In total, by 2022, they had invested €5 billion in their buildings, vehicle fleets, renewable energy production and cycling facilities. They had also subsidized investment in rail, river and urban public transport to the tune of €2.3 billion.

In 2020, to encourage households to use bicycles rather than cars in urban areas during the COVID-19 crisis, local governments more than doubled their investment in cycling facilities, creating temporary cycle paths and then making them permanent. By 2021, this investment had returned to pre-crisis levels, before increasing again by more than 50% in 2022, to a level that is likely to have been maintained in 2023.

As for their other own investments, local governments have stepped up spending on electrification of vehicle fleets and energy retrofitting of buildings from 2021. They have also increased production of renewable energy, particularly of biomethane from waste collected and processed in their areas, and development of heating networks. To finance their investments, local governments have benefited from the measures in the COVID-19 recovery plan, which have granted an additional €1 billion in local investment support for 2021, earmarked for the ecological transition, health resilience and the renovation of local heritage.

Transport is a major part of expenditure for local governments, via mobility organization authorities (AOMs). In this estimate, only investment subsidies granted by local governments to AOMs are considered, and not all the investments made by AOMs, which are financed by fare revenues and the mobility payment paid by companies. Since 2017, local governments have increased subsidies granted to transport network operators, particularly for rail from 2020, and have maintained these funding levels in 2021 and 2022. It is the regions in

particular that have supported investment in rail infrastructure by SNCF Réseau and in rolling stock dedicated to the TER, with a total of €1.4 billion in funding.

The 13% increase in current expenditure in 2022 compared with 2021 can be qualified by the sharp rise in equipment prices. Considering price trends in the sectors in which they operate, local authority spending in 2022 actually increased by only 3%. Over the period 2017-2022, almost half of the overall increase in local authority climate spending is due to a price effect.

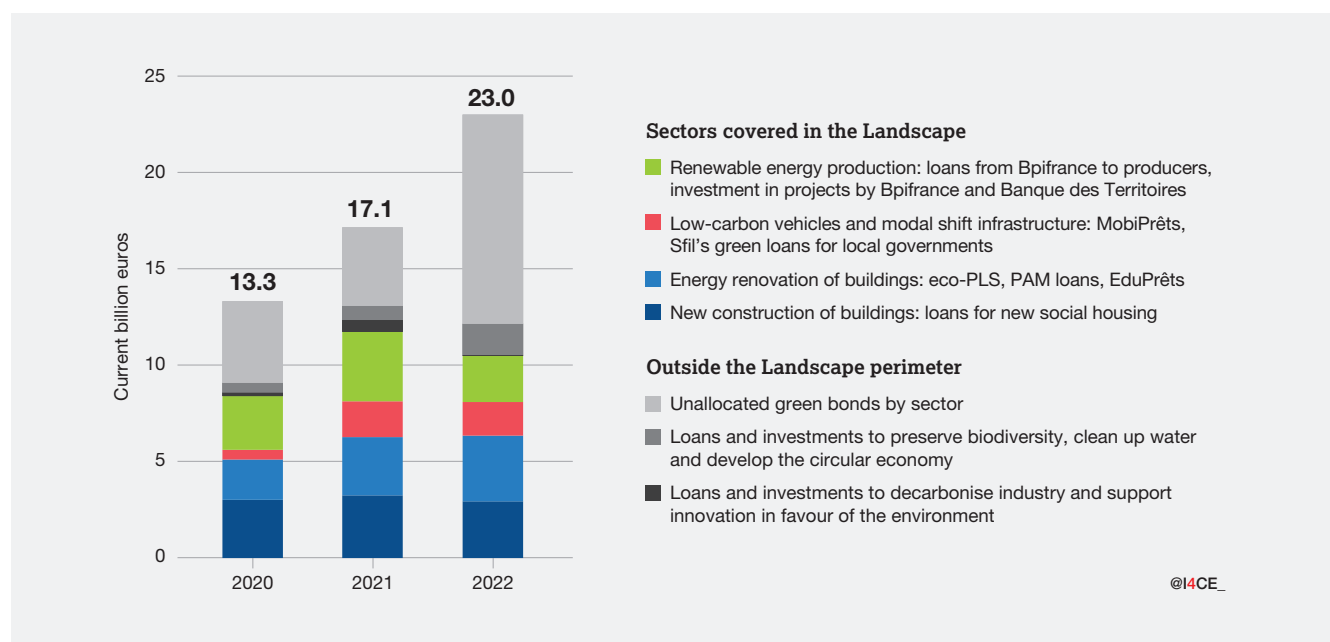
In addition to the Landscape, I4CE has published a detailed analysis of local authority climate investments over the period 2017-2022 in a dedicated study: I4CE, *Investissements climat des collectivités : une hausse à poursuivre et à accentuer*, 2023 (only available in French).

## Financing from public banks

The Caisse des Dépôts Group (CDC) and the European Investment Bank (EIB) play different roles in financing the energy transition. While the EIB finances projects mainly through bank loans, the CDC group makes equity investments in regional

projects in the sectors covered. While the EIB finances a small share of the construction sector, the CDC Group, which has traditionally financed social housing, devotes at least 50% of the financing reported in this study to this sector.

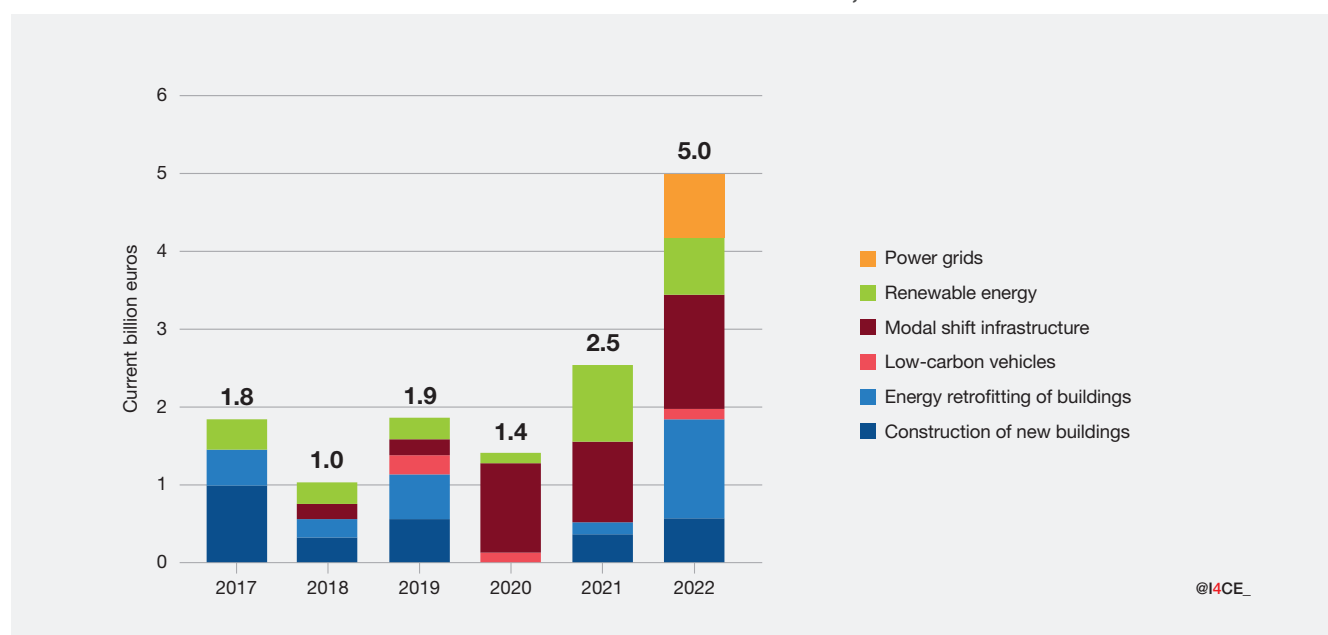
FIGURE 10. CDC GROUP FINANCING FOR CLIMATE INVESTMENTS



Of the total funding for ecological transformation reported by Caisse des Dépôts Group in 2022, 46% corresponds to loans and investments in building construction, energy retrofitting of buildings, decarbonization of transport and renewable energy production. Unhedged financing mainly corresponds to subscriptions to green bonds by asset managers, but also to financing granted for preservation of biodiversity and water management, or for decarbonization of industry.

In the four sectors studied, 80% of financing is in the form of loans and 20% is in the form of equity investments in companies. Caisse des Dépôts uses part of the funds invested in the Livret A and the Livret de Développement Durable et Solidaire – popular tax-free household savings accounts – to finance construction and energy retrofitting projects for social housing. Using these regulated savings, the bank loaned more than €5 billion social landlords in 2022 on advantageous terms such as subsidized rates and long repayment periods (Groupe CDC, 2023). Caisse des Dépôts also finances energy renovation of public buildings, in particular renovation of schools through Eduprêts. The amount of financing granted for construction and energy renovation remained stable in 2021 and 2022.

To decarbonize transport, Banque des Territoires, Bpifrance and Sfil grant loans for the modernization and development of urban public transport infrastructure, as well as for the greening of vehicle fleets. The volume of financing granted for the decarbonization of transport increased in 2021. Banque des Territoires has provided much more funding for the installation of electric charging stations from 2021 onwards. Most of the funding for renewable energies comes from Bpifrance, which finances their development through both loans and equity investments. This financing decreased in 2022 as project developers delayed their decision to invest, due to the rise in the cost of materials and interest rates (GreenUnivers, 2022).

**FIGURE 11. EIB LOANS FOR CLIMATE INVESTMENTS IN FRANCE IN BUILDINGS, TRANSPORT AND ENERGY PRODUCTION**

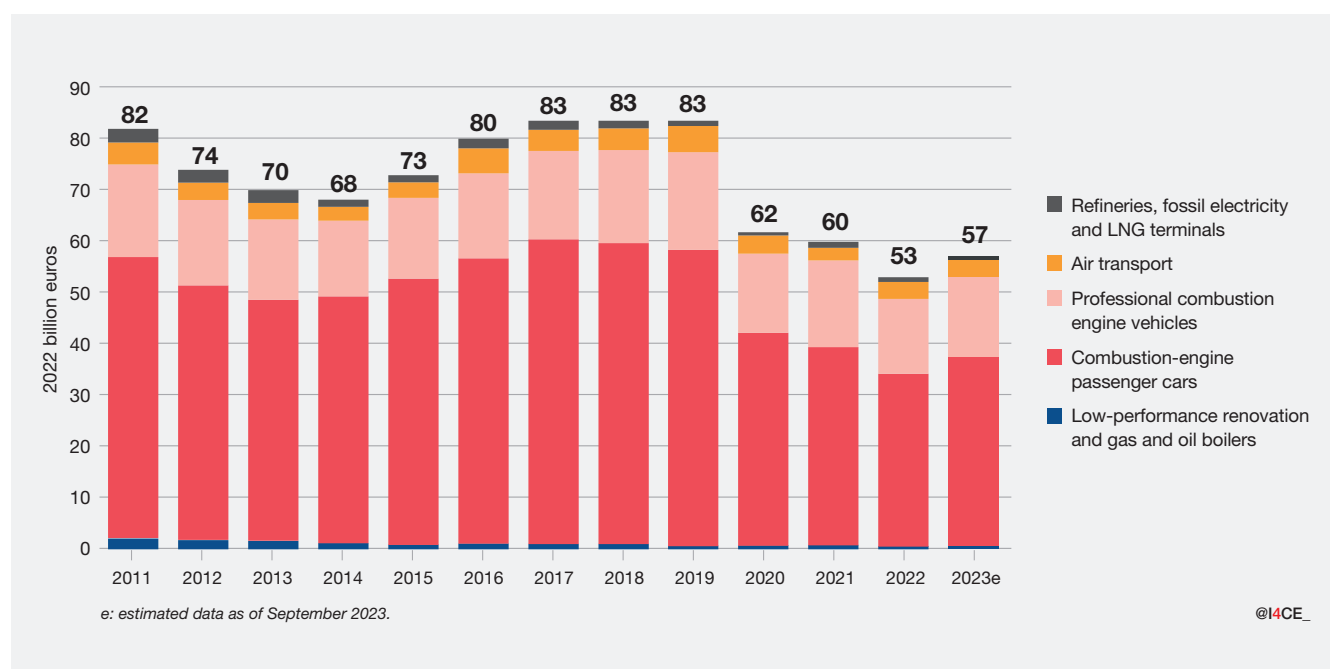
Of the loans signed by the European Investment Bank for French projects over the period 2017-2020, around 40% relate to activities covered by the Landscape: energy performance of new buildings and energy retrofitting of existing buildings, low-carbon vehicles, transport infrastructure, renewable energy and electricity networks. The rest corresponds to credit lines granted to banks to support small and medium-sized enterprises (SMEs), research and development and deployment of digital technologies.

Since 2020, EIB climate financing in France has increased significantly. The bank has granted loans to commercial banks to finance the development of renewable energies. The EIB has lent €800 million to Enedis, which manages France's electricity network, to enable it to reinforce the network and create connections to support the energy transition. Since 2020, the bank has provided local governments with at least €1 billion to develop urban public transport and rail transport. The EIB has also provided €800 million to Société du Canal Seine Nord Europe to develop the river network. In the area of energy-efficient renovation of buildings, the amount of financing was much higher in 2022. In particular, the EIB made a €1 billion financing line available to Caisse des Dépôts.

## Fossil-fuel investments have been falling since 2019, but could still rebound

Fossil investments continued to fall in 2022, extending the downward trend that began in 2020. Investment in combustion engine vehicles is decreasing due to supply difficulties in the car market and to regulations that increasingly favour electric vehicles. However, investment in fossil fuels was set to rebound from 2023, boosted by a recovery in the market in several sectors.

FIGURE 12. FOSSIL INVESTMENTS IN FRANCE BY SECTOR



### Fossil-fuel investments continue to stall in 2022

After a sharp fall in 2020 due to the COVID-19 crisis, fossil investment continued to fall in 2022. It stands at €53 billion, down 12% on 2021.

Most of the decline in fossil-fuel investment is due to the drop in registrations of combustion-engine vehicles. The combustion-engine vehicle segment, which accounts for over 90% of fossil-fuel investment, was still suffering from supply difficulties in 2022. Since the COVID-19 crisis, automotive supply has been severely disrupted by the shortage of semi-conductors. In addition, European and national regulations are helping to limit the share of internal combustion vehicles in vehicle registrations.

Even though public authorities have taken decisions that have led to fossil-fuel investment, in order to secure energy supplies in the short term, particularly in coal-fired power stations and liquefied natural gas (LNG) terminals, investment in fossil fuels remains limited and has been falling since 2021.

### Fossil-fuel investments set to rebound as early as 2023

There are several factors behind the upturn in fossil-fuel investment. In the case of combustion engine vehicles, the re-establishment of supply channels is leading to an upturn in investment. The ageing of the vehicle fleet is likely to trigger a new wave of registrations, which could partly benefit petrol and diesel vehicles, especially if car prices stabilize. In the air transport sector, after a sharp slowdown because of the COVID-19 crisis, traffic picked up again in 2022 and 2023, providing airlines and airport managers with new investment opportunities. The reconfiguration of gas supplies because of the geopolitical crisis with Russia could force France to invest in additional LNG import capacity.

However, this upturn in fossil investment could be capped by various public policies, particularly regulatory ones. Since 2020, European regulations have obliged carmakers to sell proportionally fewer combustion-powered cars. Although there are few controls and sanctions at this stage, the law on mobility (LOM) obliges local governments and companies to reduce the proportion of fossil-fuelled vehicles registered in their fleets.

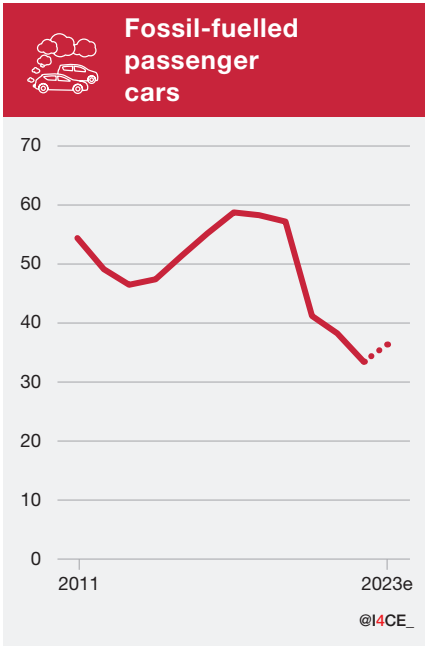
In addition, the decree on heating equipment will have a lasting and significant impact on installation of new oil-fired boilers. As a result, fossil-fuel investments should remain well below the more than €83 billion a year recorded over the 2017-2019 period.

The rebound in fossil investment will remain limited in the medium term if climate investments continue. By leading to energy savings or new low-carbon energy production capacity, climate investments will reduce France's dependence on fossil fuels. As a result, investment in the development and maintenance of fossil-fuelled equipment will be less imperative.

#### FOSSIL-FUEL INVESTMENT IN 2022, ESTIMATES FOR 2023 AND KEY FACTORS

(in billions of 2022 constant euros)	Investments in 2022	Investment estimates for 2023	Short-term key factors
Combustion engine passenger cars	33.4	36.7 (+10%)	Restoration of supply channels, risk of postponement of the introduction of low-emission mobility zones
Professional combustion engine vehicles	14.7	15.3 (+4%)	In some segments, few regulatory measures to limit registrations, and expensive low-carbon alternatives
Air transport	3.1	3.4 (+8%)	Air traffic upturn, but few public policies to limit investment
Gas and oil boilers	1.0	0.9 (-7%)	Lack of regulations to rapidly reduce the installation of gas boilers
Refineries, fossil electricity and LNG terminals	0.8	0.8 (-1%)	Risk of an increase to secure fossil-fuel supplies after the Russian-Ukrainian crisis
<b>Total</b>	<b>52.9</b>	<b>57.0</b> <b>(+8%)</b>	

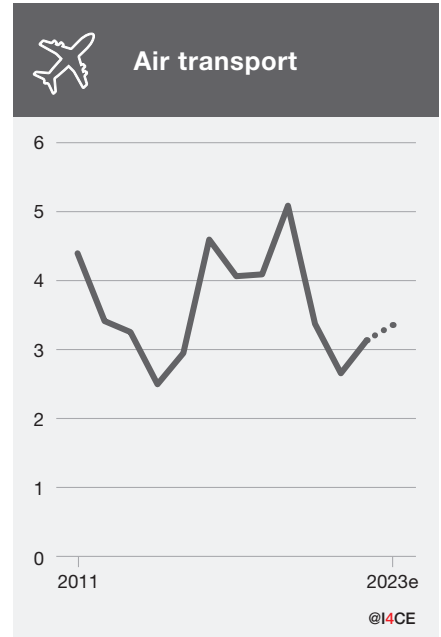
Fossil-fuel investments by sector



Since 2019, combustion-engine car registrations have declined sharply. The entry into force of European regulations on cars has given a greater boost to electric vehicle registrations, and the automotive sector has been affected by difficulties in the supply of semi-conductors, which have limited car production capacity, in particular fossil-fuelled ones. In 2023, the end of the shortage of electronic components, the ageing of the car fleet and the stabilization of car prices was expected to lead to an increase in the number of combustion-engine cars sold.

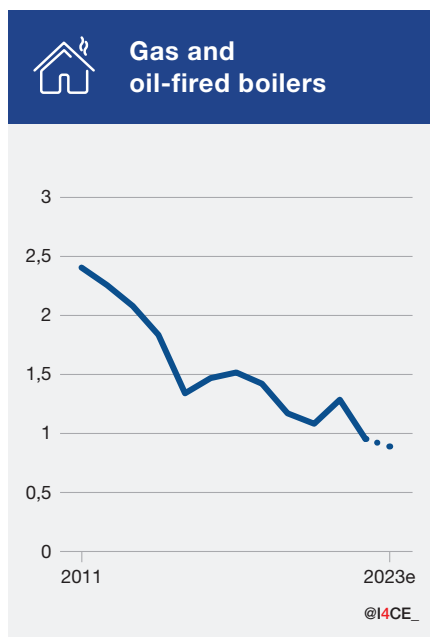


Investment in combustion-engine trucks, buses and coaches returns to lower levels, after a rebound linked to the upturn in economic activity in 2021. Like the automotive sector, the commercial vehicle market has had to contend with difficulties in the supply of semiconductors. The decline is less marked than for passenger cars, as carmakers are not yet being targeted by regulations on CO<sub>2</sub> emissions from heavy-duty vehicles. Investment was expected to rise again in 2023, although not to the levels seen in 2019.

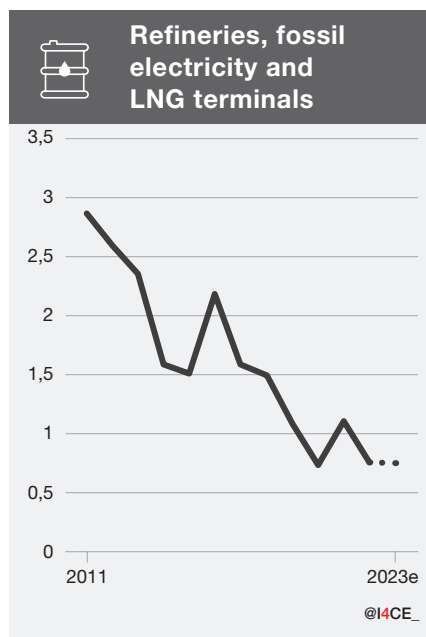


The slump in air traffic caused by the COVID-19 crisis led investors to reduce their holdings to preserve their cash flow. Prospects for traffic growth are now prompting airlines and infrastructure managers to invest more, although without reaching pre-crisis levels.





Since 2011, investment in gas and oil-fired boilers has tended to fall, due to public support for other efficient heating appliances. Since 2021, investment has been falling mainly because regulations prohibited the installation of oil-fired boilers from July 2022, but also because heat pumps and wood-fired heating appliances are competing more fiercely with gas- and oil-fired boilers.



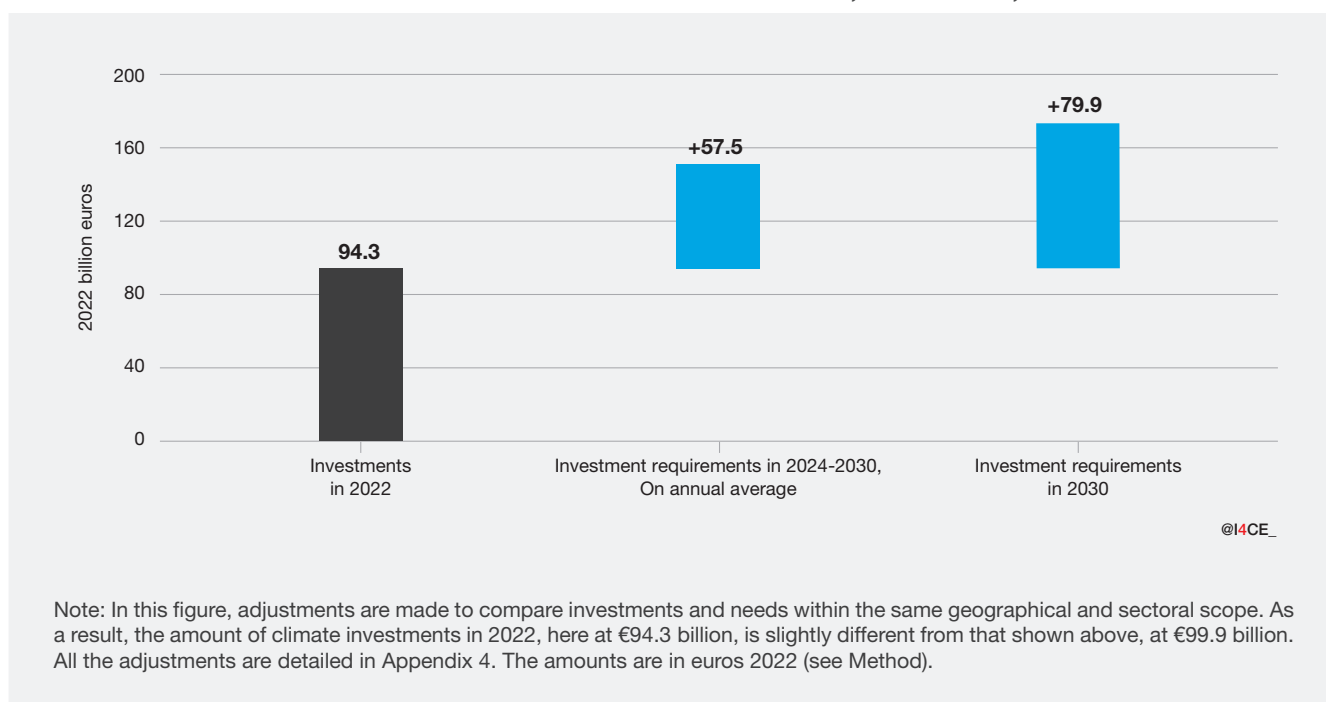
Investment in this sector is very low, as France imports most of the fossil-fuel it consumes and the vast majority of its electricity generation is low-carbon. The fleet of oil- and coal-fired power stations is shrinking, and therefore requires less investment to maintain. A gas-fired power station is due to come on stream in 2022, hence the increase in investment for this year. Most of the investment is in refineries, where investment was likely to remain stable in 2022-2023. Concerns about energy supply have triggered additional investment in LNG terminals, to import gas from other continents.

## Accelerating climate investments to stay on course for the 2030 targets

To achieve the objectives set out in the draft scenario of the French national low-carbon strategy, €58 billion of additional climate investment will be required each year between 2024 and 2030. Fossil-fuel investments must be reduced to zero by 2040. In addition to redirecting investment from fossil-fuelled equipment to climate, the transition will increase total investment in buildings, transport and energy.

### Investing a further €58 billion in climate action

FIGURE 13. ANNUAL PUBLIC AND PRIVATE CLIMATE INVESTMENTS 2024-2030, IN BUILDINGS, TRANSPORT AND ENERGY



These needs are a minimum: our estimate only covers the buildings, transport and energy sectors, and does not take into account the needs of agriculture (excluding methanization), industry, research and development, or adaptation to climate change. On the other hand, and in contrast to previous editions, the trajectory studied is now in line with the European Union's Fit for 55 objective (see Method).

These needs presuppose favourable economic conditions. It is assumed that there is adequate supply to meet the demand for work and equipment at prices close to current levels. However, some sectors are already facing bottlenecks due to a lack of manpower, skills, materials or industrial production capacity. Accelerating climate investments implies removing these obstacles.

Moreover, future prices are highly uncertain. This projection is based on assumptions about price trends for the main sectors. Expressed in volume terms, *i.e.* if prices in 2022 were maintained until 2030, additional annual investment requirements for the period 2024-2030 would be €69.2 billion (see Appendix 4). The difference comes mainly from the low-carbon vehicle sector, where reductions in the cost of batteries are expected, helping to reduce average investment requirements for the period 2024-2030 by €10.7 billion a year. Finally, the investment expected in 2023 and 2024 is unlikely to be sufficient to cover needs. Not only will investment in electric vehicles continue to rise, but there is likely to be greater need for investment in renovation of buildings, renewable heat, railways and power grids.

## BOX. REVISING INVESTMENT REQUIREMENTS IN THIS EDITION OF THE LANDSCAPE

This edition of Landscape revises climate investment needs upwards, for several reasons:

- The draft scenario of the new national low-carbon strategy aims to reduce gross greenhouse gas emissions by 50% by 2030 compared with 1990 levels, compared with 40% in the 2020 strategy (see Method).
- The needs are formulated over a shorter period, 2024-2030, and include catching up on delays accumulated up to 2022-2023.
- Certain methods have been filled out, and the sources updated. For example, investment in rail infrastructure is based on the French Transport Regulation Authority's report published in July 2023. Vehicle price assumptions have also been updated using recent vehicle sales data.
- The cost trajectories include anticipated upward trends in certain sectors, notably public works and, to a lesser extent, construction.

### The Landscape's climate investment needs converge with those of the national mission on the economic impact of climate action

In May 2023, Jean Pisani-Ferry and Selma Mahfouz submitted a milestone report to the French Prime Minister on the economic impact of climate action. The authors estimate annual investment needs for climate action at €66 billion. This figure is in fact the balance between the additional investment needed in climate solutions such as energy retrofitting of buildings, electric vehicles and renewable energies, and the investment that needs to be reduced in fossil-fuelled equipment, mainly combustion-engine vehicles and gas- and oil-fired boilers. These are therefore net investment requirements (see Climate net and total investment needs box), expressed in relation to the level of a hypothetical scenario without climate action. This way of presenting the requirements is relevant for understanding the overall impact on the country's level of investment and for measuring the macroeconomic implications.

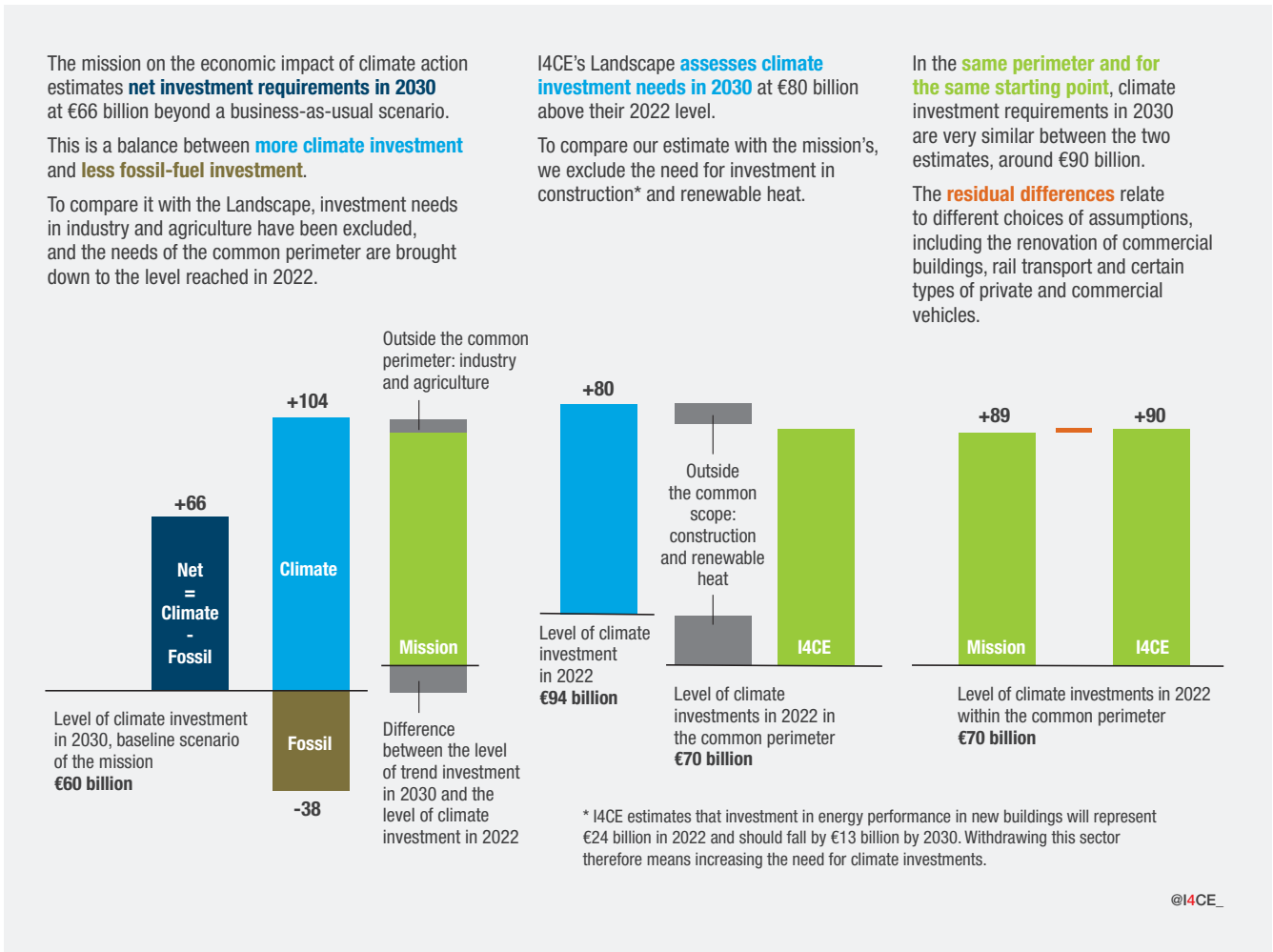
The estimates of the national mission and the ones presented in this edition of the Landscape converge on the total amount of additional climate investments in 2030, compared with the 2022 level, which is €89.2 billion for the mission and €89.9 billion in the Landscape. However, they differ on several sectoral points:

- **Tertiary renovation:** The mission considers the total cost of certain works, particularly for public buildings, whereas the Landscape only takes into account the cost of energy retrofitting in the strict sense and therefore estimates that climate investment requirements will be lower.
- **Vehicles:** The mission only includes electric passenger vehicles in climate investments, whereas the Landscape also includes rechargeable hybrids. The mission uses a higher unit cost than the Landscape for electric and hydrogen-powered light commercial vehicles.

- **Rail:** The mission adopts the figures from the 2022 edition of the Landscape. These figures are revised upwards in the 2023 edition, with the publication of the report by the Transport Regulation Authority (Autorité de Régulation des Transports, ART), which incorporates the new trajectory of the Conseil d'Orientation des Infrastructures.

Finally, some sectors are not comparable between the two estimates: these are construction, which is covered in the Landscape but not in the mission's work, and agriculture and industry, which are covered by the mission but not in the Landscape. Details of the comparison are available in Appendix 4.

**FIGURE 14. COMPARISON OF CLIMATE INVESTMENT NEEDS BETWEEN I4CE'S LANDSCAPE AND THE MISSION ON THE ECONOMIC IMPACT OF CLIMATE ACTION**



### DISTINGUISHING CLIMATE, NET AND TOTAL INVESTMENT NEEDS

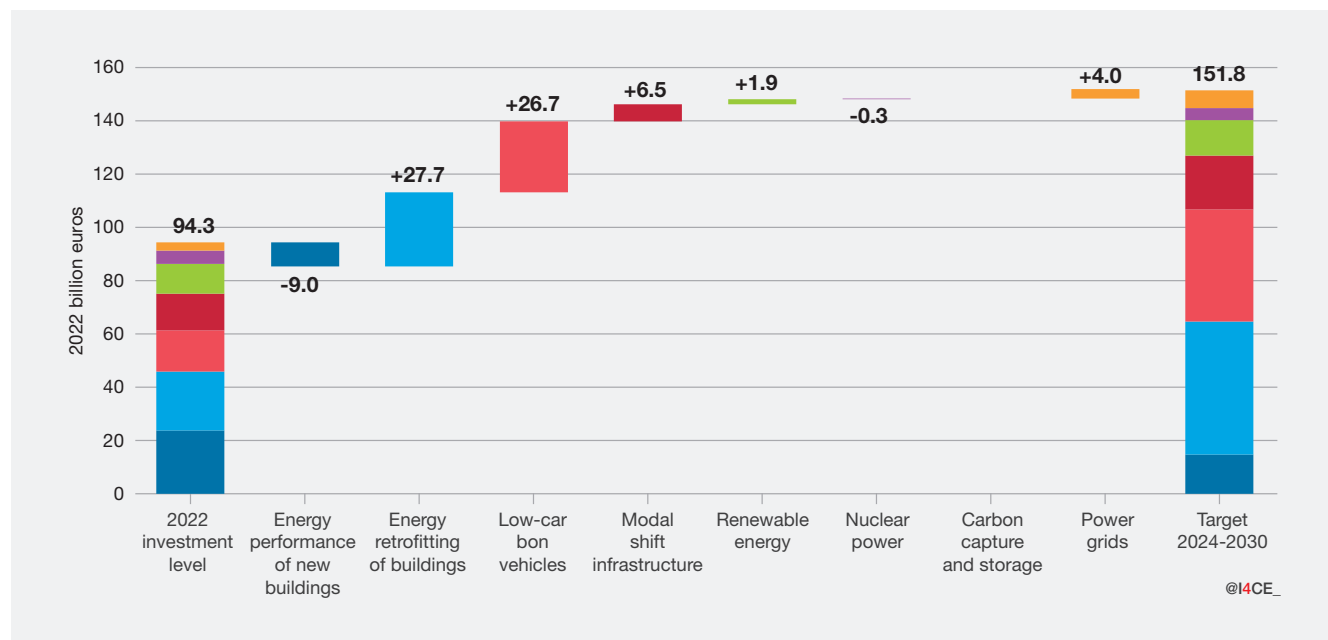
Drawing on the Quinet Commission report on the value of climate action (France Stratégie, 2019), we differentiate between three levels of investment needs:

- Climate investment needs refer to spending that reduces greenhouse gas emissions, for example on energy retrofitting of buildings, electric vehicles or renewable energies. They are expressed in relation to a reference level, in this case the year 2022 in this edition of the Landscape. Other reports refer to them as green investments or gross investments. We include all the expenditure, but other studies only include a fraction of the cost associated with the climate, for example the price difference between an electric vehicle and an equivalent fossil-fuelled vehicle.
- Net investment needs refer to the balance between additional climate investments and the decrease in fossil investments. When climate investments are greater than net investments, this implies a redirection of fossil fuel projects towards climate-friendly projects.
- Total investment needs cover the variation in all investments. In the Landscape, in addition to net investment requirements, the impacts of climate action on other investment items, such as related works or construction excluding energy performance, are taken into account. Other studies calculate total investment needs at the national level, by passing on the impact of climate action to the rest of the economy, in particular through macroeconomic closure.

## Sector priorities

While investment needs are concentrated in housing energy retrofitting and low-carbon vehicles, all the sectors are affected by the guidelines of the draft scenario of the national low-carbon strategy.

**FIGURE 15. CLIMATE INVESTMENT REQUIREMENTS, ANNUAL AVERAGE IN 2024-2030, BY SECTOR**



### Energy performance of new buildings: is investment declining?

In our estimate, investment in the energy performance of new buildings will fall by 2030. In fact, in the draft scenario of the national low-carbon strategy, the number of dwellings decreases. The majority of these homes are multi-family buildings. There will also be fewer new tertiary buildings, mainly because remote work is reducing demand for offices. New buildings are applying the recent environmental regulations (RE 2020), are more energy-efficient and are supplied primarily by renewable energy sources. Because these guidelines affect the number, composition and quality of buildings, their impact on investment remains difficult to determine.

### More comprehensive renovations targeting energy-intensive buildings

Investment in energy retrofitting of buildings is set to rise rapidly, reaching around €54 billion in 2030, €32 billion more than in 2022. The draft scenario of the national low-carbon strategy calls for priority to be given to renovating energy-intensive homes (F and G, known as “leaky homes”), eliminating all homes heated with oil and reducing the number of homes heated with gas. Achieving these targets will require 900,000 homes to undergo high-performance deep renovation by 2030. In the commercial sector, regulations require owners of large buildings to carry out work to save 40% energy by 2030, rising to 60% by 2050. To achieve this, they are carrying out a wide range of works, from simply changing heating systems to comprehensive operations including insulation.

While the costs of the work are well documented for the housing sector, they are more uncertain for the commercial sector, due to the lack of hindsight on a sufficient number of operations.

### Continuing and accelerating the rise of electric vehicles

In the draft scenario of the national low-carbon strategy, electric vehicles increase from 13% to 66% of passenger car sales between 2022 and 2030. Pure battery electric models will replace rechargeable hybrids, which will gradually be phased out. While the price of battery capacity will continue to fall thanks to economies of scale, it is also assumed that new electric vehicles will have greater range, resulting in higher capacity batteries, for an average cost that is broadly stable compared with today. In the commercial vehicle segment, electric powertrains are growing rapidly, accounting for 51% of light vehicle sales and 46% of heavy goods vehicle sales, compared with just 5% today. To effectively replace today's larger heavy goods vehicles, electric models need to be fitted with high-capacity batteries, which not only increases their purchase price but also their carrying capacity. Overall, investment in low-carbon vehicles is growing very rapidly, reaching an average of €39.9 billion a year between 2024 and 2030, €25.3 billion more than in 2022. All these vehicles will require the deployment of a dense network of charging stations, with an average annual investment of €2.2 billion between 2024 and 2030, *i.e.* €1.4 billion more than in 2022.

### Investing to renew and develop public transport networks, particularly railways

Investment in modal shift infrastructure should increase by around €6.5 billion a year between 2024 and 2030. This level has been revised upwards compared with the estimates in the 2022 edition of the Landscape (see Method). It reflects new ambitions set out by the Conseil d’Orientation des Infrastructures (COI) in a report submitted in February 2023, and translated into rail investment trajectories by the Transport Regulation Authority in July 2023, all of which make up the infrastructure component of the draft national strategy. According to these reports, the rail network requires additional investment of €4 billion a year between 2024 and 2030 compared with 2022, rising to €13 billion by 2030. The aim is to renew, modernize and develop the current network. In terms of urban public transport, investment is declining in the Île-de-France region with the completion of the Grand Paris Express and is holding steady in the other regions with the development of tramways, high service level buses and regional metropolitan express services (SERM). Investment in cycling is increasing, with the aim of equipping around 100,000 kilometres of urban and suburban roads, with the emphasis on the suburban network, which is still underdeveloped.

### Renewable energies: installations on the rise, offset by price falls in some sectors

Investment in renewable energies, both electrical and thermal<sup>3</sup>, is set to rise by around €2 billion a year by 2022, to €13.1 billion a year. This is partly due to the development of renewable gas and heat. The document setting out the guidelines for the next multi-annual energy programme forecasts 52 terawatt hours (TWh) of energy from biomethane injected into the grid by 2030, compared with 7 TWh today, and plans to double the length of heating networks and triple the number of homes connected. The deployment of electric renewable energies is also accelerating, with a minimum installed capacity target of 33 gigawatts (GW) of onshore wind power and 54 GW of solar photovoltaic panels in 2030, compared with 21 GW and 16 GW respectively in 2022. However, we anticipate that the price of this equipment will fall between now and 2030, which will moderate the increase in investment needs in renewable energies to an average of €0.6 billion per year compared with 2022.

### Major overhaul of nuclear power plants, and the start of EPR construction in 2030

Investment in nuclear power plants is stable compared with 2022, at €4.6 billion per year. Until 2030, investment will be concentrated on extending the existing fleet, through the Grand Carénage programme. According to the document setting out the guidelines for the next multi-annual energy programme, the operational life of all nuclear reactors is to be extended to 60 years where possible. After 2030, investment in existing plants will decline and the focus will shift to construction of new reactors, amounting to around €8 billion a year, with the aim of building 14 EPRs (in addition to the Flamanville EPR) by 2050.

### Increased investment in extending and reinforcing power grids

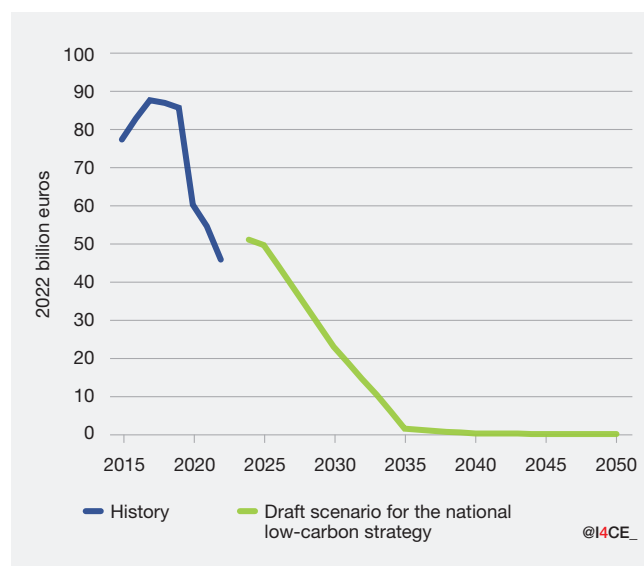
Changes in the energy mix, in particular the development of decentralized renewable energies, and changes in electricity use, are accompanied by the need to extend and reinforce the electricity transmission and distribution networks.

Investment in network extension and reinforcement will amount to €6.1 billion per year over the period 2024-2030, €3.0 billion more than in 2022. There will also be further investment in renewing and modernizing existing networks, amounting to €4.4 billion a year, €1.4 billion more than in 2022.

### Fossil-fuel investments must be rapidly reduced to zero

In the draft scenario of the national low-carbon strategy, fossil-fuel investments will disappear almost entirely by 2035. In the meantime, they should be halved between 2022 and 2030, particularly in combustion-engine vehicles, both passenger cars and commercial vehicles.

FIGURE 16. FOSSIL-FUEL INVESTMENTS IN FRANCE, 2015-2050



By 2030, fossil-fuelled vehicles will account for all fossil-fuel investments, compared with 90% today. European regulations ban the sale of diesel and petrol cars from 2035, while imposing a gradual reduction in average CO<sub>2</sub> of heavy vehicles put on the market between 2030 and 2040.

As a result, investment in petrol and diesel vehicles will rapidly disappear, starting with new passenger cars, then light commercial vehicles and finally heavy goods vehicles.

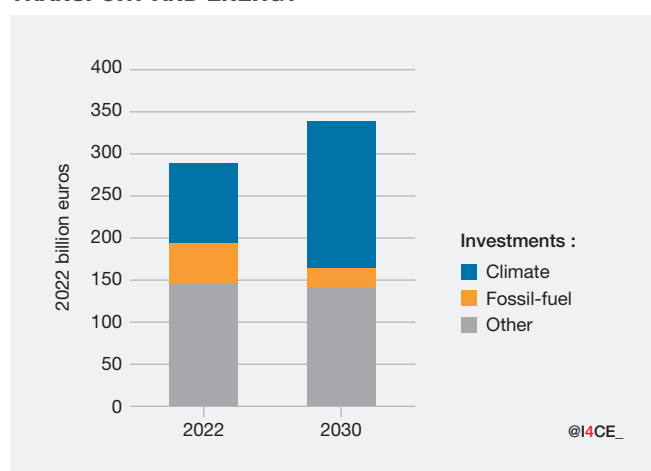
<sup>3</sup> The investments in thermal renewables included in this total are the injection of biomethane, the extension of heating networks and biomass heating plants to supply them.

## Total investment requirements

The Landscape presents an estimate of total investment in the three sectors studied, for the year 2022 and for the year 2030. This estimate involves adding together the effects of rising climate investments, falling fossil investments, and the anticipated change in other investment items that may be influenced by climate action, such as related work in renovated buildings. This method makes it possible to distinguish between redirection and additional effort in the variation in the total and composition of investments. However, because it covers only three sectors and does not include a loop, this method remains exploratory and incomplete for a full understanding of the macroeconomic impacts of the transition.

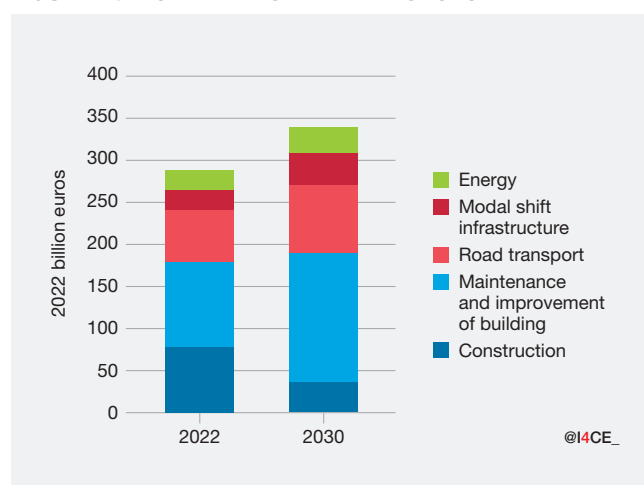
Between now and 2030, achieving France's climate objectives will require both redirecting some fossil-fuel investments towards climate investments, and increasing the total level of investments by around €51 billion more than in 2022, in the three sectors studied.

**FIGURE 17. TOTAL INVESTMENT IN BUILDINGS, TRANSPORT AND ENERGY**



The redirection of investment towards climate action also leads to a redirection between the different sectors studied. In fact, achieving the targets implies reducing investment in construction in favour of building maintenance and improvement, with investment in the buildings sector as a whole remaining fairly stable compared with its current level. Investment in the transport sector is increasing, both in road transport with the deployment of low-carbon vehicles, and in other modes including rail and urban public transport. The energy sector remains at its 2022 level, with the bulk of additional investment – in new nuclear power in particular – taking place after 2030.

**FIGURE 18. TOTAL INVESTMENT BY SECTOR**



In terms of total investment, the conclusions of this edition are very different from the previous one, in which we wrote that the transition did not necessarily require more investment than in 2019. Several factors explain this upward revision:

- A shift in the market for electric vehicles towards more autonomous and more expensive models.** In the previous edition, we considered several climate scenarios: the 2020 national low-carbon strategy scenario and the four ADEME scenarios (ADEME, 2021). Among the latter, two scenarios opted for a particularly low trajectory in terms of construction, which greatly reduced total investment. In addition, the 2020 strategy envisaged the deployment of small electric vehicles equipped with low-capacity batteries. The current market is for much more autonomous vehicles, which is reflected in higher battery costs in the draft scenario of the national low-carbon strategy in 2023.
- Greater investment needs in the short term.** In the previous edition, investment needs were reported for the period 2021-2050; this edition presents investments for 2030. However, the intermediate objective of reducing gross emissions by 50% compared with 1990 is more demanding, particularly given the very short timeframe for achieving it, which increases total investment between now and that date.
- Less redirection of investment into energy retrofitting of buildings.** In the previous edition, we identified investments in low-performance energy renovation projects, such as facade renovation and re-roofing without insulation. These missed opportunities were redirected towards high-performance work. However, on closer examination of the cost perimeters, it would appear that this work would not simply be avoided, but carried forward as associated costs, with the energy renovation of these items only describing the additional investment compared with an operation without insulation. If we exclude this redirection, the new total is higher than in the previous estimate.

# REFERENCES

- ADEME, Marchés et emplois concourant à la transition énergétique dans le secteur du bâtiment résidentiel, Situation 2018-2020 - Estimation préliminaire 2021 - Objectifs 2023, September 2022
- ADEME, Marchés et emplois concourant à la transition énergétique dans le secteur des énergies renouvelables et de récupération, Situation 2018-2020 - Estimation préliminaire 2021 - Objectifs 2023, September 2022
- ADEME, Marchés et emplois concourant à la transition énergétique dans le secteur des transports terrestres, Situation 2018-2020 - Estimation préliminaire 2021 - Objectifs 2023, September 2022
- ADEME, Prospective - Transitions 2050 - Rapport, November 2021
- Autorité de régulation des transports (ART), Scénarios de long terme pour le réseau ferroviaire français (2022-2042), July 2023
- BNEF, Bloomberg New Energy Finance, Lithium-ion Battery Pack Prices Rise for First Time to an Average of \$151/ kWh, December 6, 2022
- CESE, Acceptabilité des nouvelles infrastructures de transition énergétique : transition subie, transition choisie ?, March 2022
- Climate Bonds Initiative, Climate Bonds Standard and Certification Scheme
- Cour des Comptes, La filière EPR, July 2020
- Eurostat, Commission Européenne, Système européen des comptes - SEC 2010, June 2013
- Eurostat, Environmental goods and services sector accounts, Handbook, 2016 Edition, 2016
- Eurostat, Environmental protection expenditure accounts, Handbook, 2017 Edition, 2017
- French State, Rapport sur l'impact environnemental du budget de l'Etat, October 2022
- Haut Conseil pour le Climat, Rapport annuel 2022 - Dépasser les constats, mettre en œuvre les solutions, June 2022
- IEA, Projected Costs of Generating Electricity - 2020 Edition, December 2020
- INSEE, Les comptes de la nation en 2022 - Produit Intérieur Brut (PIB) et grands agrégats économiques, May 2023
- INSEE, La note de base 2014 - Tome 1 : le partage volume-prix, May 2018
- Ministère de la Transition écologique et solidaire, Stratégie nationale bas-carbone - La transition écologique et solidaire vers la neutralité carbone, March 2020
- Ministère de la Transition écologique et solidaire, Programmation pluriannuelle de l'énergie 2019-2023 et 2024-2028, April 2020
- Ministère de la Transition écologique et solidaire, Label Greenfin France finance verte, référentiel, April 2019
- Ministère de la Transition Energétique, Plan national intégré énergie-climat de la France - Projet de mise à jour, November 2023
- Pisani-Ferry and Mahfouz, Les incidences économiques de l'action pour le climat, May 2023
- Réseau de transport d'électricité (RTE), Bilan prévisionnel - Édition 2023 : Consultation publique sur le cadrage et les hypothèses de l'étude des perspectives pour le système électrique à l'horizon 2035
- SDES, Bilan annuel des Transports en 2021, October 2022
- SDES, Bilan énergétique de la France en 2022 - Données provisoires, April 2023
- Sénat, Grand Paris Express : des coûts à maîtriser, un financement à consolider, October 2020
- SGPE, Planification écologique, Conseil national de la transition écologique, 22 May 2023
- Technical Expert Group Sustainable Finance, Taxonomy report: technical annex, Updated methodology & updated technical screening criteria, March 2020



# APPENDICES

- Appendix 1: Definitions of climate and fossil-fuel investments based on national and international documents
- Appendix 2: Table of climate and fossil-fuel investments (2011-2023)
- Appendix 3: Price variations in a sample of climate investments
- Appendix 4: Investment needs (2024-2030)





---

The Institute for Climate Economics (**I4CE**) is a non-profit research organization that provides independent policy analysis on climate change mitigation and adaptation. We promote climate policies that are effective, efficient and socially fair. Our 40 experts engage with national and local governments, the European Union, international financial institutions, civil society organizations and the media. Our work covers three key transitions – energy, agriculture, forest – and addresses six economic challenges: investment, public financing, development finance, financial regulation, carbon pricing and carbon certification.



[www.i4ce.org](http://www.i4ce.org)

---

**INSTITUTE FOR CLIMATE ECONOMICS**  
30 rue de Fleurus - 75006 Paris

[www.i4ce.org](http://www.i4ce.org)  
Contact : [contact@i4ce.org](mailto:contact@i4ce.org)

Follow us

