

Landscape of Climate Finance in France

Edition 2019

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Study overview

The Landscape of Climate Finance is a comprehensive study of domestic financial flows in favour of climate and the broader energy transition in France. The study maps the flows supporting investments leading to greenhouse gas mitigation across the French economy.

Findings are compared from year to year and assessed in comparison to projected investment needs to achieve national greenhouse-gases (GHG) reduction targets and other energy transition objectives. The Landscape of Climate Finance lists the climate investment expenditure in France and analyses the way in which these expenditures are financed.

In this way, the Landscape contributes to the public debate on the relevancy of public and private climate finance.

The Landscape is based on a transparent methodology, and its results are discussed in a steering committee composed of representatives from the Ministry of Ecological Transition and Solidarity, the Ministry of Finance, and the French Energy Management Agency (ADEME). Since 2016, I4CE is working with partners at the European level and internationally to support the development of similar analyses in different countries such as Colombia, Poland and Morocco.

Nota bene

These results update and replace those found in previous editions of the French Landscape. Changes in sources, methodology and in the scope of the study has led to the revision of the results for the entire period 2011-2018. Changes in sources, methodology and in the scope of the study has led

to the revision of the results for the entire period 2011-2018. Thus, only the comparisons between years presented in this edition should be used as the totals for all years have been updated using the same constant method.”

Suggested reading

To learn more about the Landscape and climate change finance:

Low-carbon investments in France 2011-2017

This report is intended for those who want to understand in detail the climate investments in France, as well as the associated public policies. It provides detailed information on the Landscape methodology itself. It aims to support, if not inspire, all those who would like to develop similar exercises in their countries.

<https://www.i4ce.org/download/low-carbon-investment-2011-2017/>

The Landscape of domestic climate investment and finance flows: Methodological lessons from five years of application in France.

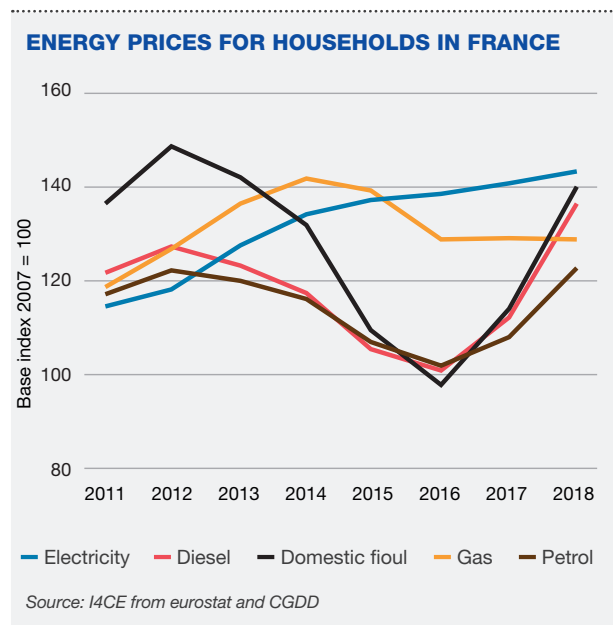
To further improve transparency on the assumptions and data used for its Landscape, I4CE detailed the methodology in an article published in the academic journal International Economics. This article is intended to facilitate the work of those who would like to reproduce such an exercise in other countries, and to validate the academic rigour of the Landscape.

<https://www.i4ce.org/the-landscape-of-domestic-climate-investment-and-finance-flows-methodological-lessons-fromfiveyears-of-application-in-france/>

Over the past two years, the economic and regulatory context has been increasingly supportive for to climate investments

Energy and CO₂ prices have increased after years of decline

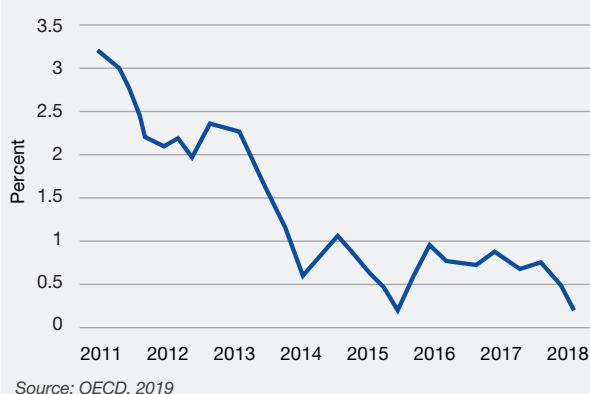
Consumer prices of most fossil fuels increased in 2017 and 2018, interrupting the significant decline that began in 2012 with the fall in world oil and natural gas prices. Indeed, the introduction of a carbon component (CCE) in energy taxation sharpened the rebound in world prices.¹ For households, the prices of petroleum products increased most significantly, while gas prices stabilized (see figure). For large industries, the price of CO₂ on the European Union Emissions Trading Scheme (EU ETS) reached €20/tCO₂ in 2018 for the first time in ten years.² In general, higher energy prices foster energy efficiency investments by households and companies or the switch to renewable energy sources.



Unusually low interest rates have decreased the cost of borrowing

Interest rates are historically low in several capital markets, particularly in the bond market (see figure). Since 2014, the European Central Bank has implemented monetary policy instruments leading to financing conditions that are favourable to government bodies, companies and households. These low interest rates make the cost of borrowing lower for economic actors. The reduction in the public debt burden has enabled public actors (central government, local authorities) to free up additional investment capacity.

INTEREST RATES ON 10-YEAR GOVERNMENT BONDS



The regulatory framework has been strengthened

The 2015 Energy Transition for Green Growth Act included provisions that allow or encourage climate investments - or that make their financing easier. Some of these rules came into force at the end of 2016 or in 2017. If the measures adopted remain, in general, insufficient to achieve the objectives of the legislation (see pp.6-7), they have nevertheless contributed to increasing climate investments in the sectors studied in this report.

1 Reference: I4CE, 2018, La composante carbone en France : fonctionnement, revenus et exonérations (publication in French)

2 Reference: ERCST, Wegener Center, ICIS, I4CE and Ecoact, 2019 State of the EU ETS Report

Investments identified in five areas of climate action

The Landscape of climate finance aggregates publicly available information on the low-carbon investments and their financing between 2011 and 2018 in France.

The study identifies investments made by households, business and government bodies in the following areas.

MAIN INVESTMENTS DOCUMENTED IN THE LANDSCAPE

Energy efficiency	Construction of energy-efficient buildings, energy retrofitting of buildings, energy savings in industry, purchases of electric, hybrid and CNG vehicles
Renewable energies	Wind farms, photovoltaic panels installed on the ground and on roofs, electricity or heat production from biomass, biogas, waste recovery. Renewable marine energy. Installation of biomass boilers, heat pumps and solar thermal in buildings.
Sustainable infrastructure	Development and maintenance of the rail network, urban public transport infrastructure, river and maritime transport infrastructure, cycling paths and network, charging stations for electric, CNG or hydrogen vehicles.
Nuclear energy	Construction of the Flamanville EPR third generation nuclear reactor project and the “grand carénage” plant refit program.
Non-energy	Upstream forestry and industrial processes, wood construction. Not covered: agroecology.

Identifying climate investments supporting French climate policy objectives

The study uses a hybrid definition of what constitutes ‘climate investments’ and seeks to identify the investments that contribute – or are counterproductive – to the achievement of French climate-related objectives. It takes into a consideration:

- the French National Low Carbon Strategy (SNBC);
- the French Multi-annual Energy Plans (PPE);
- the nomenclature of the France Green Finance Label (Greenfin, formerly TEEC label);
- the criteria set out by the Climate Bond Initiative;
- the reports of the EU Technical Expert Group (TEG) on Sustainable Finance³.

Variable levels of available data depending on the sector

Housing, transport and energy production sectors are the best documented in France. In the tertiary buildings, in the agricultural and industrial sectors, lack of data limits the assessment of current investments and makes it impossible to present a complete snapshot of climate investment needs and the sum of investments with climate-adverse effects. Investments in research and development or adaptation to climate change are not documented in this study, as their identification and assessment require different methods and definitions than those used here.

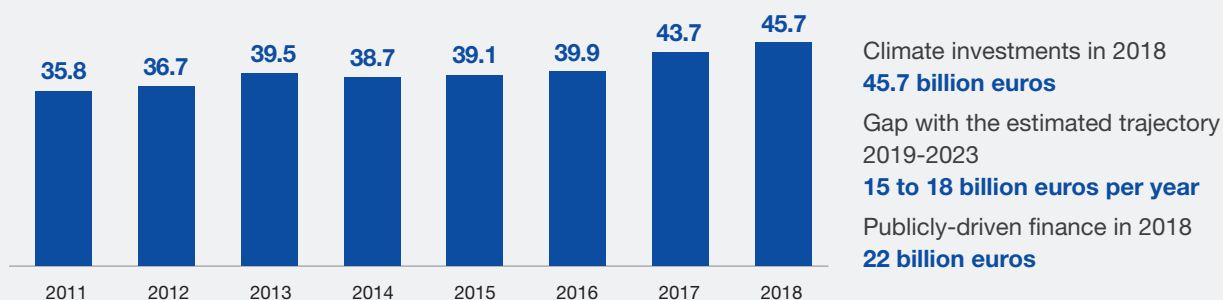
SECTOR COVERED BY THE LANDSCAPE	Housing	Transports	Energy Production	Tertiary Buildings	Agriculture	Industry	R&D	Adaptation
Climate Investments 2011-2018 (pp.3 to 5)	■	■	■	▲	▲	▲	–	–
Investment Needs 2016-2028 (pp.6-7)	■	■	▲	▲	–	–	–	–
Finance Estimates 2016-2028 (pp.8-9)	■	■	▲	▲	–	–	–	–
Fossil fuel investments 2011-2018 (p.10)	■	■	■	▲	–	–	–	–

■ Covered in the Landscape ▲ Partial coverage – Not covered

3 I4CE detailed the methodology in an article published in the academic journal International Economics, see : <https://www.i4ce.org/the-landscape-of-domestic-climate-investment-and-finance-flows-methodological-lessons-fromfiveyears-of-application-in-france/>

The growth of climate investment is accelerating

CLIMATE INVESTMENTS IN FRANCE 2011-2018 (IN BILLION EUROS)



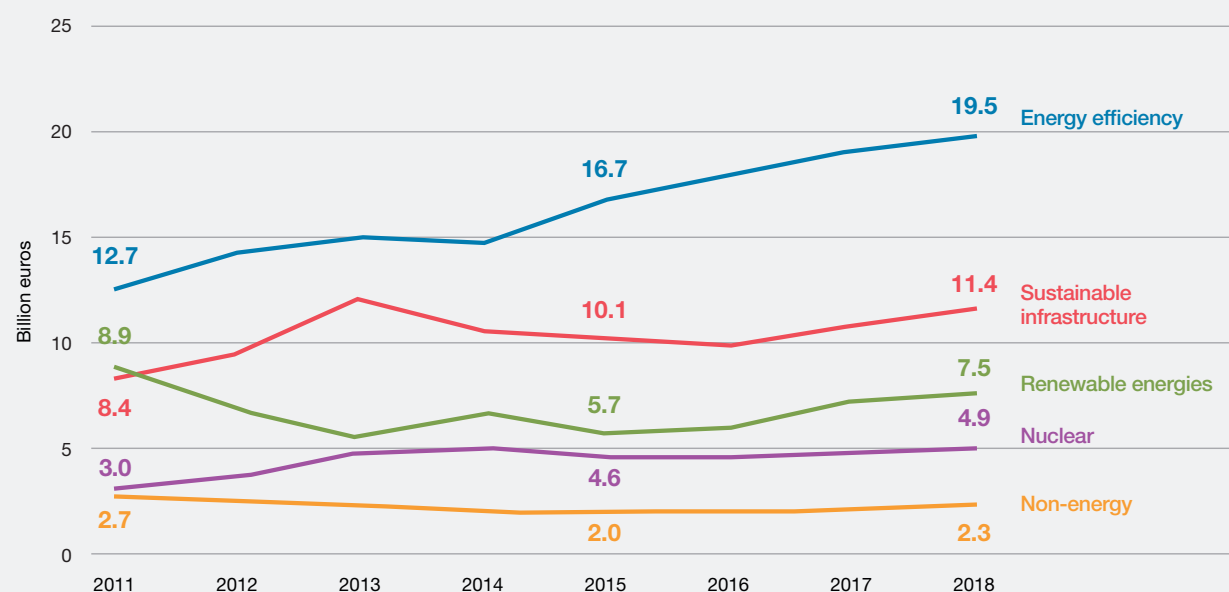
Source: I4CE, Landscape of climate finance in France, Edition 2019

Climate investments from households, businesses and government bodies totalled 45.7 billion euros in 2018. The growth was constant between since 2014 and 2016, and increased in 2017 and 2018 due to a context favourable to investment in these sectors.

In 2018, France spent nearly 20 billion euros in energy efficiency investments, 7.5 billion euros in the renewable energy deployment, and 11 billion euros for sustainable infrastructure construction in the transport and network

sector. Investments in the redevelopment and extension of the nuclear fleet reached 5 billion euros. Those in the forest and non-energy industrial processes totalled 2 billion euros. Investments in energy efficiency have been steadily increasing since 2014. Those in the sustainable infrastructure and renewable energy have, in turn, been growing since 2016.

INVESTMENTS IN FAVOUR OF CLIMATE IN FRANCE, BY DOMAIN OF CONTRIBUTION TO THE LOW-CARBON TRANSITION



Source: I4CE, Landscape of climate finance in France, Edition 2019

Public authorities are increasingly involved in the financing climate investments

Public authorities intervene through several channels to foster the financing of climate investments. Their intervention goes beyond public budgets to include the mobilization of private funding:

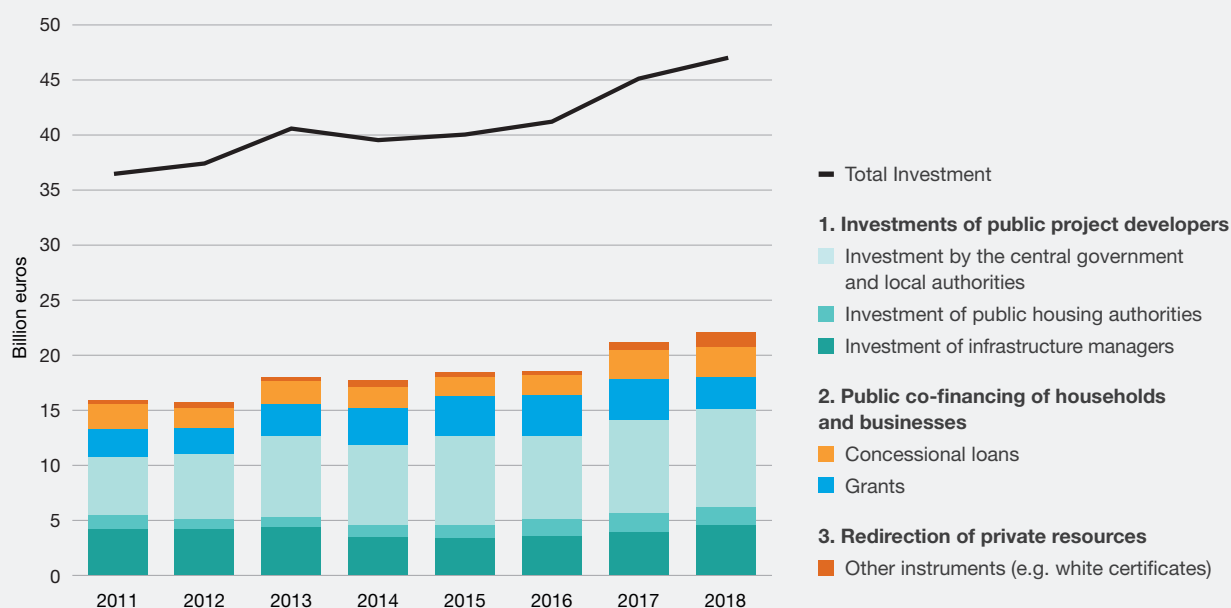
■ ■ ■ Their support occurred first and foremost through their direct investments as project developers (see box on next page). This included investments by the central government and local authorities in their own building stock and vehicles fleet, local authorities and infrastructure managers (RATP, SNCF Réseau) in the development and maintenance of rail and urban public transport networks, and public housing authorities for the construction and the retrofitting of public housing. Together, this totalled 15 billion euros in 2018.

■ ■ In addition, public authorities co-financed projects initiated by households and private companies. This co-financing came from the budgets of the central government and local authorities most often in the form of subsidies, and from public financial institutions (Caisse des Dépôts, BPI France, EIB) in the form of concessional loans. Together, co-financing operations totalled 5.7 billion euros in 2018.

■ Finally, public authorities supported the redirection of private capital to low-carbon projects through mandatory mechanisms such as white certificates, or voluntary programs such as the interest-free eco-loan proposed by commercial banks.

In total, publicly-driven financing reached 22 billion euros in 2018.

CLIMATE INVESTMENTS AND PUBLIC SECTOR SUPPORT



Source: I4CE, Landscape of climate finance in France, Edition 2019

From 2011 to 2018, the annual contribution of public authorities to the financing of climate investments increased by 6 billion euros

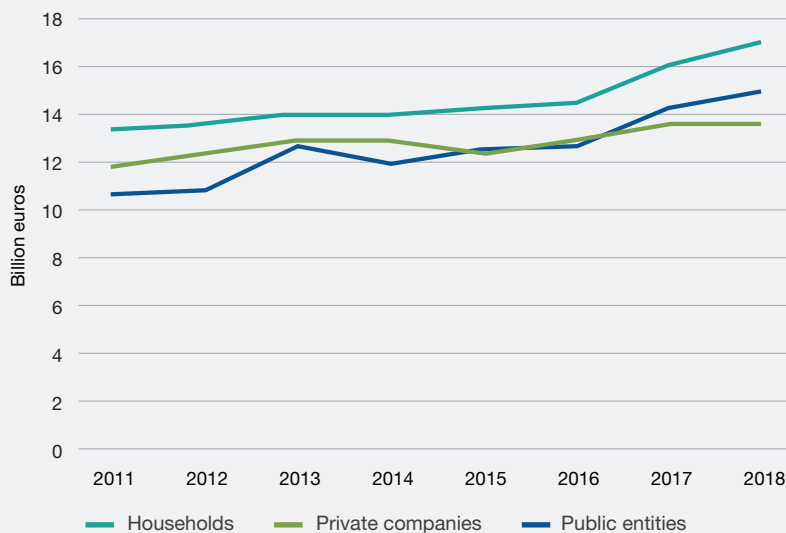
Investment by public project developers increased significantly, particularly with the infrastructure investment programmes of SNCF Réseau and Société du Grand Paris.

In 2018, for the first time since 2014, government co-finance in the form of grants decreased, with an increase

in the use of concessional loans, redirection schemes and direct investments.

Indeed, since 2015, there has been an increase in concessional loans, largely due to the activity of BPI France and the EIB in co-financing renewable energy producers.

CLIMATE INVESTMENTS IN FRANCE, BY TYPE OF PROJECT DEVELOPER



Source: I4CE, Landscape of climate finance in France, Edition 2019

Households invested 17 billion euros in 2018. The investments were concentrated in the construction and renovation of private dwellings, and in the transport sector with the acquisition of low-carbon passenger cars.

Companies invested 13.6 billion euros in 2018. They were involved in all sectors and were responsible for almost the totality of investments in energy production, industry and agriculture.

Investments by public project developers, which include those of the central government, local authorities, public housing authorities and infrastructure managers, totalled 15.1 billion euros in 2018. Investments mainly occurred in the transport sector for the construction and maintenance of infrastructure.

Investment of a further 15-18 billion euros is needed each year by 2023 to be on track for carbon neutrality

- For France to be on track to achieve its goal of carbon neutrality, climate investments must reach nearly 50 billion euros per year over the next five years.
- By 2014-2028 (France's third carbon budget), investment needs are estimated of around nearly 70 billion euros per year – double the current level.
- To increase investment, making new sources of financing available alone won't be enough. The profitability, economic viability and regulatory conditions affecting low-carbon projects play a determining role in their success.

I4CE estimates annual investment needs based on French national objectives

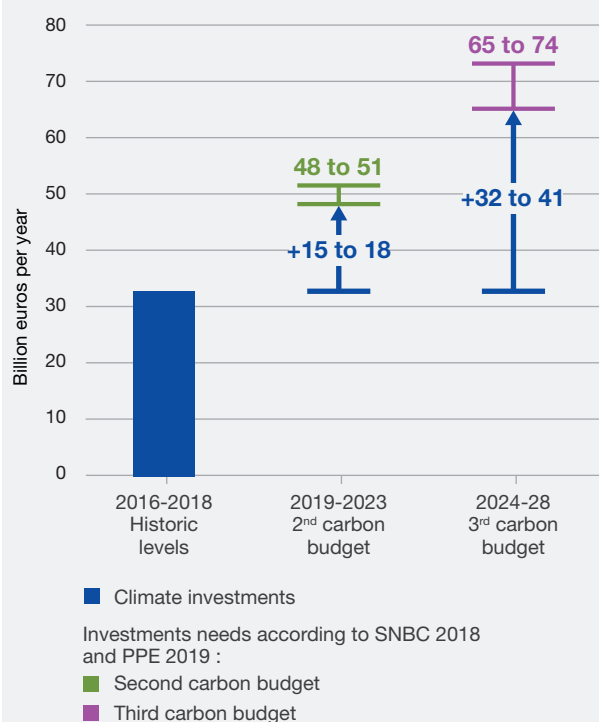
French national climate objectives are quantified in three principal strategic documents: the draft French National low-carbon Strategy (SNBC, December 2018), its Reference Scenario, and the draft Multi-annual Energy Plans (PPE, January 2019)⁴. Based on these documents, I4CE identifies in each sector the equipment that is planned to be deployed. For example, the number of dwellings to be renovated, the wind or solar power generation capacity to be installed, and the length of transport infrastructure to be built. Based on the costs observed in similar projects in recent years and their anticipated evolution, I4CE then calculates the investments associated with the scenarios used in the strategic documents.

Investment needs are presented for two periods, corresponding to SNBC's carbon budgets:

- 2019-2023, SNBC's second carbon budget and first period of the PPE;
- 2024-2028, SNBC's third carbon budget and second period of the PPE.

The resulting investment need estimates are presented as a range that includes uncertainties related to the cost and speed of equipment deployment.

CLIMATE INVESTMENTS: HISTORIC LEVELS AND ESTIMATED AVERAGE ANNUAL NEEDS



Source: I4CE, Landscape of climate finance in France, Edition 2019

Nota bene: for 2016-2018, the climate investments and finance totals presented on pages 6 to 9 differ from those presented on pages 3 to 5. Indeed, in some sectors such as agriculture, industry or nuclear, the SNBC and PPE analysis does not provide sufficient detail to estimate an investment trajectory or finance projections: these sectors are therefore excluded from the comparison.

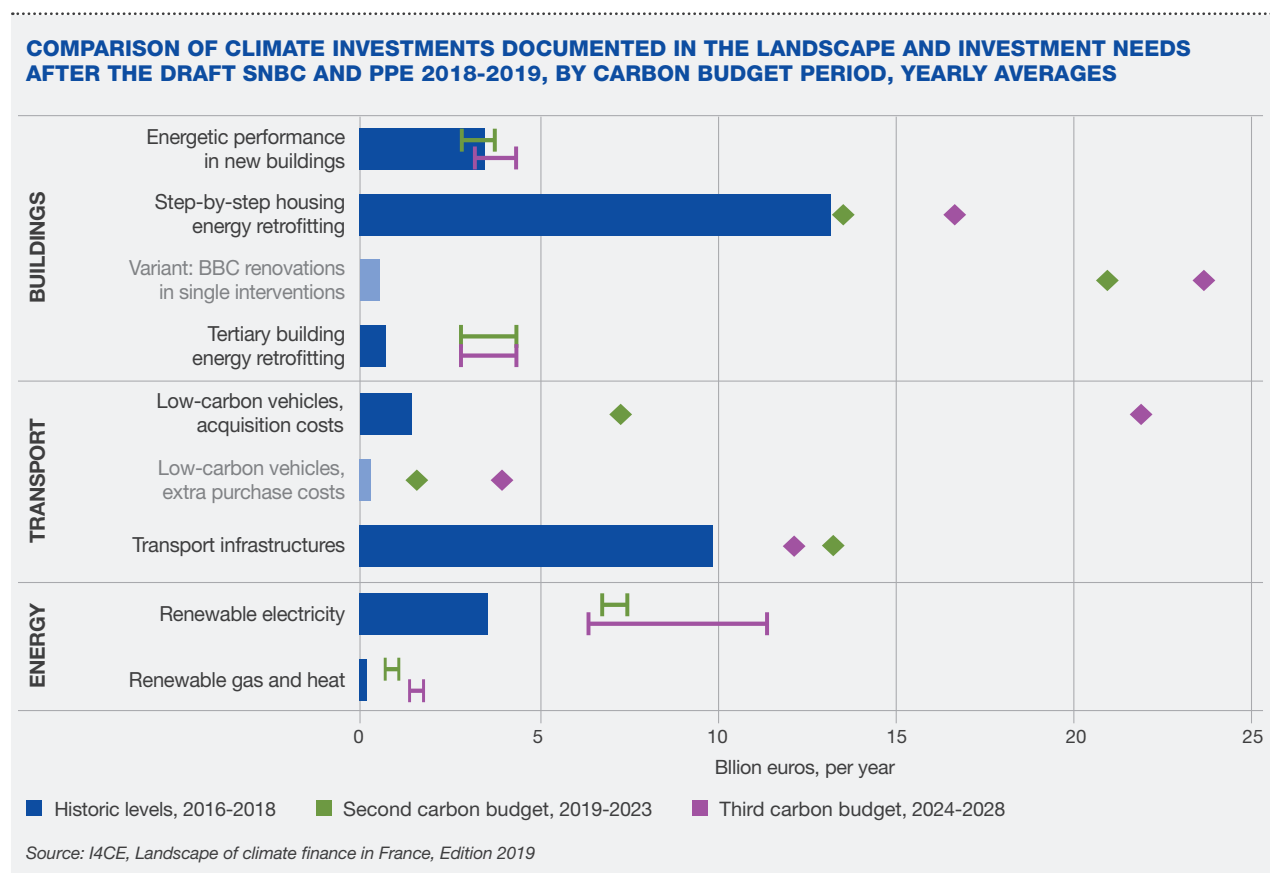
Main sectors (in billion euros, per year)	Historic Levels 2015-2018	Second Carbon Budget 2019-2023	Third Carbon Budget 2024-2028
<div></div> Housing <div></div> Renewable energies <div></div> Transport	33	48 to 51	65 to 74
<div></div> Agriculture <div></div> Industry <div></div> Nuclear (inter alia)	13	?	?
<div></div> R&D <div></div> Adaptation	?	?	?

■ Covered in the Landscape ▲ Partial coverage – Not covered

⁴ These projects can be consulted on the Ministry of Ecological Transition and solidarity website:
 SNBC: <https://www.ecologique-solidaire.gouv.fr/strategie-nationalebas-carbon-snbc>
 PPE: <https://www.ecologique-solidaire.gouv.fr/programmationspluriannuelles-lenergie-ppe>

Growth in investment must accelerate from 2019 in most sectors

- Placing the sector of housing renovation, low-carbon vehicles, renewable energies and transport infrastructure on the path to carbon neutrality implies increasing climate investment as soon as possible.
- In the construction sector, the challenge is to maintain current investment levels.



Investments in low-carbon vehicles are estimated to grow rapidly in the second and third carbon budgets. However, when compared to what would have been spent on conventional vehicles, investments in electric, CNG or hybrid alternatives generate a modest additional cost, from 2 to 4 billion euros per year (see pp.14-15).

The energy efficient renovations of buildings carried out in 2018 are compatible with a step-by-step retrofitting trajectory. However, undertaking today full BBC-label retrofitting actions would require considerable investments in the next 5 years, compared to the step-by-step approach (see pp.16-19).

If the funding model does not evolve, the annual government contribution must increase from 7 billion to 9 billion euros by 2023

If the current financing model is replicated on the scale of investment needs identified by the SNBC and the PPE, French public authorities would have to spend by 2023 between 25 to 27 billion euros per year on climate investment and co-financing. By 2028, this contribution would increase to between 28 to 31 billion euros.

- Direct investment in public buildings or transport infrastructure are expected to grow and then to remain at 17 billion euros per year over the entire period.

- Subsidies and concessional loans to households and businesses would reach 8-9 billion euros per year by 2023 and 11-14 billion euros per year by the third carbon budget.

Despite this increase, the government's share of total climate investment would remain stable at around 50% between 2019 and 2023, and then would decline to around 40% between 2024 and 2028.

THE CONTRIBUTION OF PUBLIC AUTHORITIES TO THE FUNDING OF CLIMATE INVESTMENTS

(in billions of euros, per year)	Historic Levels 2015-2018	Funding Projections	
		Second Carbon Budget 2019-2023	Third Carbon Budget 2024-2028
Direct investment: buildings and infrastructure	12	17 to 18	17
Cofinance: grants, concessional loans, other instruments	6	8 to 9	11 to 14
All public authorities	18	25 to 27	28 to 31
Total climate investment and finance, public and private actors	34	49 to 52	66 to 75

Source: I4CE, *Landscape of climate finance in France, Edition 2019*

Note: Public co-financing includes tax expenditure (reduced rate VAT for energy efficiency works), which is not included in the investments presented on the next page, and which include VAT.

I4CE HAS ESTIMATED THE FINANCIAL FLOWS THAT COULD COVER THE CLIMATE INVESTMENT NEEDS OF THE NEXT TWO CARBON BUDGETS

To estimate this, I4CE prepared a financial flows projection in which each sector achieved the investment objectives set in the SNBC **by maintaining the proportion between public and private financing sources and instruments observed in 2015-2018**. To simplify the analysis, the financial flows projection does not take into account announcements and commitments that would result in changes in the levels of public funding, nor does it anticipate changes in equipment prices, energy prices, risks or leverage levels.

The results are aimed to frame the debate on the extent of public and private funding that could be mobilized to cover investment needs.

The results are presented for the two periods corresponding to the carbon budgets:

- 2019-2023, second carbon budget of the SNBC and first period of the Multi-annual Energy Plan (PPE);
- 2024-2028, third carbon budget of the SNBC and second period of the PPE.

As in the projection of investment needs, the financial flows scenario concerns only a part of the flows documented in the Landscape. Indeed, in some sectors such as agriculture, industry or nuclear, the SNBC and PPE do not provide sufficient levels of detail to construct a trajectory of investment needs.

The share of climate investments of households and companies will increase under French climate policy

I4CE's assessment of French national climate policy defined in the SNBC and the PPE suggests that private project developers will see their annual climate investments increase from 9 to 12 billion euros by 2023.

Indeed, the most significant investment needs are among

assets owned by these actors, particularly buildings and vehicles. By 2028, annual household and business investment is expected to increase by 27-35 billion euros compared to its current level. In comparison, investments by public authorities would rise by only 4-5 billion euros by 2023 and then would remain at this level.

DIVISION OF INVESTMENT NEEDS BY TYPE OF PROJECT DEVELOPER

(in billions of euros, per year)	Historic Levels 2015-2018	Investment Projections	
		Second Carbon Budget 2019-2023	Third Carbon Budget 2024-2028
Public Authorities	13	17 to 18	17
Households	15	16 to 17	25 to 26
Companies	6	14 to 16	23 to 30
All Actors	33	48 to 51	65 to 74

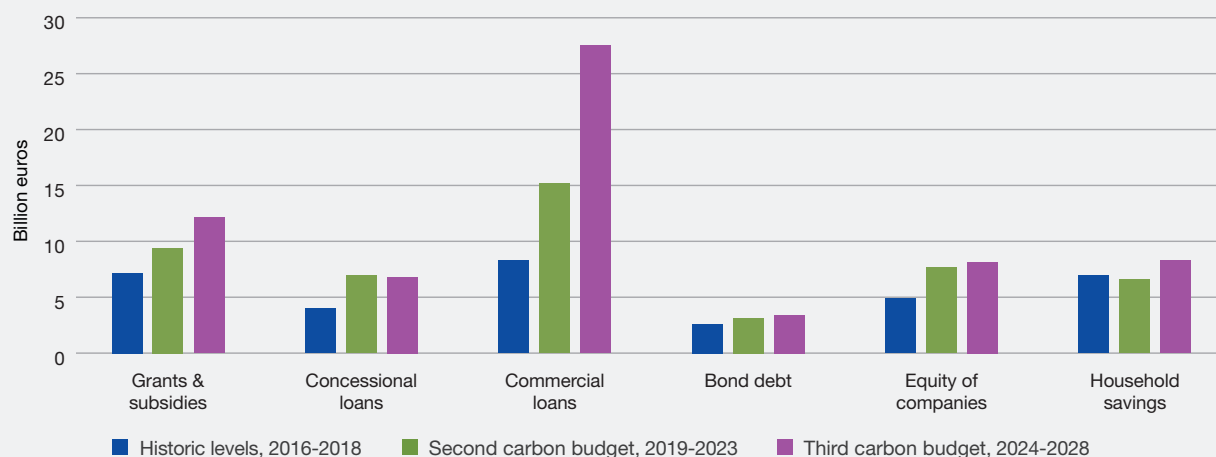
Source: I4CE, Landscape of climate finance in France, Edition 2019. Excluding tax expenditures (e.g. the reduced rate of VAT at on energy efficiency works in dwelling).

Commercial loans stand to become the principal tool for financing climate investments

Public debate currently focuses principally on grants and concessional loans given that they are the main instruments of public authorities. However, future investment needs are concentrated in those sectors principally financed through commercial debt, such as the building retrofitting, vehicle acquisitions or the production of renewable

energy. If the current funding model remains unchanged, I4CE's assessment indicates that commercial lending to finance climate investments could reach 15 billion euros per year by 2023 - and exceed 25 billion euros per year by 2028. In comparison, financing in the form of bond debt, companies equity, and the household equity would experience more modest growth.

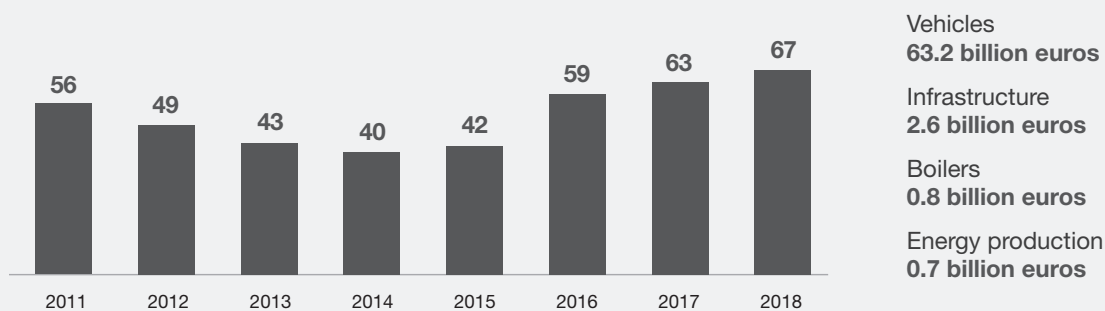
FINANCING OF CLIMATE INVESTMENTS, BY SEGMENT, HISTORIC LEVELS AND PROJECTIONS



Source: I4CE, Landscape of climate finance in France, Edition 2019

Fossil investments are concentrated in the passenger car market

CLIMATE-ADVERSE FOSSIL INVESTMENTS IN FRANCE (IN BILLION EUROS)



Source: I4CE, Landscape of climate finance in France, Edition 2019

Climate-adverse investments have increased consistently since 2015, although the increase in 2018 (+4 bn€) is lower than in 2016 (+17 bn€).

These investments are concentrated in the transport sector (98% of the total), and are principally financing the purchase of new passenger cars (43 billion euros in 2018).

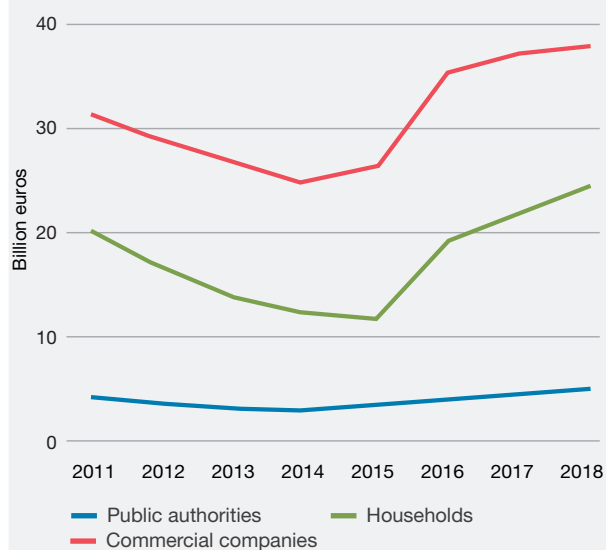
In this market, sales of heavier and more energy-intensive vehicles continued to rise, with emissions per kilometer of new vehicles relatively unchanged since 2015. This stagnation means that the emission performance of the French vehicle fleet is increasingly diverging from the trajectory defined in the government's reference scenario (see pp.14-15).

In the boiler market, climate-adverse investments doubled between 2014 and 2018 - despite the fact that some of the costs of removing and replacing fuel tanks were included in the works eligible for the energy transition tax credit program (*Crédit d'impôt à la transition énergétique* or CITE).

Fossil-fuel related investments are mainly undertaken by private project developers

Companies and households made the most climate-adverse investments (56% and 36% of the total respectively). Climate-adverse public investments were concentrated in airports and diesel public transport vehicles.

DISTRIBUTION OF ADVERSE FOSSIL FUEL INVESTMENTS, BY PROJECT DEVELOPER



Source: I4CE, Landscape of climate finance in France, Edition 2019

Private investment is continued to be encouraged by the persistence of climate-adverse tax provisions

If public authorities are not the main direct investors in fossil fuels, a number of tax provisions continue to help make these energies more attractive for households and businesses.

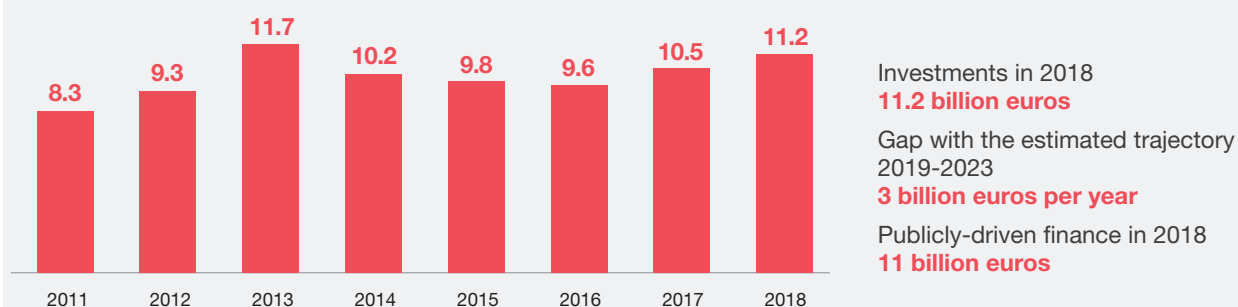
The climate assessment of the French government's national budget led by I4CE in 2019⁵ identified 16 billion euros in climate-adverse tax expenditures. Four tax loopholes imply that 25% of French emissions are exposed to relatively low tax levels – or are not taxed at all, including: the exemption on aircraft kerosene, reduced rates for heavy goods vehicles, off-road diesel fuel, and the relative rates applied to diesel fuel compared to petrol.

5 Fetet M., Perrie Q. and Postic S. (2019), A first 360-degree climate assessment of the French State budget, I4CE, Paris, France (publication in English forthcoming in November)



Investments must increase in cycling and public transport infrastructure

CLIMATE INVESTMENTS IN SUSTAINABLE INFRASTRUCTURE IN FRANCE (IN BILLION EUROS)



Source: I4CE, Landscape of climate finance in France, Edition 2019

After several years dominated by rail projects, urban public transport has made up most of investments since 2016. Indeed, new efforts are underway in the Ile-de-France region with the public transport modernisation plan and the Grand Paris Express development. In the other French regions, the projects part of the 3rd “Public transport and sustainable mobility” call for projects are moving forward in 2017 and 2018.

On one hand, the National Low Carbon Strategy plans to maintain current levels of investments in rail network renovations; simultaneously the Grand Paris Express projects scheduled to date will reach their peak by 2024.

On the other hand, to meet ambitions the infrastructure for charging electric, CNG and hybrid vehicles must increase to nearly 700 million euros per year, compared to the current 100 million euros.

The SNBC and the Bike Plan (“Plan Vélo”) aim to triple the share of cycling trips by 2024. A major factor to achieve this objective is the development in city centres and peri-urban areas of high-quality cycling infrastructure. I4CE has estimated that their construction would require investments of approximately 1.6 billion euros per year, compared to the current level of investment of 500 million euros per year in 2018.

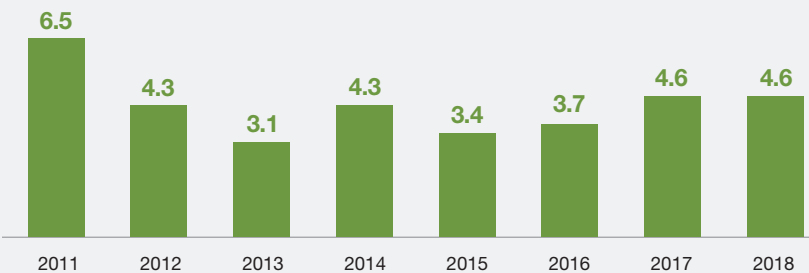
KEY MESSAGES ON TRANSPORT INFRASTRUCTURE

- Investments in sustainable transport infrastructure have been growing since 2016 and exceeded 10 billion euros again in 2018.
- Public authorities finance these long-term investments.
- The draft Law on Mobility (LOM) gives priority to the modernisation of daily transport modes, to the deployment of alternatives to the private car throughout the country, and to promoting active mobility.



Renewable electricity: stable investments while waiting for offshore wind projects to begin

INVESTMENTS IN RENEWABLE POWER GENERATION (IN BILLION EUROS)



Investments in 2018

4.6 billion euros

Gap with the estimated trajectory 2019-2022

+3 to 4 billion per year

Publicly-driven finance in 2018

2.2 billion euros*

Source: I4CE, Landscape of climate finance in France, Edition 2019

* Excluding public co-financing of rooftop solar that is accounted for in the building, agricultural and industrial sector totals.

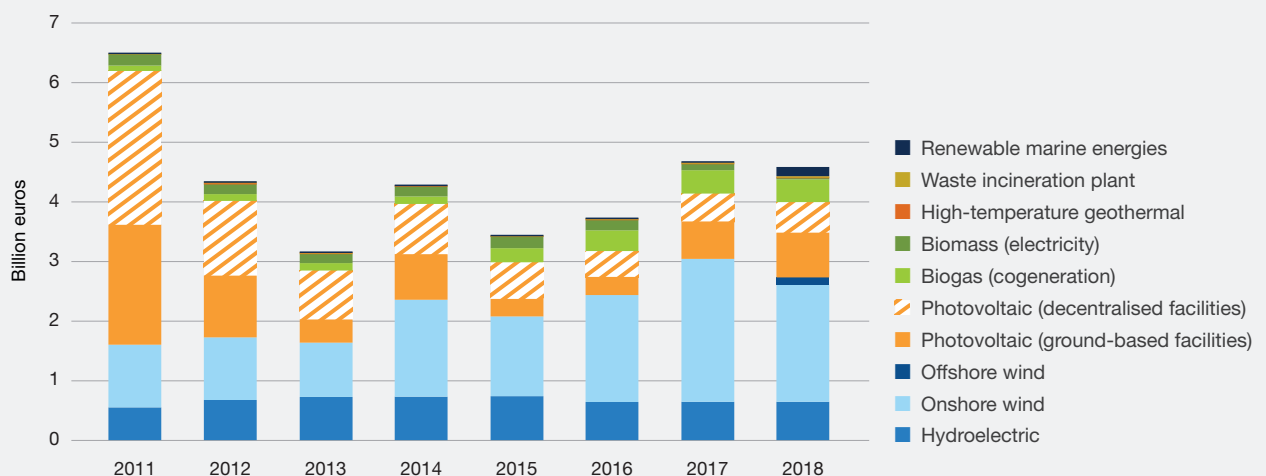
Wind power dominates investments in renewable electricity

Onshore wind power has become the leading renewable electricity subsector in France: it accounted for 43% of investments in 2018, compared to only 16% in 2011 (see graph below). The solar sector has shifted to ground-based and large roof projects after the fall in feed-in tariffs. Biomass electricity production currently attracts only small levels of investment, with public support now directed towards the biomass use in the form of heat. In 2018, new emerging subsectors were noted: offshore wind power (anchored) and renewable marine energy (e.g. underwater turbines).

Major investments are planned over the next 5 years

The trajectory established in the SNBC and the PPE implies increasing investments during the second carbon budget from 7 to 8 billion euros per year. Part of this increase is already in the planning and design stages: several offshore wind farms, representing a total investment of 12.8 billion euros, are expected to be deployed between 2019 and 2023. To be compatible with SNBC and PPE objectives, the annual investments for onshore wind and solar photovoltaics should, however, increase by approximately 35%.

INVESTMENTS IN RENEWABLE ELECTRICITY PRODUCTION



Source: I4CE, Landscape of climate finance in France, Edition 2019



Investments were mainly made by developers through project companies

The financing of the involved project companies relies principally on bank loans and equity capital held by the developers or involved local authorities through semi-public companies (SEM).

If the government does not subsidize the projects at the time of investment, it does guarantee renewable electricity producers that their production will be bought back at guaranteed rates, or at the market price with a supplement. The national government compensates for the difference between these advantages and the price of electricity on the wholesale market.

For example, in 2018, the income of renewable electricity producers under purchase contracts amounted to around 7.5 billion euros, of which around 5.7 billion euros was made up of compensation payments by the central government (source: French Energy Regulatory Commission).

The involvement of public financial institutions continued to grow in 2018

BPI France co-finances renewable electricity production project companies alongside commercial banks. The latter are also refinanced by the EIB at very low rates. Together, these schemes accounted for 55% of project financing in 2018, compared to 16% in 2011.

In mature sectors such as onshore wind or ground-based solar energy, this growing involvement of public funding could potentially be at the expense of private investors ("crowding-out"). However, public financial institutions also have tools adapted for less mature sectors such as loans without guarantees or risk coverage.

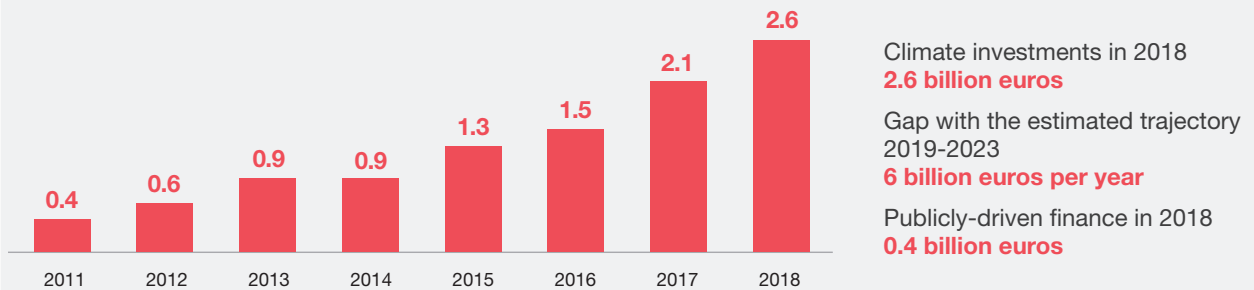
KEY MESSAGES ON RENEWABLE ELECTRICITY

- Investments in renewable electricity production capacity, such as solar and wind farms, stabilised at 4.6 billion euros in 2018.
- The installations growth is driven by technological advances, regulatory simplification and lower installation and production costs.
- The SNBC and PPE recommend doubling investments over the next 5 years, particularly in offshore wind power, where several projects began in 2018.



Vehicles: the expansion of low-carbon technologies does not reduce the growth in sales of combustion-powered cars

CLIMATE INVESTMENTS IN LOW-CARBON VEHICLES IN FRANCE (IN BILLION EUROS)



Source: I4CE, Landscape of climate finance in France, Edition 2019

Investments in low-carbon vehicles accelerate in 2018

The low-carbon vehicle market is now dominated by passenger cars. They made up more than 71% of investments in 2018, compared to 28% in 2011. Investments in other types of vehicles (buses, trucks, vans) have also increased since 2015.

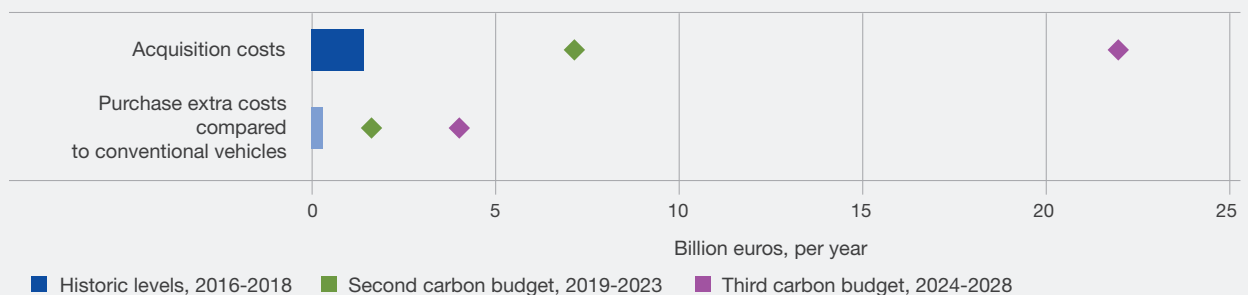
Electric vehicles is relatively more prevalent in the passenger car and commercial vehicle segment, while

CNG is the main low-carbon energy source for heavy-duty trucks.

However, the level of investment in low-carbon vehicles should be put into perspective and compared to the continued volume of investment in climate-adverse vehicles. Investments in these vehicles represented 63.2 billion euros in 2018. This market was 25 times larger in 2018 than the low-emitting engines' ones.

The SNBC bets on a rapid and massive redirection of fossil investments towards low-carbon alternatives

COMPARISON OF CLIMATE INVESTMENTS DOCUMENTS IN THE LANDSCAPE AND INVESTMENTS TOWARDS LOW-CARBON ALTERNATIVES



Source: I4CE, Landscape of climate finance in France, Edition 2019

Investments in low-carbon vehicles are expected to grow rapidly in the second and third carbon budgets: 7 and 22 billion euros per year respectively. However, expressed in terms of the extra cost of purchasing a low-carbon

vehicle compared to a fossil alternative, these amounts are more modest. In this case, they amount to 2-4 billion euros per year over the period studied.



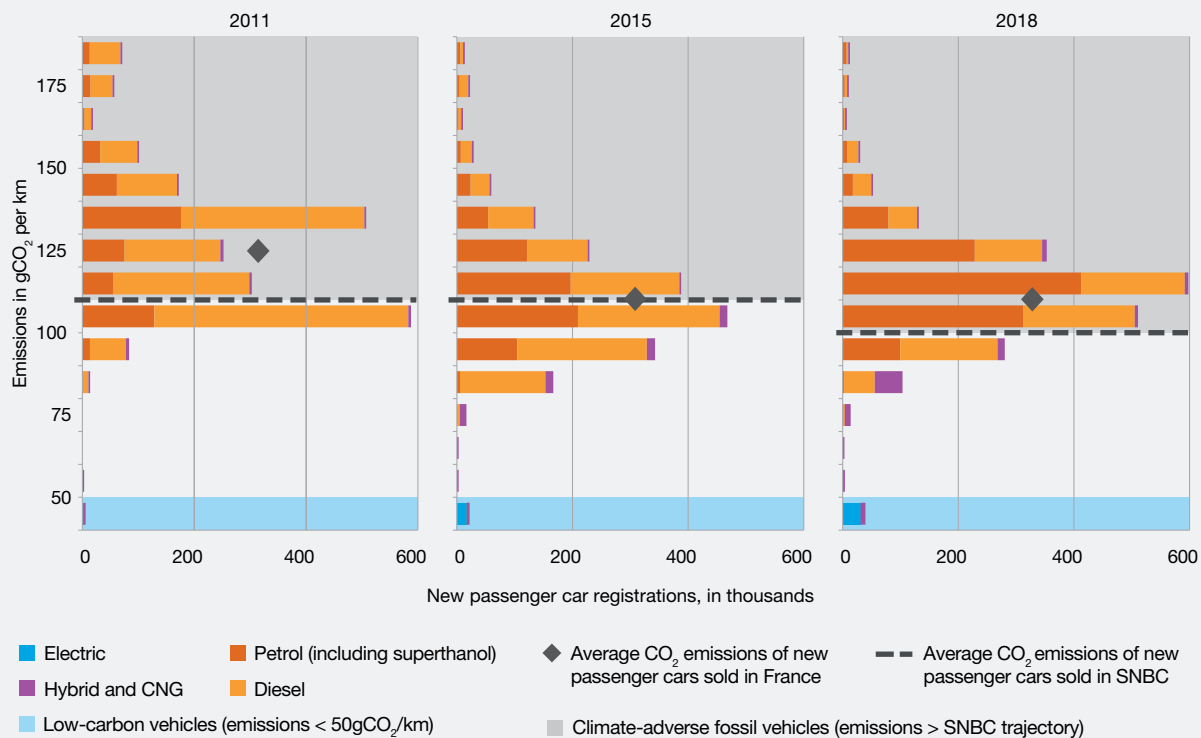
EMISSIONS FROM THE PASSENGER CAR MARKET ARE RAPIDLY EXCEEDING THE TRAJECTORY SET OUT IN THE NATIONAL LOW-CARBON STRATEGY

In 2015, the downward trend in emissions per kilometre from new passenger cars halted. Since then, sales of emitting vehicles – i.e. above the average used in the SNBC reference scenario – have increased.

Indeed, the ‘upmarket’ trend of new vehicles (power, size, equipment, “SUV” models) has erased the progress in engine weight reduction and efficiency. In addition, the levelling of taxation of petrol and diesel fuel, started in 2015, continues to encourage sales of gasoline vehicles. In tests, these vehicles have only marginally higher CO₂ emissions per kilometre than diesel vehicles.

Nevertheless, the average price of combustion vehicles continues to rise. This trend is reflected in an increase in the total volume of climate-adverse fossil-related investments. In 2018, the revenues from the car penalty (malus) targeting vehicles emitting more than 120 gCO₂/km in 2018 represented 559 million euros, a record since the scheme’s inception.

PASSENGER CAR REGISTRATIONS, ENGINES AND CO₂ EMISSIONS



Source: I4CE, from CGDD and ADEME Car Labelling

* For more information, see (available in French only): France Stratégie, « Comment faire enfin baisser les émissions de CO₂ des voitures ? », 2019

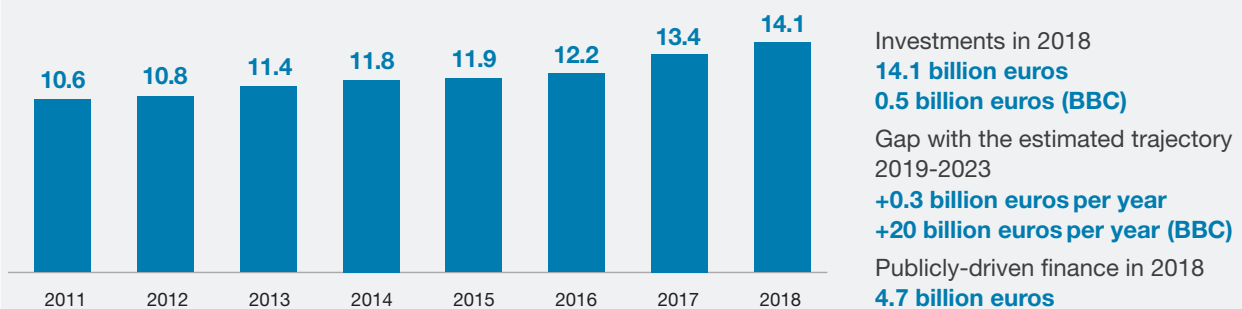
KEY MESSAGES ON VEHICLES

- Growth in investments in low-carbon vehicles continues and is accelerating. Investments have increased seven-fold since 2011 in the electric, hybrid and CNG vehicles segments.
- Lower acquisition costs, higher fossil fuel prices, pollution regulations emissions in urban areas and the deployment of recharge capacities have contributed to their popularity.
- However, these investments remain modest compared to the level of sales of fossil fuel combustion-powered vehicles whose average emissions have not decreased since 2015.



Housing energy retrofitting: the current investment level is compatible with a “step-by-step” renovation trajectory

CLIMATE INVESTMENTS IN HOUSING RENOVATION IN FRANCE (IN BILLION EUROS)



Source: I4CE, Landscape of climate finance in France, Edition 2019

Efficiency improvement are increasing, but some actions are still neglected

Since 2011, investments have mainly increased in high-performance window insulation, heat pumps and condensing boilers. Social housing retrofitting programs have grown significantly since 2015. However, essential measures to renovate the existing housing stock in an in-depth way are missing:

- Investments are stagnating in the insulation of walls, facades and roofs;
- The share of renewable energies (wood, heat pumps, solar thermal) has fallen: these devices represented only 62% of the improvements to heating systems in 2018 (compared to 71% in 2011) – a trend contradictory to the SNBC’s plans to scale-up these technologies;
- Few efficient ventilation systems (such as double-flow CMV) are being installed as part of retrofitting.

The public support landscape is changing

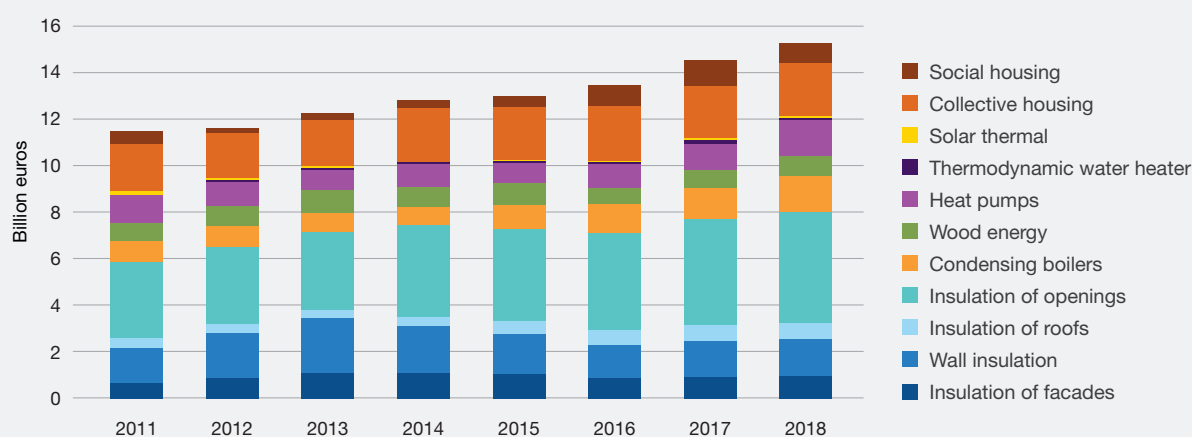
The action of replacement of windows has been judged as insufficiently ambitious and was initially excluded from the Energy Transition Tax Credit Program (CITE) in 2018, but later reinstated at a reduced rate. As such, spending on this tax credit by the government was reduced by almost half. At the same time, the value of white certificates program has almost doubled. This may have led to a reduction in prices charged for some retrofitting works. The support administered by the National Housing Agency (Agence nationale de l’habitat, ANAH) continued to grow, fuelled by increasing revenues from the auctioning of emission permits on the European carbon market.

There was an encouraging sign in 2018: although the overall level of subsidies has fallen since 2017, the tightening of performance criteria observed does not seem to weigh on the volume of investment committed by households.

For the past two years, support for retrofitting projects, such as thermal audit and individual counseling for energy efficiency projects, has been increasing. This support is expected to play a crucial role in the success of projects.



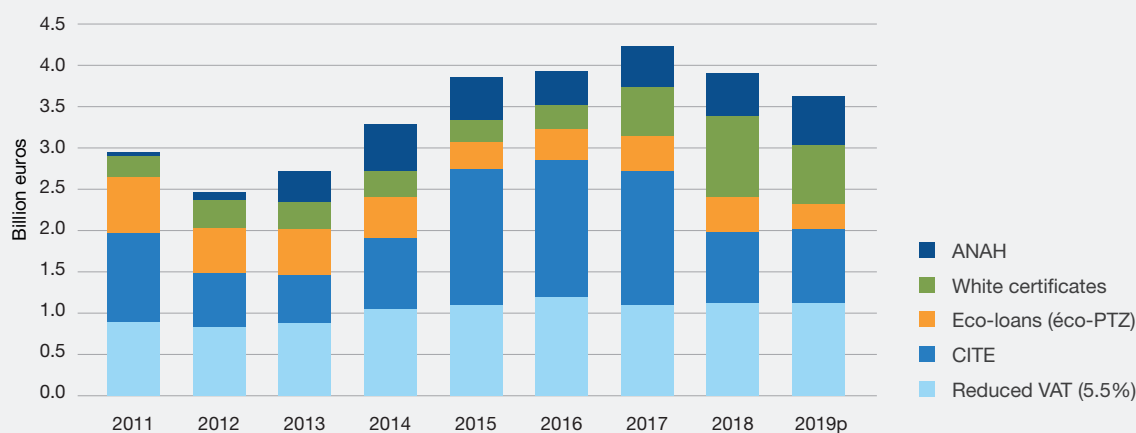
CLIMATE INVESTMENTS IN HOUSING RETROFITTING IN FRANCE, PER SECTOR AND EQUIPMENT TYPE (DETAILS ON EQUIPMENT FOR SINGLE FAMILY HOMES ONLY)



Source: I4CE, Landscape of climate finance in France, Edition 2019

PUBLIC SUPPORT FOR THE FINANCING OF ENERGY EFFICIENT RENOVATION OF PRIVATE HOUSING

p : projections



Source: I4CE, Landscape of climate finance in France, Edition 2019

Note: The budgetary impact of the reduced VAT rate for equipment contributing to the energy efficiency of housing is included in the total of instruments, but is excluded from the investments presented above. The CIDD/

CITE amounts presented here correspond to the year in which the work was carried out. Thus, the CITE funding distributed in 2018 by the central government is related to works carried out in 2017.

KEY MESSAGES ON BUILDINGS

- Investments in energy retrofits for housing have increased since 2011. Their growth accelerated in 2017 and 2018 to reach 14.1 billion euros.
- Two paths are possible to achieve carbon neutrality: continue to retrofit dwellings step-by-step, or focus on the retrofitting efforts in a single intervention to reach the needed low level of consumption (“Bâtiment Basse Consommation” or BBC) (see next page).
- Public aid for renovation, such as grants and subsidized loans, represents one third of the total amounts invested.



Two divergent investment pathways possible to renovate the housing stock by 2050

The French National Low-Carbon Strategy calls for a “low consumption” (BBC) housing stock in 2050. However, it does not dictate whether renovation should occur through

successive stages or in a single intervention. I4CE studied the investments associated with the two trajectories.

■ The reference scenario foresees a phased renovation of the housing stock to ‘BBC’ level

The successful work carried out today are compatible with a step by step renovation path

To carry out successive renovation works in most homes, these works must be planned by households today. Indeed, the progressive treatment of the insulation involves the anticipation of heating system changes. However, to date, few households have indicated the intention to carry out coordinated work to achieve very low levels of consumption.

In the reference scenario, investments increase massively beyond 2030

The reference scenario was developed in tandem with the SNBC and provides an indicative trajectory for achieving its objectives. Starting from the current level, annual investments in the building stock increase to 17 billion euros by 2028. They reach 30 billion euros in 2050. To triple the amounts invested in high-performance work, the scenario combines economic incentives (rising energy prices, subsidies, etc.) and regulatory provisions (compulsory performance, retrofitting obligations).

■ In the variant scenario, each dwelling is renovated to BBC level in one intervention

Today, few renovated homes reach the BBC-compliant low consumption levels

About 35,000 homes applied for “low-energy building” certification in 2018 (according to BBC Observatory). These projects required investments of around 500 million euros per year between 2016 and 2018.

Starting today with an adequate number of BBC renovations requires considerable investment

To renovate each of the 31 million principal residences that will still be used in 2050 to BBC level would require one million projects aiming to achieve BBC levels per year from 2020.

According to an Enertech report submitted to ADEME in 2016, retrofitting a dwelling to the BBC standard costs on average around 400 euros/m² (excluding VAT) in single-family homes, and around 250 euros/m² (excluding VAT) in multiple unit buildings. If the number of annual renovations increases, the costs per m² could decrease to around 300 euros/m² (excluding VAT) for individual dwellings.

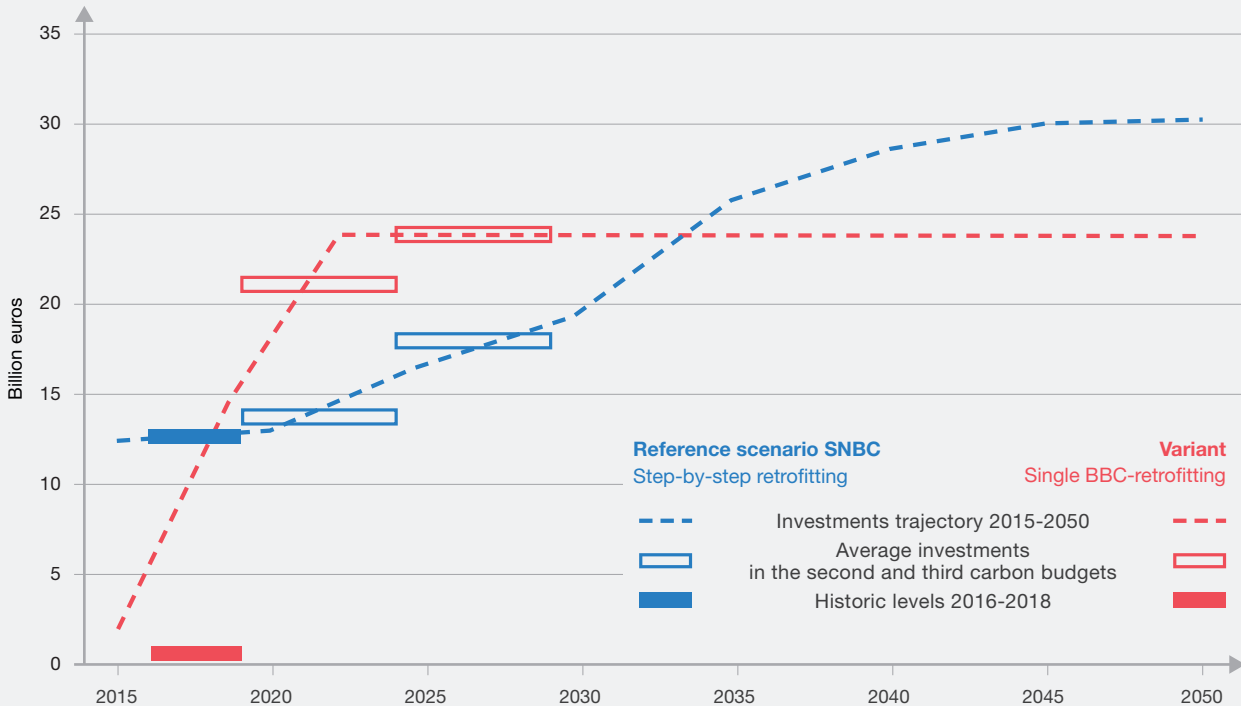
Thus, renovating 1 million homes to BBC level would represent annual investments of around 24 billion euros from 2022 to 2050.

INVESTMENTS IN ENERGY EFFICIENT RENOVATIONS OF THE HOUSING STOCK

(in billion euros, per year)	Historic levels 2016-2018	Second Carbon Budget 2019-2023	Third Carbon Budget 2024-2028	2040	2050
■ Step-by-step retrofitting	13.3	14	17	29	30
■ Single BBC-retrofitting	0.5	21	23	24	24



INVESTMENTS IN ENERGY EFFICIENT RENOVATIONS OF THE HOUSING STOCK



Source: I4CE, Landscape of climate finance in France, Edition 2019

NEW DRAFT NATIONAL LOW-CARBON STRATEGY: WHAT IS CHANGING?

In the 2018 Edition of the French Landscape, I4CE had estimated climate investment needs to meet the French SNBC ranging from 45 to 70 billion euros per year between 2016 and 2030. For the period 2016-2020, the gap between observed investments and needs was between 10 and 30 billion euros per year. This estimate was based on the first National Low Carbon Strategy (SNBC, 2015) and Multi-annual Energy Plans (PPE, 2016).

The publication of a new SNBC in February 2018 and PPE (February 2019) projects has led I4CE to revise the investment needs estimates. For example, the 2018 SNBC recognizes and accepts that emissions in France did not decrease enough between 2015 and 2018 to meet the first carbon budget (2016-2019). As such, in the revised SNBC efforts are deferred to the second (2019-2023) and especially the third carbon budget (2024-2028).

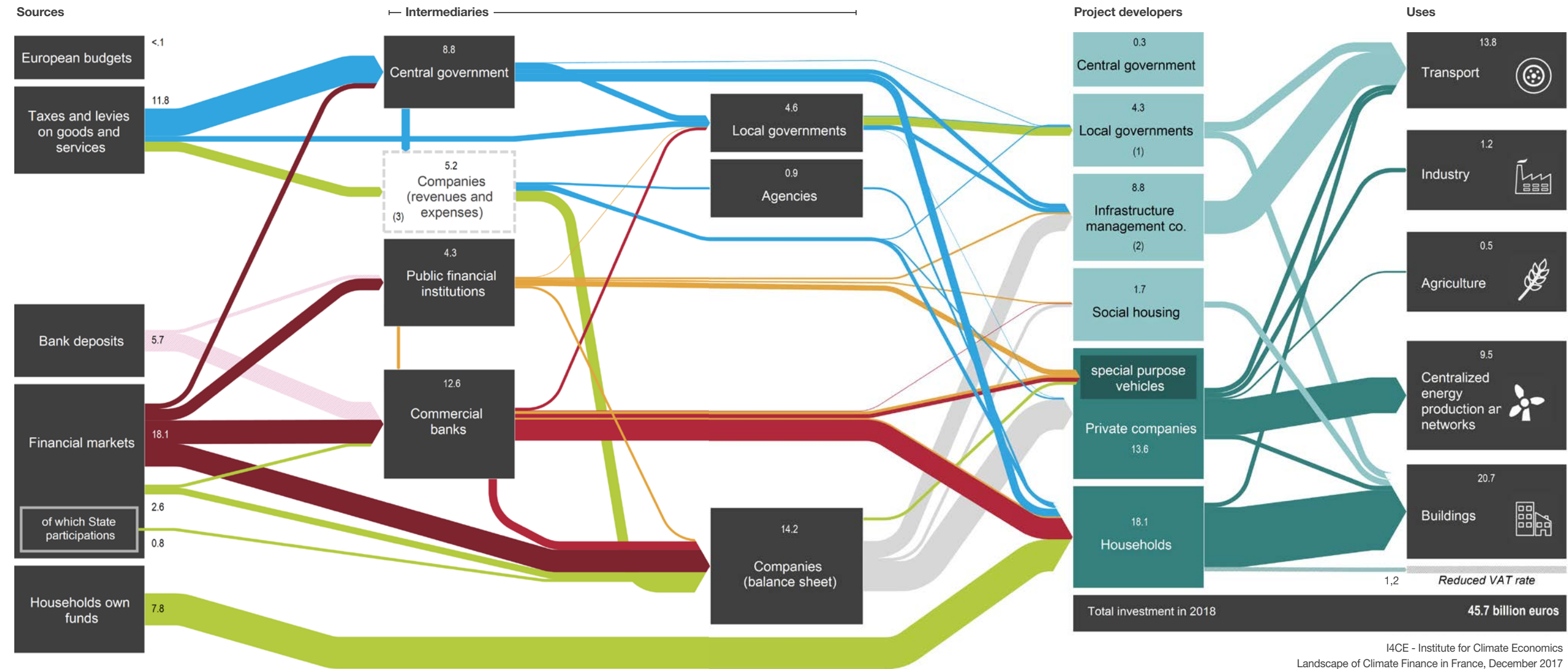
The French Economic, Social and Environmental Council notes that “compared to the first SNBC, the expected reduction in transport emissions has been halved and building emissions reduced by a third over the period 2019-2023 (...) while it has increased in agriculture, industry and waste”.

In addition, changes occurred in the use of sector models to simulate the direction the national strategy should take, which have been taken into account in the method used by I4CE in the 2019 Edition to estimate investment needs.

Finally, in this 2019 Edition of Landscape, I4CE has taken into account recent developments in certain technology costs, particularly regarding low-carbon vehicles or renewable electricity.

As a result, I4CE has adjusted its estimate of investment needs for the second carbon budget between 2019 and 2023 at between 48 and 51 billion euros per year, and those for the third carbon budget between 2024 and 2028 at between 65 and 74 billion euros per year (see pp.6-7).

The domestic landscape of climate finance is a powerful tool to track and monitor low-carbon investments



The Landscape of Climate Finance maps investment in tangible (physical) assets securing reduction of GHG emissions in France. This includes construction and equipment acquisition costs and some durable goods as used in national accounts (e.g. vehicles). This excludes the costs of, preparatory studies, operating costs, administrative costs and public procurement costs. Debt represented on the flowchart includes loans and bonds issued by or to project developers, but does not include the reimbursement of previously borrowed funds.

Acronyms: NE = not estimated

<.1 = amounts of less than 100 million euros.

To maintain clarity, these amounts are not represented graphically but are still included in the total of each box.

(1) As project developers, i.e. investing in their own buildings or durable goods. Local governments include public transport authorities ("autorités organisatrices des transports", or AOT).

(2) Public operators include SNCF Réseau (known up to 2014 as RFF), Voies Navigables de France (VNF) and RATP for investment in public transport infrastructure in the Ile de France region.

(3) Consumption of goods and services on which levies are raised. Proceeds from these levies are dedicated to the financing of low-carbon investment. This includes the transport levy ("versement transport"), carbon auction revenues and the value of white certificates (CEE).

To finance their investments, project developers employ four main types of instruments:

- Grants, subsidies and transfers, that include no financial obligation for the beneficiary;
- Concessional debt, in the form of loans with better interest rate, maturity or guarantees than market-rate debt;
- Commercial debt, loans issued by private banks at market conditions;

Financing instruments

5.7 Household deposits
8.2 Grants, subsidies, and transfers

16.8 Equity and own funds
5.7 Concessional debt

10.4 Commercial debt
5.8 Bonds
Balance-sheet financing

Investments

15.1 Public investments
30.6 Private investments

- Equity, in the form of the project developer's own funds and resources, generally mobilized without an intermediary.
For companies (public or private), debt and equity are often raised at the corporate balance sheet level, while special purpose vehicles use principally non-recourse financing. Public and private project developers are typically the owners of the assets

generated by the investment. Their investments are made in several sectors; each sector can include actions in one or more uses related to climate change mitigation and the energy transition, such as energy efficiency, development of renewable energies or the building of sustainable infrastructure. The Landscape of Climate Finance only aggregates spending and funds

engaged at the time of the investment (capital expenditure). Some financial instruments contributing to a project's financial profitability during its lifetime, such as carbon pricing systems or feed-in tariffs for renewable energy, are not represented on the flowchart.



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