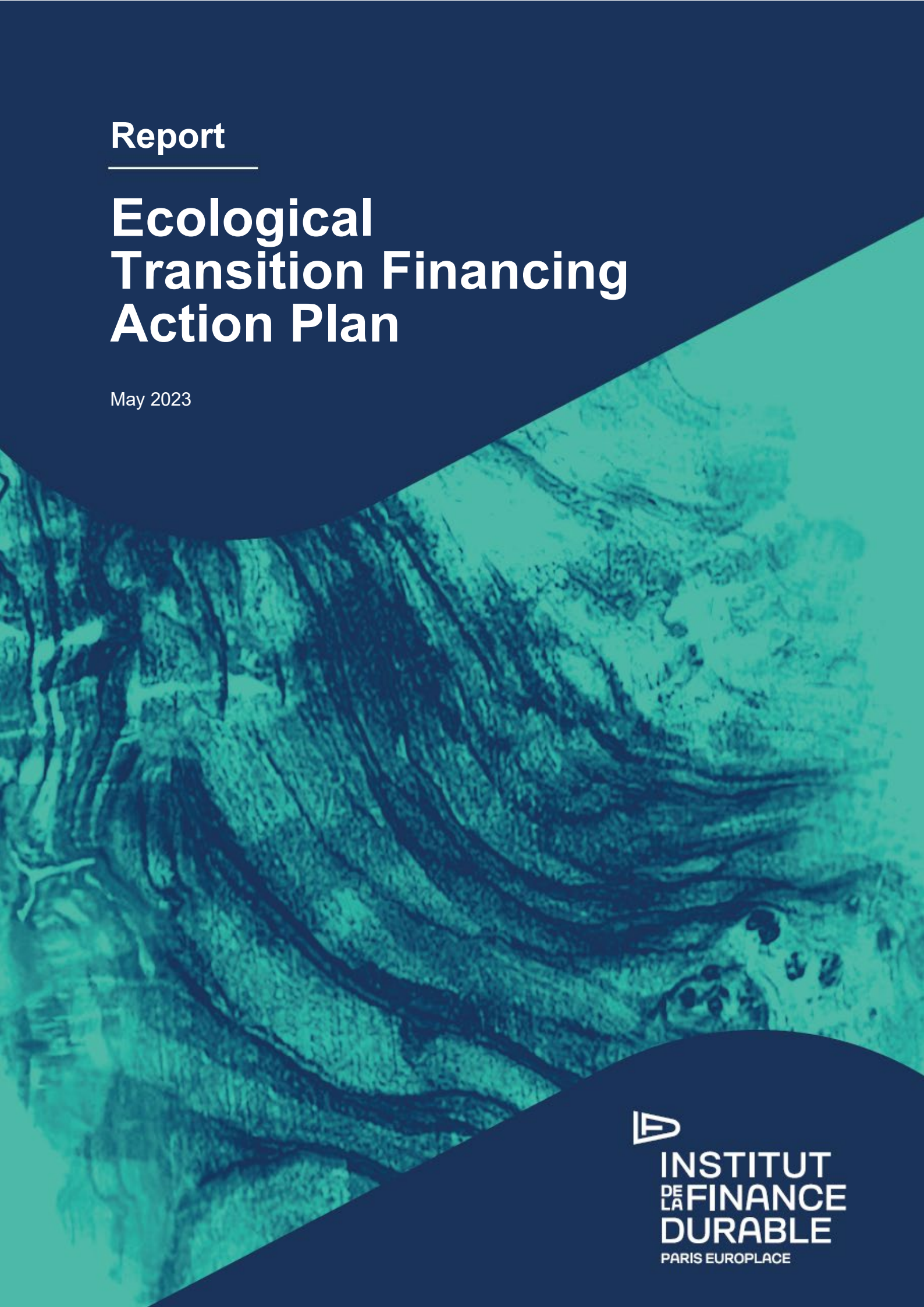
Report

Ecological Transition Financing Action Plan

May 2023



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Mr Yves Perrier
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Paris, 26 May 2023

Dear Minister,

In response to the task you entrusted to me in 2021, in March 2022 I submitted my report on how to organise the Paris Financial Centre to establish it as a benchmark for the climate transition. The Institute for Sustainable Finance was created further to this report. In November 2022, you entrusted me with a new task of forming the Paris marketplace Ecological Transition Financing Committee (CFTE) and proposing an action plan setting out the framework for the investments needed. In accordance with your request, please find enclosed the report that we have prepared in consultation with the French Treasury (*Direction générale du Trésor*). This report was produced by a taskforce of economic and financial experts. The main professional federations (FBF, France Assureurs, AFG and France Invest in particular) were closely involved in the taskforce and have approved the proposals.

There are three parts to the report:

1) An assessment of additional investment needs;
2) Details of available resources and current financing solutions;
3) The proposals put forward.

While the additional investment needs are significant, estimated at between €30 billion and €65 billion per year, French savings deposits, which total nearly €6,000 billion, including €3,000 billion in long-term savings, are a real asset that can be used to finance the ecological transition. This can be achieved by redirecting savings deposits, but also, and above all, by earmarking inflows, which average more than €100 billion per year, for transition financing.

A major issue we have sought to address in this report, besides identifying financial resources, is the need to consider the economic profitability of investment projects. Currently, there is a shortage of actual projects rather than of resources available for their funding, for two main reasons:

- The fact that many projects in support of the ecological transition are not economically profitable. Because of their low value in use, few of these projects have a profile likely to trigger investment decisions. This is particularly true of the thermal renovation of buildings.
- A cumbersome and unclear administrative framework, which complicates the implementation of

projects and appropriate financing solutions.

Accordingly, our proposals aim to address the issues of economic profitability, financing and the "channelling" of savings, while respecting two essential constraints:

- Any action to proactively channel savings will have to meet savers' basic demands in terms of return, risk and liquidity.
- The funds mobilised will have to satisfy the asset-liability and liquidity management constraints of the financial institutions involved (banks, insurers, asset managers, etc.).

Lastly, to make these proposals actionable by public authorities and private actors, we have ensured that they are simple to implement and compatible with the objectives of controlling public finances.

The proposals revolve around supporting individuals and businesses in their investments:

- For individuals, we propose rolling out interest-free loans at scale, accompanied by tax benefits in the form of a tax credit obtained as investments are repaid. The combination of interest-free loans and a tax credit, in the new inflation environment, should make these investments attractive to individuals and investors. For public finances, the expense is spread over the repayment period (e.g. 10-15 years for the thermal renovation of buildings and 5-7 years for vehicles).
- With regard to support for businesses, we propose, on the one hand, strengthening tax credit mechanisms through accelerated depreciation and, on the other hand, setting up a state guarantee fund that would boost the profitability of industrial or technological research projects that present a higher risk, but have strategic benefits in terms of the transition, particularly for start-ups, SMEs and mid-caps.

These loans to individuals and businesses would be funded by regulated savings deposits (LDDS, Livret A and PEL accounts), thereby ensuring that these deposits are used appropriately in light of the country's current challenges, and by life insurance. Target percentages will need to be defined to increase the portion of these savings used to fund these loans and investments for the ecological transition, while taking into account each institution's specific situation. Monitoring would be established to adjust the system as required.

The implementation of these mechanisms requires a clear definition of the investments to be targeted, be they project financing or corporate financing solutions, which must meet the dual objective of decarbonisation and reindustrialisation.

Once these guidelines are validated, the steps would be as follows:

- The creation of an "Ecological Transition" label, jointly with industrial, financial and public stakeholders (French Treasury, ministries, etc.), which would clearly identify the investments eligible for the financing or guarantees described above.
  While a large part of the investments (and the corresponding financing) can be qualified as "green" investments due to their intended purpose (thermal renovation, mobility based on electric, nuclear and renewable energy sources, for example), some investments are financed by corporate loans or equity, which, by design, are not specifically earmarked as such. A simple and robust analysis and certification methodology must be put in place for these investments.
  In essence, this exercise must adopt an industrial planning approach that prioritises investments based on two major criteria: their impact on CO_2 emissions and their contribution to the country's reindustrialisation in identified sectors and/or regions.

- The financial calibration of the proposed schemes, particularly in terms of tax credits, interest subsidies and risk guarantees, with three impact assessment criteria:
    - Economic profitability of projects for individual or corporate investors
    - Impact on public finances
    - Acceptability and social equity of aid granted.

Regarding the timetable, the objective would be to implement this work in the third quarter, so that the planned mechanisms, which, based on an initial analysis, do not require major legislative or regulatory changes, can be operational in early 2024.

I hope that these proposals will meet your expectations and thank you once again for the trust you have placed in us.
Yours sincerely,

[signature]

Yves Perrier
President of the Institute for Sustainable Finance

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Executive Summary

Executive Summary

This report follows on from the recommendations of the Perrier report of March 2022, in response to the task entrusted by the Minister of the Economy in 2021 on mobilising the financial sector to help decarbonise the economy.

In this report, Yves Perrier explained the way forward: "*the success of the climate transition will depend on the alignment of businesses, the financial system and the state. The transition is a long-term project that integrates a carbon target with industrial policy, social policy and sovereignty issues. To achieve this, it is essential to adopt a co-construction and co-steering approach.*" It is with this in mind that the Institute of Sustainable Finance (IFD) was created within Paris Europlace. The objective of the IFD is to coordinate the actions of ecosystem players (financial institutions, manufacturers, consulting firms, rating agencies, think tanks, federations and professional associations, and government authorities) to help transform the economy.

In November 2022, the Minister of the Economy and Finance entrusted the President of the Institute for Sustainable Finance with a new task: to propose an action plan for financing the ecological transition and to create the Ecological Transition Financing Committee (CFTE). This market and strategic policy guidance body aims to align private sector financial resources and instruments with decarbonisation strategies defined by sector.

A multi-stakeholder taskforce (comprising economists, banks, insurance companies, asset management companies, professional federations and public authorities)[1] was set up to carry out an initial analysis of ecological transition financing, coordinated by the French Treasury and the IFD. The proposals were discussed with the financial sector's main professional federations, namely the Fédération Bancaire Française, France Assureurs, the Association Française de la Gestion Financière and France Invest. The report focuses mainly on the energy transition and decarbonisation and does not address all ecological transition topics.

In accordance with the engagement letter, this report aims to define an action plan for financing the ecological transition based on an analysis of investment needs. Its objective is to support the CFTE by sharing a common assessment of the additional investments needed to be made by both businesses and individuals in the sectors with the highest emissions, and proposing financing solutions to meet these needs. This report is therefore a first step in the development of a genuine collective strategy to ensure that the Paris financial centre can meet the challenges and set an example internationally.

[1] The composition of the taskforce is provided in the Appendix.

I. The additional investments needed to ensure the ecological transition in France are estimated to be between €30 billion and €65 billion per year by 2030

Based on current macroeconomic calculations (Rexecode, I4CE, ADEME)[2][3][4] and estimates from the French Treasury, the additional investments needed to achieve the climate objectives set out in the second National Low Carbon Strategy (SNBC-2) are estimated at ***€30 billion to 65 billion per year by 2030 in relation to 2021****. These additional investments represent needs relating to the six major economic sectors to be decarbonised as identified in the SNBC, namely construction, transport, energy, industry, agriculture/forestry and waste. By way of comparison, the recent report[5] by J. Pisani-Ferry and S. Mahfouz estimates the need for additional "green" investments for the transition at €101 billion per year[6] by 2030 based on projections in the forthcoming SNBC-3[7].*

Investment needs are considered in this report in terms of gross fixed capital formation (they do not include expenditure related to intangible capital such as R&D or regular consumption). They are estimates of additional requirements compared to a business-as-usual scenario that repeats the investments made each year or projects past emission trends.

The cost of these investments would be mainly borne by businesses and public sector stakeholders (around €20-40 billion per year, or around two-thirds of the total). Households must be supported in making a significant investment effort (around €10 billion to €25 billion per year, the remaining third of the total), mainly for housing renovations to reduce carbon emissions and the transition to low-carbon mobility[8].

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[2] I4CE, 2022, Landscape of Climate Finance in France – 2022 edition.
[3] Rexecode, 2022, Working Paper No. 83 – The economic challenges of decarbonising France. An assessment of the necessary investments.
[4] ADEME, March 2022, Transition(s) 2050 – Choose Now. Act for the climate]. Macroeconomic Effects series.
[5] https://medias.vie-publique.fr/data_storage_s3/rapport/pdf/289488_1.pdf.
[6] These figures correspond to €66 billion/year of additional net investments for the transition, once the decline in "brown" investments (and those in vehicles with internal combustion engines) has been consolidated.
[7] As a reminder, the SNBC-3 (still under discussion) aims to align French efforts to reduce emissions with the new European target of a 55% decrease by 2030 compared to 1990 (Fit for 55 package), whereas the SNBC-2 was calibrated on the previous European target of a 40% reduction. In a previous memo for France Stratégie, J. Pisani-Ferry and S. Mahfouz estimated the additional net investment needs linked to the transition at €70 billion per year to 2030 to comply with SNBC-2 objectives.
[8] The figures of +€10 billion to +€25 billion/year for households are estimated based on price ranges for the cost of thermal renovations of residential property and the transition to low-carbon mobility, which are the two types of investments for the ecological transition to be made by households. The renovation of residential properties to reduce carbon emissions requires €5 billion to €20 billion/year of additional investments, from which the cost of renovating social housing should be deducted (source: I4CE; French Treasury). As regards the replacement of private vehicles with low-carbon models, the additional investment required is estimated at between €5 billion and €15 billion/year, from which the share of professional vehicles, which is included in the cost estimate, should be deducted (source: I4CE; French Treasury).

Sector	Average additional investment needs compared to 2021 to achieve SNBC-2 targets by 2030	Main items and stakeholders
Construction	**+€10bn to +€20bn/year, +€40bn/year in an ambitious scenario:** – Energy bill savings of up to €7bn/year (French Treasury) – Potential reallocation of funding at the expense of new construction (I4CE 2022)	Renovation: +€10bn to +€20bn/year Owner-occupiers, social housing landlords, private and public sector tertiary building owners
Road & rail transport	**+€10bn to +€20bn/year:** - Reallocation of purchases towards non-ICE vehicles, with additional cost - Technical uncertainties on heavy machinery; aviation and shipping not documented - Energy bill savings of up to €7bn/year (French Treasury)	Private vehicles: +€5bn to +€15bn/year All parties
Energy	**+€3bn to +€16bn/year:** Significant increase possible by 2050 to absorb increasing electrification	Renewables, electrical network Government, local authorities and energy firms
Industry	**+€2bn to +€3bn/year**: €6.9bn financed through the France Relance and France 2030 schemes. The SNBC-3 is expected to increase these needs	Energy efficiency, electrification, process change, CCS Main major high-emission sites
Agriculture and forestry	**+€2.5bn/year min. (+€1bn/year for forestry and +€1.5bn/year for agriculture):** up to +€5bn/year by 2050 with changes in practice and training	Use, livestock farming, reforestation Farm operators and forest owners
Waste	**+€1bn/year:** Few estimates available	Collection and energy recovery Local authorities

Figure 1 - Summary of additional financing needed for the ecological transition in France

These investments break down between the six economic sectors as follows:

- **Construction:** average additional investment needs are estimated at **+€10 billion to +€20 billion per year** by 2030 (or even **+€40 billion** in an ambitious scenario eliminating all buildings leaking heat by 2030). The main need is for building renovations to reduce carbon emissions, including changing heating energy sources. The main players concerned are households (the residential sector accounts for 64% of emissions compared with 36% for tertiary and public buildings).
- **Transport:** average additional investment needs are estimated at between **+€10 billion and +€20 billion per year** (before the increase in requirements under the SNBC-3). The main needs are related to transport and charging infrastructure as well as the purchase of low-carbon vehicles by individuals[9]. The additional cost of a low-carbon vehicle in relation to an internal combustion engine (ICE) vehicle would fall.
- **Energy:** additional investment needs are estimated at **+€3 billion to +€16 billion** per year due to the expected sharp increase in electrification. This wide range is explained by the uncertainty surrounding political and industrial choices for this sector. The main needs concern an increase in electricity generation and its decarbonisation (including the new nuclear programmes already announced), and electricity networks (transmission, distribution and flexibility). This decarbonisation is strategic for that of the economy as a whole, as it is also a condition for the decarbonisation of industry, transport and even construction (particularly in terms of new heating energy sources).
- **Industry:** average additional investment needs are estimated at **+€2 billion to +€3 billion per year** (to meet SNBC-2 objectives). The main needs concern energy efficiency, electrification, process change and CO_2 capture and storage. These figures, which may seem low, can be explained by the fact that decarbonisation mainly concerns that of energy sources, but also because very significant investments are already being made in the sector, aided by recent government funding plans (France Relance and France 2030). It is also difficult to distinguish between what constitutes “routine” investment in the industrial apparatus and “transition” investments. The SNBC-3 and a proactive industrial policy are expected to significantly increase investment needs in this sector.
- **In agriculture**, average additional investment needs are estimated at **+€1.5 billion per year** (**up to +€5 billion per year to 2050** including changes in agricultural practices and training). The **forestry sector** adds a further **+€1 billion per year** to investment needs. The main needs are the decarbonisation of motor vehicles, the reduction of the use of inputs and livestock emissions, the strengthening of natural carbon sinks and the adaptation of forests to climate change and the use of wood in construction.
- **Waste:** average additional investment needs are estimated at **+€1 billion per year.** The main needs are for waste reduction, collection and energy recovery.

The investment needs presented here should be considered as the lower end of the range of investments to be made in the coming years. These figures are in fact necessarily underestimated, firstly because they are based on the objectives of the SNBC-2 and do not yet take into account the increased climate objectives of SNBC-3, which are currently being

[9] N.B. Investments in aviation and shipping are not covered by recent studies.

developed. This will result in a significant increase in the investments required.

Secondly, these estimates are based on macroeconomic scenarios and assumptions that are subject to considerable uncertainty regarding the initiation of investment decisions and the amounts of these investments. These are dependent on market trends, the cost of raw materials and also the estimation uncertainties inherent in the prices of technologies that are not yet mature. They may vary according to political choices, in particular industrial and decarbonisation policies, and the proactiveness of these policies.

Thirdly, in the absence of available data, these estimates do not cover investment needs related to climate change adaptation, which will certainly require additional investments.

II. French households hold substantial savings that are compatible with financing needs and could be better used in support of the ecological transition

The financial savings landscape in France has changed very little over nearly 40 years. It was built around the objectives of home ownership and precautionary savings, in a country where retirement planning is dominated by compulsory pay-as-you-go pension systems. Today, there is a need to redefine the savings landscape to adapt it to the challenges of our time and to massively redirect both new and outstanding savings towards financing the ecological transition.

French savings are particularly high

With one of the highest savings rates in developed countries (14% of disposable income per year on average over the last ten years)**, household financial savings are dynamic and resilient, amounting to nearly €6,000 billion (as of Q3 2022).** These savings are invested in life insurance (32%, ~€1,900 billion, of which 77% in traditional euro funds and 23% in unit-linked (UL) policies at end-2021) and regulated savings (15%, ~€860 billion, of which 39% in Livret A, 35% in PEL and 15% in LDDS accounts), reflecting French people's preference for liquidity, their risk aversion and their expectations in terms of return. The French also hold a large share of their savings in current accounts and sight deposits (14%, ~€810 billion) as well as in term accounts and ordinary savings accounts (6%, ~€340 billion). Lastly, 20% (~€1,140 billion) of financial savings are invested in unlisted equities[10] (mainly the productive assets of self-employed workers) and 8% (~€455 billion) in listed equities.

However, it is important to distinguish between types of savings in terms of how easily they can be mobilised to finance the ecological transition. **Long-term savings, including life insurance, regulated savings accounts and listed share ownership, which can be mobilised for the energy and ecological transition, amount to nearly €3,200 billion.** They account for more than half of French people's savings (55.7%). The remaining half would be more difficult to mobilise (mainly demand deposits and unlisted equities), except possibly via private equity, private debt and infrastructure funds.

Financial investments	Outstanding amounts (in € bn, in Q3 2022)	Share of outstanding savings (%)

[10] Unlisted shares make up a significant portion of outstanding savings but will not be considered in the rest of this report, given their low liquidity and the limited capacity to mobilise this type of savings (founders' shares, business creation shares, etc.).

Main financial investments	**5,691.6**	**100**
Long-term savings products	**3,167.1**	**55.7**
Life insurance and retirement savings	***2,876.7***	***32.9***
o/w traditional euro funds	*1,436.0*	*25.2*
o/w unit-linked funds	*440.7*	*7.7*
Regulated savings accounts	***862.3***	***15.2***
Listed equities	***299.7***	***5.3***
Indirectly-held shares (UCIs)	***128.4***	***2.3***
Cash, demand deposits and similar	**1,299.2**	**22.8**
Cash and demand deposits	*817.7*	*14.4*
Other interest-bearing bank deposits (saving accounts, term accounts)	*344.5*	*6.1*
Indirectly-held debt securities (UCIs)	*96.7*	*1.7*
Directly-held debt securities	*36.1*	*0.6*
Money market funds	*4.2*	*0.1*
Unlisted equities and other products	**1,225.3**	**21.5**
Unlisted shares and other equity investments	***1,143.4***	***20.1***
Other (including real estate and non-residents)	**81.9**	**1.4**

Figure 2 - Summary of financial savings (source: Banque de France, IFD)

These savings are substantial and confirm that the French economy has the capacity to finance the investments needed for the ecological transition by itself.

Annual net inflows total more than €110 billion and have increased since the Covid crisis

The financial savings of French households are growing, with the savings rate at end-2022 (6.9%) two points higher than its pre-Covid level (4.9% at end-2019). The savings rate has risen by nearly 5% per year in recent years, benefiting from both a positive market effect and positive net inflows (€112 billion per year on average over the past ten years)**.** It rose sharply during the pandemic, with net private savings inflows of €198.6 billion in 2020, €161.5 billion in 2021 and €155.5 billion in 2022. The Banque de France estimates net inflows in 2022 to be €40.3 billion for regulated savings accounts and €39.1 billion for unit-linked life insurance products (compared with outflows of €10 billion from life insurance products over the period). These strong net inflows overall reflect the capacity of the French economy to finance investments in the ecological transition over the coming decades.

The current market environment could change the structure of savings

The current market environment (rising interest rates, inflation, sharp decline in the equity and bond markets in 2022, uncertainty about the macroeconomic environment, etc.) is likely to have a contrasting effect on the savings behaviour of French households. On the one hand, the savings rate could increase with a rise in precautionary and regulated savings in a crisis environment. On the other hand, the inflationary environment may reduce households' savings capacity.

In any case, the current trend is likely to affect the structure of outstanding savings. In times of uncertainty, households seek out liquid products, which should benefit regulated savings, particularly the Livret A and the LDDS accounts. These products recorded a rise in inflows in early 2023 as their nominal return increased. For other products such as life insurance, we can expect less momentum.

In addition, changes in the structure of French savings also reflect longer-term challenges, with a relative rise in retirement savings products (individual, collective and

mandatory company retirement savings plans) **and responsible investment** (gradual increase in the weight of ESG/SRI investments in investment strategies, fund labelling mechanisms, allocation of assets, transparency and sustainability regulations, etc.).

Savings only marginally finance the ecological transition at present

French people's savings mainly finance debt, housing, businesses (including VSEs and SMEs), shares on a secondary basis, but very few products that are identified as being "green" or in transition. The regulatory landscape for financial savings in France has changed very little over nearly 40 years. It was built around the objectives of home ownership, precautionary savings and inter-generational transfers, in a country where retirement planning is dominated by compulsory pay-as-you-go pension systems. Today, this landscape needs to be redefined and adjusted to the challenges of our time.

As part of efforts to combat climate change and with the rise of green finance, there are initiatives to create **"green" savings products, but the amounts invested in them are insignificant in view of potential needs**. In the particular case of the main savings products:

- **The main regulated savings products used to finance the transition are products partially allocated to the National Savings Fund** (in French "Fonds Epargne" - mainly Livret A and LDDS savings accounts). This represents around €500 billion in savings, 60% of which are centralised in the National Savings Fund managed by Caisse des Dépôts. The remaining 40% are held by the collecting banks. The centralised savings and a portion of outstanding deposits are partially invested in the transition (e.g. for the energy renovation of buildings, construction of buildings according to new environmental standards, green loans, green financial assets, etc.). For non-centralised savings, the collecting banks are obliged to invest at least 10% of the funds in support of the energy and ecological transition (EET). They already easily meet this objective.
- **Life insurance funds are gradually channelling some flows and outstanding assets towards EET financing, but this remains minimal.** However, the possibilities for channelling investments towards "green" products need to take into account certain constraints (e.g. solvency rules for investments in euro funds, the duty to advise investors, etc.).

As such, the portion devoted to financing the ecological transition is still minimal, though it remains in line with the reality of identifiable ecological transition projects sponsored by private and public actors. Today, there is a need to redefine the savings landscape to adapt it to the challenges of our time and to redirect new and outstanding savings to financing the ecological transition.

There is a multitude of initiatives to promote EET financing but they are dispersed

The review of the resources that could be mobilised to support the ecological transition must also consider the solutions already available in France, both for individuals and businesses. The aim is to consider financial resources with current public and private financial instruments that support the transition and their relevance with regard to the real needs of private and public actors with concrete projects - over and above estimated needs - in order to identify their limits and thus the levers for action.

In recent years, there has been a rise in French and European initiatives aimed at individuals and businesses to promote the financing of the EET.

For individuals, there is an array of specific schemes to encourage the thermal renovation of homes and the purchase of clean vehicles, the main one of which is the éco-PTZ (zero-interest eco loan). The government also offers subsidies: MaPrimeRénov' for thermal renovations and the vehicle scrappage bonus for the purchase of clean vehicles. While these schemes are starting to gain popularity, they alone do not yet provide enough incentive for households to carry out renovations or change vehicles to meet national targets in this area. These financial solutions complement the savings that households can use for their project and traditional bank financing solutions such as home loans and consumer loans, which are widely accessible and competitive. The obstacles include the complexity of procedures, the definition of the project and the choice of professionals, as well as the uncertain profitability of these investments.

Businesses have access to a range of solutions to finance an investment or expense that supports the ecological transition. Upstream of financial instruments, there are also solutions available to assist with the implementation of an ecological transition approach (diagnostic tools available from the Chambers of Commerce (CCI), the environment agency (ADEME), Bpifrance, etc.). In particular, Bpifrance supports investments in R&D or in industrial companies' first investments. The main ecological transition project financing tools specifically available to businesses, beyond traditional bank financing solutions, are green and responsible bonds and green loans. There are also public support mechanisms similar to those available to individuals (energy-savings certificates (CEE scheme), clean mobility assistance, etc.).

The European Union has also developed business financing solutions to decarbonise the economy. These various investment programmes often include a green component - this is the case for economic stimulus tools (Recovery and Resilience Facility, InvestEU, REPowerEU, Innovation Fund, etc.). The European Investment Bank (EIB) is one of the world's leading sponsors of climate action.

As a result, we are seeing an increase – or even a real surge – in the number of financing initiatives and instruments available to businesses and individuals, whether public aid or private financing schemes, to support ecological transition projects. However, this wide range of solutions and easy access to credit for many years to finance any solvent project, including green or transition projects, does not alone seem to be enough at present to encourage private and public players to launch useful projects that can be financed using current resources.

Over and above the shortage of projects, there can be many difficulties related to the financing of these projects: a lack of financial solutions to cover the level of risk inherent in certain highly innovative projects, implementation procedures that are unsuited to the current challenges, a lack of visibility of the solutions available, complex administrative formalities to obtain insufficient amounts of aid, etc.

However, it is important to capitalise on these experiences at all levels to simplify the solutions and roll out the most efficient systems at scale so this ecosystem encourages players to take action to achieve climate objectives.

III. Ecological transition financing action plan: recommendations of the Institute for Sustainable Finance

The investments needed are compatible with the available resources. The key challenge is to create the economic conditions for these investments to be made and for financial savings to be channelled into these projects. As these investments have no value in use, the question arises as to the breakdown of their cost between individuals, companies and the state. Here, the IFD proposes a roadmap to successfully decarbonise the economy and reindustrialise the country.

The fight against climate change and the reindustrialisation of France are now priorities, the success of which requires considerable investment in research and development, the transformation of industrial processes and new infrastructure for key sectors of the economy. The French economy has the means to make these investments, in particular thanks to household savings, which have never been so abundant. A major issue we have sought to address in this report, besides identifying financial resources, is the need to consider the economic profitability of investment projects. Currently, there is a shortage of actual projects rather than of resources available for their funding. One of the major challenges of the ecological transition for France is to encourage the key players in this transition (businesses, households, public sector players) to initiate projects in this area.

As the transition has a low value in use (the negative externalities have very little impact on economic agents), the costs of this transformation must be shared to create the conditions for a sustainable transition market and establish the necessary new economic equilibrium. Given the state's financing constraints, it will be necessary to spread the cost between individuals, businesses and the state while ensuring that the solutions chosen do not deteriorate the state's financing terms. Succeeding in the ecological transition means above all enabling the emergence of solid business cases that combine a facilitating legal framework, quality infrastructure, public coordination and private initiative.

This redirecting of French households' financial savings towards financing the ecological transition will have to take into account their preferences in terms of risk, return and liquidity. The success of the solutions implemented will thus depend in part on the financial competitiveness of green investments, taking into account taxation, other public support measures and the actual environmental impacts of the investments.

The ecological transition as a new challenge for international competition

While Europe is a pioneer in the ecological transition, Asia and the Americas have gained solid momentum in this area. In 2022, China attracted $546 billion in energy transition investments[11]. It is also the global powerhouse in the manufacture of clean technologies, producing 96% of solar panels, 83% of offshore wind turbine blades and three-quarters of the world's batteries[12]. Meanwhile, the US has enacted the Inflation Reduction Act (IRA), one of the most important laws in decades supporting an industrial policy designed to stimulate the US economy, reorganise supply chains and decarbonise its economy. While these ambitious programmes are an

[11] "Global Low-Carbon Energy Technology Investment Surges Past $1 Trillion for the First Time", 26 January 2023, BloombergNEF.
[12] IEA.

opportunity for the planet, they show that the ecological transition has now become a matter of international competition.

In response to the US Inflation Reduction Act, the European Commission published its own proposed regulation, the Net Zero Industry Act. At the same time, a proposal for European legislation to reform the organisation of the electricity market[13] and the market for critical raw materials[14] was also presented. These proposed regulations aim to clarify the legal framework for the EU's energy transition and reduce its dependence on imports, which are highly concentrated among a few countries. As a necessary building block to finalise the framework of the European Green Deal, this mechanism could prove insufficient in the face of the IRA and its massive subsidies, which could affect the development of a European green industrial sector. While the response must be partly regulatory, the EU must also adopt financial solutions to secure the investments needed to decarbonise its economy and ensure its industrial sovereignty.

Make France more attractive and meet climate objectives

To make France more attractive and ensure it meets its climate goals, the government has prepared a draft green industry law with two objectives: to make France the champion of clean technologies and support industries with their decarbonisation to ensure the country's industrial and energy sovereignty.

Successfully decarbonising the economy and reindustrialising the country means successfully managing two joint requirements:

- mobilising financing, in particular financial savings invested in debt and *equity*, in support of the necessary investments. This means using savings to back investments in the ecological transition;
- finding the economic equilibrium of ecological transition projects to trigger investment decisions and make them sustainable over time. The public authorities must ensure the creation of an ecological transition market using the four tools at its disposal (subsidies, the cost of financing, state guarantees and tax credits).

To succeed, the proposal is to "green" all long-term savings by transforming the entire financial savings architecture as it is structured today. These solutions aim for simplicity and clarity. The IFD has focused its proposals on three areas of action:

1) Clearly define the projects for which resources must be mobilised;

2) Increase the economic profitability of the ecological transition for project owners, investors and individuals;

3) Mobilise financial resources for ecological transition projects.

[13] European legislation to reform the organisation of the electricity market.
[14] European legislation to reform the organisation of the market for critical raw materials.

I. Clearly define how the resources mobilised will be used and what projects can be financed

The purpose for which the financing will be mobilised must be clearly defined. As a first step, it is therefore necessary to clearly identify the types of projects and businesses involved in the ecological transition and define the corresponding eligibility criteria. Project financing is by nature easier to identify and a detailed list of activities will make it easy to as certain the financing and investments that contribute to it. However, for corporate debt financing (loans or investments), the destination of financing is inherently untraceable. It is therefore necessary to clearly define criteria that can easily determine what qualifies as “transition financing” for the companies that benefit from it.

Proposal 1a: Clearly define a list of priority activities and projects to be financed for the ecological transition, which could be awarded an “ecological transition project” label

First, it is necessary to define a precise list of priority and eligible activities and projects in order to clarify the allocation of financial savings and constraints on their use in order to better identify what contributes to the ecological transition.

This does not entail building a parallel Taxonomy but instead **drawing up a list of priority transition activities as part of a “green” industrial strategy for the country.**

Within this framework, priority investment areas could also be identified to integrate the objective of supporting local areas the most affected by deindustrialisation. The definition of “green” projects should take into account their contribution to reducing greenhouse gas emissions and the country’s objectives of reindustrialisation in sectors that are deemed priorities.

This list of projects will require consensus among public and private stakeholders and will be regularly updated to take into account scientific and technological developments. It should thus be built with industrial companies and public actors, supported by scientific analysis. This work could potentially be carried out by the IFD, which will report on its work to the Ecological Transition Financing Committee.

Proposal 1b: Determine the conditions that businesses must meet to be able to consider that the financing and investments they receive are part of the transition

Financing the transition involves supporting the transformation of the business models or production methods of the most carbon-intensive companies. In addition to financing dedicated projects, assets or activities, it is also crucial to establish a framework to enable financial institutions to assess whether “corporate” investments or loans, which are not earmarked for a particular project, contribute to the transition. It would therefore be useful to define clear criteria to assess whether a business active in a sector with the highest greenhouse gas emissions is indeed in transition.

<u>Proposal 2</u>: Create an "Ecological transition" label for financial products

To foster better identification and monitoring of financing for the transition and the decarbonisation of our economy, it would be useful to create an "Ecological transition" label designed as a transition finance classification and not only as a savings product label. This proposal could, of course, only be worked on after the transition criteria for the underlying assets are defined (see proposals 1a and 1b). Such a label would also serve savers, even if this is not its primary purpose. Consequently, its interaction with current labels will need to be carefully studied. This work should ideally be carried out at European level.

II. Increase the economic profitability of the ecological transition for project owners, investors and individuals

Financial players note a shortage of projects in the energy and ecological transition. There are two paths to be followed to ramp up these projects: (i) the creation of an environment that makes investing in France attractive; (ii) the development of conditions that make transition projects more profitable.

Enabling businesses to invest in the ecological transition presupposes, above all, a global ecosystem that makes investing in France more attractive via several strategic components, including (i) the development and consolidation of an infrastructure network commensurate with the challenges of the ecological transition, (ii) an education system that makes the ecological transition a core skill, and (iii) access to cheap energy to ensure the sustainability of industrial investments, particularly investments in the energy transition. These conditions are essential to ensure a favourable environment to encourage investments in support of the energy and ecological transition. However, they are partially outside the IFD's remit and will require strong political will.

The next step is to create the conditions for a sustainable transition market and to find the necessary new economic equilibrium. Two key issues in investment decisions are reward and risk. Whether for individuals, businesses or investors, projects linked to the transition often do not currently meet the reward and risk criteria required to encourage action. For example, one of the obstacles to the thermal renovation of homes, besides operational considerations, has been the low economic interest for households: until recently, the return on investment arising from the savings made was too uncertain to guarantee an economic interest. To ensure a just transition, additional investment costs cannot be borne solely by households, under regulatory constraints, or only by businesses, because these additional costs will inevitably be passed on to the prices of goods and services (if this proves difficult or impossible, it will exacerbate the shortage of investments) and therefore ultimately to the consumer. The transition to more sustainable systems will only be possible if governments and businesses work to reduce social inequalities and improve access to greener goods and services.

One solution would obviously be to integrate the cost of carbon, which would impact the profitability of projects, while taking into account the societal impacts on consumers. However, as this necessary condition does not fall within the scope of the financing plan, it is not further developed in the report.

Beyond this, the aim is to implement financial instruments to promote the economic equilibrium of investments for both individuals and businesses.

A) Foster economic profitability for businesses

Proposal 3: Accelerate the tax amortisation of EET investments

To encourage companies to make these investments, it would be possible to allow accelerated tax amortisation of investments in the ecological transition (as defined in proposal 1). This proposal must be calibrated with the public authorities to avoid unintended consequences and limit the impact on public finances.

Proposal 4: Create a state guarantee fund for green investments, particularly for more strategic investments, and/or investments driven by SMEs/mid-caps

The IFD proposes the creation of a guarantee fund based, in particular, on the model of the "Junker plan" of the European Fund for Strategic Investments (EFSI) which, with an initial allocation of €21 billion and leverage, guaranteed more than €335 billion of private investment throughout the European Union over three years to revive the economy after the crisis.

The IFD proposes developing a state guarantee fund to back transition investments, especially in infrastructure and innovative technologies and in particular investments by SMEs and mid-caps, which are currently considered riskier and are therefore more difficult to finance.

B) Help individuals invest in the ecological transition

Households have an important role to play in the ecological transition, in particular by investing in housing renovations to reduce carbon emissions and low-carbon vehicles. To ensure the thermal renovation of homes and encourage the purchase of clean vehicles at scale, these investments must be made more attractive, their results must be made more certain and their economic profitability must be ensured for households. The combination of the éco-PTZ, enhanced aid packages such as MaPrimeRénov', the energy savings achieved, and the clear risk of a fall in the asset price with additional tax depreciation should make housing renovations to reduce carbon emissions and the purchase of low-carbon vehicles more attractive, while spreading the necessary public spending over time.

Carrying out home renovations to reduce carbon emissions is a complex administrative and operational process. Households have to make multiple applications and carrying out the work is time-consuming and energy-intensive. In addition to economic incentives, public authorities must ensure that the schemes available to households are easy to use. This means consolidating the France Renov single point-of-contact and generalising an integrated approach to building renovation to facilitate support and reduce the administrative procedures that currently hinder the thermal renovation of homes.

<u>Proposal 5</u>: Roll out the éco-PTZ (zero-interest eco-loan) at scale for housing renovations to reduce carbon emissions and extend it to all household EET investments

The éco-PTZ is an effective solution and the experience and visibility acquired must be leveraged. It should be established as a long-term scheme and its use should be generalised and extended:

- The éco-PTZ should be allowed to finance 100% of the investment effort to avoid households having to make a cash contribution, as this most often discourages the completion of the work.
- Broaden the scope of éco-PTZ financing: Energy sovereignty is a priority. Households may want to insulate their homes but also produce energy (solar panels, geothermal energy, wind turbines, etc.) or buy an electric vehicle. The éco-PTZ could also finance these types of household investment. A single loan for all purposes would improve its visibility.
- Facilitate the mechanism that makes it possible to take out an éco-PTZ loan at the same time as a loan to purchase a home and finance refurbishments.
- **Simplify decision-making for co-ownership associations and access to the éco-PTZ for collectively-owned buildings.** Very few thermal renovations are carried out in co-owned buildings because of the cumbersome decision-making process and the difficulties in financing such projects. A loan associated with the property and not the person could be considered for properties under co-ownership, with the amount payable being assigned by the previous owner at the time of sale via a notarial deed.[15]

<u>Proposal 6:</u> Make household investments in the ecological transition tax deductible

To simplify administrative procedures, the aim would be to shift public expenditure away from subsidies (in particular by limiting the MaPrimeRénov' grant and bonuses for the purchase of a clean vehicle to the lowest-income households) and instead provide financing to make household EET investments tax deductible. In particular, this would make it possible to spread the state's financial effort over time. Analysis involving the various stakeholders to define and confirm the benefits of such a change and the conditions for its success will be necessary to involve all stakeholders and ensure their appropriation of the system. The aim would be to target and calibrate this proposal with the public authorities to avoid unintended consequences and limit the impact on public finances.

III. Redirect savings to finance the ecological transition

The IFD proposes strengthening current savings schemes serving the ecological transition by encouraging the greener use of these savings:

- Regulated savings, in particular through the Caisse des Dépôts et Consignations National Savings Fund;
- Long-term financial savings, including life insurance products and retirement savings plans.

[15] This proposal requires a detailed analysis of the processes to be implemented to ensure compliance with debt ratios.

It is not a matter of inventing new savings products, but of using all household financial savings to finance the transition.

A) Strengthen regulated savings schemes to finance the ecological transition

The IFD proposes encouraging the allocation of regulated savings inflows that already contribute to the financing of the ecological transition, in particular the Livret A, the LDDS and the PEL, so that these savings can be mobilised, in line with needs, in parallel with the implementation of ecological transition projects. There are already mechanisms in place for allocating these savings to the EET, either via the CDC National Savings Fund or banks' balance sheets, but these mechanisms need to be clarified and strengthened.

Proposal 7: Increase the share of the National Savings Fund that finances housing renovations to reduce carbon emissions, low-carbon construction and energy infrastructure projects that are key to the ecological transition

The National Savings Fund must continue to be used to finance social housing and urban policy, which remain a priority. However, the government could set a target for it to be used more to finance renovations to reduce the carbon emissions of social housing and public buildings. Social housing players are now setting an example in terms of renovations to reduce carbon emissions, but the climate emergency requires an acceleration of the pace. This would not require any change in the law, but a clarification of Caisse des Dépôts' investment policy.

While the EET is indeed a priority of the National Savings Fund, with budgets specifically allocated to it, the government could enshrine the financing of the ecological transition as a priority alongside social housing and urban policy. Although the current framework already partially allows this, it would provide National Savings Fund asset managers with greater financial capacity (without ruling out the financing of social housing) to finance large, strategic transition infrastructure projects that require large long-term loans, with significant positive externalities. The National Savings Fund already helps many local authorities invest in the transition, but it could also finance new nationwide projects (energy infrastructure, transport and mobility, etc.).

Proposal 8: Establish dialogue between the public authorities and the banks that hold regulated savings to continuously adapt the banking offer to growing financing needs

The IFD proposes that banks regularly report on their financing of the ecological transition to monitor changes in the growth of these investments.

Targets for financing allocated to the ecological transition could be set collectively based on this monitoring and the anticipated increase in demand for financing. Public authorities and financial institutions would thus have the continuous objective of inventing new financing solutions adapted to needs.

The Ecological Transition Financing Committee would be at the heart of this task of monitoring and co-building financing solutions with financial institutions and public authorities.

In the long term, it could be possible to increase the maximum amount that can be held in the LDDS account if the financing needs of the ecological transition so require.

Proposal 9: Encourage the financing of thermal renovations via the PEL home savings loan by creating a mechanism to encourage holders to use their savings for this purpose

An interest bonus of 0.5 percentage points could be granted on the release of savings from a PEL account provided that these savings are used to finance the renovation of the saver's home to reduce its carbon emissions (for example, when applying for an éco-PTZ), regardless of the PEL interest rate, with a maximum bonus to be defined. To speed up the release of savings to ramp up renovation work before 2030, this window of opportunity should be left open for a limited time (five years for example) and subject to the age of the PEL savings account. The objective would be to encourage households that are already homeowners to use their PEL to finance renovations.

B) Direct life insurance and retirement savings assets towards long-term investments in the ecological transition

Two long-term savings mechanisms can be redirected to financing EET investments, which are long-term projects and therefore need visibility: life insurance products and retirement savings plans.

Proposal 10: Direct life insurance savings towards transition financing

Proposal 10a: Develop an "Ecological transition" label for life insurance products

On a voluntary basis, insurers would be given the opportunity to assign compliant traditional euro and euro-growth life insurance products as "Ecological transition" funds. The insurer would commit to investing a portion of the fund in "green" and transition assets as defined in proposal 2.

Proposal 10b: Strengthen private equity investments (particularly in companies in transition) in unit-linked life insurance policies by including at least one unit of account invested in private equity.

Proposal 11: Direct PER retirement savings funds more towards long-term investments

- Include a minimum share of private equity investments (particularly in companies in transition) in the PER: include an allocation in transition investments up to ten years before the retirement age to finance unlisted SMEs and mid-caps and diversify French people's savings. A minimum investment in private equity funds could be established for dynamic and balanced investment profiles.
- Allow "Transition"-labelled funds to be taken into account for the obligation to list certified funds in company savings plans (PEE) and company retirement savings funds (PER).
- Reduce social security contribution for investments in collective PER funds that offer Transition-certified funds. Currently, employee savings invested in a collective PER are subject to lower social security contributions (16% instead of 20%) if the collective PER offers a fund invested in SME-ISE securities. A similar measure for funds financing green or transition industries, or an even greater incentive (0% social security contribution), could be proposed.

Introduction

The fight against climate change and the reindustrialisation of France are now priorities, the success of which requires considerable investment in research and development, the transformation of industrial processes and new infrastructure in all key sectors of the economy. The French economy has the means to make these investments, in particular thanks to household savings, which have never been so large and abundant. A major issue we have sought to address in this report, besides identifying financial resources, is the need to consider the economic profitability of investment projects. Currently, there is a shortage of actual projects rather than of resources available for their funding. One of the major challenges of the ecological transition for France is to encourage key players (companies, households, public players) to initiate projects in this area.

The ecological transition represents a necessary shift towards a new economic and social model - a sustainable development model that changes how we consume and produce in order to meet the major environmental challenges of climate change, the scarcity of natural resources and accelerated biodiversity loss. The aim is to reinvent our economic model for the most energy-intensive sectors, namely construction, transport, energy, industry, agriculture and waste, to make them compatible with ecological constraints.

This report focuses mainly on the financing needs of the energy transition and decarbonisation. It does not cover all the financing needs of the ecological transition in the broad sense.

Find a new equilibrium for the economy and civil society in an unparalleled industrial revolution

As the transition has a low value in use, the costs of this transformation must be shared to create the conditions for a sustainable ecological transition market and establish the necessary new economic equilibrium. Succeeding in the ecological transition means above all enabling the creation of solid business cases that combine a facilitating legal framework, quality infrastructure, public coordination and private initiative.

To make climate commitments a reality, a genuine industrial and technological revolution is required at the global level to transform a significant part of the economic fabric over the next two to three decades. This change concerns all sectors of activity, which will have to adapt their products, infrastructure and industrial processes.

In addition to redirecting financial flows towards the ecological transition, it is therefore a question of creating an economic environment that allows, first and foremost, the industrial projects of the transition to be designed and desired by businesses, households and public authorities in order to grow.

Funding must be analysed in terms of two fundamental components:

- equity financing to fund long-term projects, risk-taking, intangible assets and uncertain profitability, financed by financial savings.
- debt financing for material investments and operating needs via debt instruments such as loans, which must be repaid and which fall within a responsible lending framework based on the borrower's objective repayment capacity. The funding of these instruments can be diversified, notably with fungible resources on banks' balance sheets, which are subject to an ALM policy to ensure their optimal cost and duration, in accordance with accounting and prudential banking regulations.

While the central objective of this industrial revolution is to decarbonise the economy, more

broadly it is a question of finding a new balance for civil society that takes into consideration the scarcity of resources and the fragility of nature that allows life on our planet and its habitability for mankind. The geopolitical and social consequences of this revolution in ensuring security of supply, sovereignty and the social acceptability of transformations must not be neglected. In particular, the challenges of changing uses and managing any short- and medium-term inflationary effects, while ensuring equality between generations must be anticipated. The just transition is therefore a key pillar of this revolution.

The ecological transition as a new challenge for international competition

While Europe is a pioneer in the ecological transition, Asia and the Americas are catching up. In 2022, China attracted $546 billion in energy transition investments[16]. It is also the global powerhouse in the manufacture of clean technologies, producing more than 80% of solar panels worldwide and up to 96% of certain components used in their manufacture[17], 83% of offshore wind turbine blades and three-quarters of the world's batteries[18]. Meanwhile, the US has enacted the Inflation Reduction Act (IRA), one of the most important laws in decades supporting a comprehensive industrial policy designed to stimulate the US economy, reorganise supply chains and decarbonise its economy. While these ambitious programmes are an opportunity for the planet, they show that the ecological transition has now become a matter of international competition.

In response to the US Inflation Reduction Act, the European Commission has published its proposed regulation, the Net Zero Industry Act. This regulation was published alongside a proposal for European legislation to reform the organisation of the electricity market[19] and the market for critical raw materials[20]. These proposed regulations aim to clarify the legal framework for the EU's energy transition and reduce its dependence on imports, which are highly concentrated among a few countries. As a necessary building block to finalise the framework of its Green Deal, this mechanism could prove insufficient in the face of the IRA and its subsidies, which could affect the development of European green industry. While the response must be partly regulatory, the EU must also adopt financial solutions to secure the investments needed to decarbonise its economy and ensure its industrial sovereignty. This is particularly true as its climate targets are ambitious. The new Effort Sharing Regulation adopted in March

2023 under the Fit for 55 objective sets a target for the transport, construction, agriculture and waste sectors to reduce greenhouse gas emissions at EU level by 55% by 2030 compared to 2005 levels.

Accelerate France's ecological transition and reindustrialisation

The National Low Carbon Strategy (SNBC) is the main instrument for managing the ecological transition, setting diminishing carbon budgets by sector. In the summer of 2022, the government announced the creation of the General Secretariat for Ecological Planning (Secrétariat général à la planification écologique), an inter-ministerial body to coordinate the development of national strategies in terms of climate, energy, biodiversity and the circular economy. To make France more attractive and ensure it meets its climate goals, the government has prepared a draft green

[16] "Global Low-Carbon Energy Technology Investment Surges Past $1 Trillion for the First Time", 26 January 2023, BloombergNEF.
[17] IEA, Solar PV Global Supply Chain, July 2022, here.
[18] IEA, Securing Clean Energy Supply Chains, July 2022, here.
[19] European legislation to reform the organisation of the electricity market.
[20] European legislation to reform the organisation of the market for critical raw materials.

industry law with two objectives: to make France the champion of clean technologies and support industries with their decarbonisation to ensure the country's industrial and energy sovereignty.

In his report submitted to the Minister for the Economy and Finance, Yves Perrier[21] indicated the way forward: "*the success of the climate transition will depend on the alignment of companies, the financial system and the state. The transition is a long-term project that integrates a carbon target with industrial policy, social policy and sovereignty issues. To achieve this, it is essential to adopt a co-construction and co-management approach.*" It is with this in mind that the Institut de la Finance Durable (IFD) was created within Paris Europlace. The objective of the IFD is to coordinate the actions of ecosystem players (financial institutions, manufacturers, consulting firms, rating agencies, think tanks, federations and professional associations, and government authorities) to help transform the economy. The Ecological Transition Financing Committee (CFTE), a market and strategic policy guidance body, was also created at the same time, at the request of the Minister of the Economy in his engagement letter of 4 November 2022.

The announced priority of the IFD was to address financing solutions for the ecological transition in France. A multi-stakeholder taskforce (comprising economists, banks, insurance companies, management companies, professional federations and public authorities)[22] was set up to complete this work, co-ordinated by the French Treasury and the IFD. This work was made possible thanks to the strong involvement of all the members and four taskforce sub-groups:

- Sub-group 1 identified financing needs for the ecological transition.
- Sub-group 2 produced an overview of current savings and financing solutions for the ecological transition.
- Sub-group 3 drafted proposals for corporate financing solutions for businesses' transition investments.
- Sub-group 4 produced recommendations for supporting individuals in their transition-related investments.

This report, based on the taskforce's work, seeks to support the CFTE by sharing a common assessment of the additional investments needed to be made by both businesses and individuals in the sectors with the highest emissions, and proposing financing solutions to meet these needs. It is intended to be a first step in the development of a collective strategy to ensure that the Paris financial centre can meet the challenges and set an example internationally.

The members of the Institute for Sustainable Finance therefore set themselves the task, first (Chapter I), to share a common assessment of the additional investments needed to ensure the success of the ecological and energy transition (EET) and to identify the decarbonisation levers to be financed. This work was carried out jointly with the French Treasury and must continue with dialogue between the public authorities and business leaders to define an industrial policy.

As a second step (Chapter II), an inventory of current savings (outstanding amounts and flows) and financing solutions for the EET was produced in order to analyse the obstacles and possible needs to adapt to climate objectives.

Finally (Chapter III), the Institute for Sustainable Finance drew up a list of proposals for new

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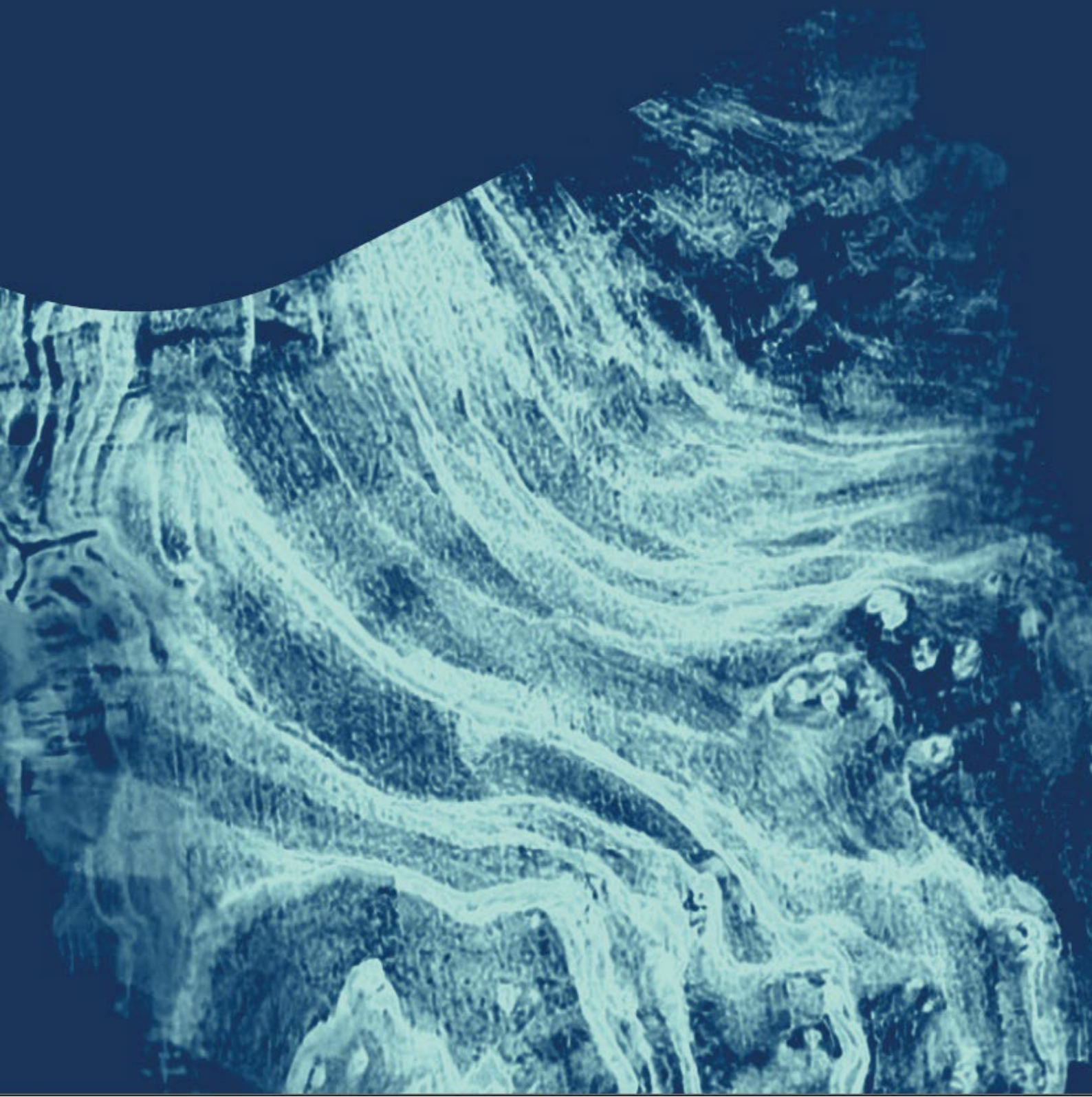
[21] Yves Perrier, Stanislas Potier and Margaux Sauvaget, *Make the Paris financial centre a reference for climate transition: a framework for action*, March 2022.

[22] The composition of the taskforce is available in the Appendix.

financing solutions intended to spread the cost of the transition for households, businesses and the state over time.

Chapter I

Assessment of additional investment needs in key sectors for the ecological transition



Based on macroeconomic figures (I4CE, Rexecode, ADEME)[23][24][25] and estimates from the French Treasury, the additional investments needed to achieve climate targets are estimated at **€30 billion to €65 billion per year by 2030 compared to 2021** (based on SNBC-2 targets). These additional investments represent needs relating to the six major economic sectors to be decarbonised as identified in the SNBC, namely construction, transport, energy, industry, agriculture/forestry and waste. *By way of comparison, the recent report[26] by J. Pisani-Ferry and S. Mahfouz estimates the need for additional "green" investments for the transition at €101 billion[27] per year by 2030 based on projections in the forthcoming SNBC-3[28].*

Investment needs are considered in terms of gross fixed capital formation (they do not include expenditure related to intangible capital such as R&D or regular consumption). They are estimates of additional requirements compared to a business-as-usual scenario that repeats the investments recorded each year or projects past emission trends.

The cost of these investments would be mainly borne by businesses and public sector stakeholders (around €20-40 billion per year, or around two-thirds of the total). Households must be supported in making a significant investment effort (around €10 billion to €25 billion per year, the remaining third of the total), mainly for housing renovations to reduce carbon emissions and the transition to low-carbon mobility[29].

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[23] I4CE, 2022, Landscape of Climate Finance in France – 2022 edition.
[24] Rexecode, 2022, Working Paper No. 83 – The economic challenges of decarbonisation in France. An assessment of the necessary investments.

[25] ADEME, March 2022, Transition(s) 2050 – Choose Now. Act for the climate]. Macroeconomic Effects series.

[26] https://medias.vie-publique.fr/data_storage_s3/rapport/pdf/289488_1.pdf
[27] These figures correspond to €66 billion/year of additional net investments for the transition, once the decline in "brown" investments (and those in vehicles with internal combustion engines) has been consolidated.
[28] As a reminder, the SNBC-3 (still under discussion) aims to align French efforts to reduce emissions with the new European target of a 55% decrease by 2030 compared to 1990 (Fit for 55 package), whereas the SNBC-2 was calibrated on the previous European target of a 40% reduction. In a previous memo for France Stratégie, J. Pisani-Ferry and S. Mahfouz estimated the additional net investment needs linked to the transition at €70 billion per year to 2030 to comply with SNBC-2 objectives.
[29] The figures of +€10 billion to +€25 billion/year for households are estimated based on price ranges for the cost of thermal renovations of residential property and the transition to low-carbon mobility, which are the two types of investments for the ecological transition to be made by households. The renovation of residential properties to reduce carbon emissions requires €5 billion to €20 billion/year of additional investments, from which the cost of renovating social housing should be deducted (source: I4CE; French Treasury). As regards the replacement of private vehicles with low-carbon models, the additional investment required is estimated at between €5 billion and €15 billion/year, from which the share of professional vehicles, which is included in the cost estimate, should be deducted (source: I4CE; French Treasury).

Figure 3 - Summary of additional financing needs for the ecological transition in France

Sector	Sector climate investments in 2021	Average additional investment needs compared to 2021 to achieve SNBC-2 objectives by 2030	Main items to be financed	Parties involved
Construction	€42bn (I4CE 2022) of which €23bn in insulation and heating for new buildings; and €20bn in energy renovations (including €5bn for tertiary buildings).	**+€10bn to +€20bn/year or even +€40bn/year in an ambitious scenario** ○ *+€5bn to +€20bn/year in residential property (up to +€30bn/year, positive scenario)* ○ *€5bn to €10bn/year for tertiary buildings* Savings on energy bills by 2030 for residential properties: up to -€7bn/year (French Treasury 2022)	- Renovations to reduce carbon emissions in residential and tertiary buildings (accounting for 64% of emissions) and public buildings (36% of emissions) - Change in heating energy sources (end of fuel oil, acceleration of the transition from gas to heat pumps, deployment and use of heating networks and increase in biogas incorporation rate)	- Owner-occupiers - Owners of private rental housing - Social landlords (5 million housing units; 10% of landlords ownhalf of buildings that leak heat) - Local authorities (20% of building emissions)
Transport	€26bn (I4CE 2022) including €12 billion for low-carbon private vehicles and €11bn in transport infrastructure (€5bn in rail and €6bn in urban public transport) Note: through France Relance and the recovery effect, +€11bn invested in decarbonising transport in 2021 compared with 2019	**+€10bn to +€20bn/year**	- Purchases of low-carbon vehicles - Transport and charging infrastructure - Transfer from road to rail	- Households, companies and public administrations for the use of low-carbon vehicles

Sector	Sector climate investments in 2021	Average additional investment needs compared to 2021 to achieve SNBC-2 objectives by 2030	Main items to be financed	Parties involved
Energy	€19bn (I4CE 2022) of which €7bn in renewable energy production €6bn in flexibility of electricity networks €5bn in nuclear power plants €1bn for the production of biofuels, gas and renewable heat €0.3 billion in heating networks	**+€3bn to +€16bn** of which ~€2bn/year for the nuclear plan (€51.7bn for six EPR2 reactors over a total construction period of 25 years)	- Decarbonisation and increase in electricity production (development of renewable energies, production of low-carbon electricity – nuclear, development of decarbonised hydrogen, increased flexibility of electricity networks) - Increase in low-carbon heat production (geothermal energy, biomass-to-energy and waste-to-energy recovery) - Decarbonisation of fossil energy sources (electrification in particular) and reduction of their use	The capacity to mobilise substantial investments in capital-intensive projects (nuclear, wind farms, etc.) will be mainly a matter for the state, its operators and local authorities, as well as for energy companies

Sector	Sector climate investments in 2021	Average additional investment needs compared to 2021 to achieve SNBC-2 objectives by 2030	Main items to be financed	Parties involved
Industry	€1.3bn invested in decarbonisation under France Relance and €5.6bn under France 2030	**+€2bn to €3bn/year**	- Transformation of the energy mix in industry (stop using coal as an energy source, integration of thermal renewable energies, electrification of heat production and increase in energy efficiency) - Process change (process electrification, replacement of methane by hydrogen, new innovative processes[30]) - Development of carbon capture and storage (for the decarbonisation of final emissions from concentrated emission sites)	More than 55% of emissions from industry are generated by 50 high emission sites, meaning that the management of decarbonisation policies can be concentrated. These sites account for more than 10% of French emissions.

[30] For example, use of clinker-free cement.

Sector	Sector climate investments in 2021	Average additional investment needs compared to 2021 to achieve SNBC-2 objectives by 2030	Main items to be financed	Parties involved
Agriculture and forestry	N/A	**+€2.5bn/year min.** o **+€1.5bn/year minimum for agriculture** (up to +€5bn/year by 2050, including changes in agricultural practices and training) o **+€1bn/year minimum for forestry**	Agriculture - Changes in livestock farming practices - Changes in field crop practices - Transformation of energy uses: reduction in energy consumption, conversion of agricultural machinery to biofuels, biogas and electricity Forestry - Strengthening of carbon storage in long-life wood products; - Reduction of soil sealing; - Strengthening of carbon storage in agricultural land; - Adaptation of forests to climate change.	Significant capital investment by forest operators and owners, which are mainly very small businesses and SMEs. Also requires changes in practices and training. The sectors located downstream of forestry (wood processing) will also have to be structured to meet the strong demand for biosourced products.

Sector	Sector climate investments in 2021	Average additional investment needs compared to 2021 to achieve SNBC-2 objectives by 2030	Main items to be financed	Parties involved
Waste	N/A	**+€1bn/year**	Prevention of mineral waste production: eco-design and increase in the life of products; Reduction of organic waste: reduction of food waste in particular; Recovery of residual waste: reuse, sorting of bio-waste at source, reuse, repair, recycling, energy recovery. Reduction and recovery of residual emissions: biogas capture, sludge treatment by anaerobic digestion.	Local authorities and, in relation thereto, private companies operating under public service contracts.

These investments break down between the six economic sectors as follows:

- **Construction:** average additional investment needs are estimated at **+€10 billion to +€20 billion per year** by 2030 (or even **+€40 billion** in an ambitious scenario to eliminate all buildings leaking heat by 2030). The main need is for thermal renovations of buildings to reduce carbon emissions, including changing heating energy sources. The main players concerned are households (the residential sector accounts for 64% of emissions compared with 36% for tertiary and public buildings).
- **Transport:** average additional investment needs are estimated at between **+€10 billion and +€20 billion per year** (before the increase in requirements under the SNBC-3). The main needs are related to transport and charging infrastructure and the purchase of low-carbon vehicles by individuals and businesses[31]. The additional cost of a low-carbon vehicle in relation to an ICE vehicle would fall.
- **Energy:** additional investment needs are estimated at **+€3 billion to +€16 billion** per year due to the expected sharp increase in electrification. This wide range is explained by the uncertainty surrounding political and industrial choices for this sector. The main needs concern an increase in electricity generation and its decarbonisation as well as electricity networks (transmission, distribution and flexibility). This decarbonisation is strategic for that of the economy as a whole, as it is also a condition for the decarbonisation of industry, transport and even construction (particularly in terms of new heating energy sources).
- **Industry:** average additional investment needs are estimated at **+€2 billion to +€3 billion per year** (to meet SNBC-2 objectives). The main needs concern energy efficiency, electrification, process change and CO_2 capture and storage. These figures, which may seem low, can be explained by the fact that the decarbonisation mainly concerns that of energy sources, but also because very significant investments are already being made in the sector, aided by recent public funding plans (France Relance and France 2030). The SNBC-3 and a proactive industrial policy are expected to significantly increase investment needs in this sector.
- **In agriculture**, average additional investment needs are estimated at **+€1.5 billion per year** (**up to +€5 billion per year to 2050** including changes in agricultural practices and training). The **forestry sector** adds a further **+€1 billion per year** to investment needs. The main needs are the decarbonisation of motor vehicles, the reduction of the use of inputs and livestock emissions, the reinforcement of natural carbon sinks and the adaptation of forests to climate change.
- **Waste:** average additional investment needs are estimated at **+€1 billion per year**. The main needs are for waste reduction, collection and energy recovery.

The investment needs presented here should be considered as the lower end of the range of investments to be made in the coming years. These figures are in fact necessarily underestimated, firstly because they are based on the objectives of the SNBC-2 and do not yet take into account the increased climate objectives of SNBC-3, which are currently being developed. This will result in a significant increase in the investments required.

Secondly, these estimates are based on macroeconomic scenarios and assumptions that are

[31] N.B. Investments in aviation and shipping are not covered by recent studies.

subject to considerable uncertainty regarding the initiation of investment decisions and the amounts of these investments. These are dependent on market trends, the cost of raw materials and also the estimation uncertainties inherent in the prices of technologies that are not yet mature. They may vary according to political choices, in particular industrial and decarbonisation policies, and the proactiveness of these policies.

Thirdly, in the absence of available data, these estimates do not cover investment needs related to climate change adaptation, which will certainly require additional investments.

Chapter II

Review of available resources and current financing instruments for the ecological transition

1. Current savings of French households

With one of the highest savings rates in developed countries (14% per year on average over the last ten years)**, household financial savings are dynamic and resilient, amounting to nearly €6,000 billion. These savings are mainly invested in life insurance** (32%, ~€1,900 billion, of which 77% in traditional euro investment funds and 23% in unit-linked (UL) policies) and **regulated savings** (15%, ~€860 billion, of which 39% in Livret A, 35% in PEL and 15% in LDDS accounts), **reflecting French people's preference for liquidity, their risk aversion and their expectations in terms of return**. **The French also hold a large share of their savings in current accounts and sight deposits** (14%, ~€810 billion)**. The rest of their savings are invested** in unlisted shares (20%, ~€1,140 billion)[32] (mainly the productive assets of self-employed workers) and listed equities (around 8%, ~€455 billion) in listed equities. The remainder is broken down between term accounts and ordinary savings accounts (6%, ~€340 billion).

Overall savings have increased by nearly 5% per year in recent years, benefiting from both a positive market effect and positive net inflows (€112 billion per year on average over the past ten years)**.** There has been a significant increase in inflows since the Covid crisis, with annual net inflows of around €160 billion in private savings (€202 billion in 2020, €161.5 billion in 2021 and around €155.5 billion in 2022). The Banque de France estimates net inflows in 2022 to be €40.3 billion for regulated savings accounts and €39.1 billion for unit-linked life insurance products (compared with outflows of €10 billion from life insurance products over the period).

The breakdown of these inflows overall matches that of outstanding savings, reflecting the behaviour and choices made by French people for their savings. Any proposed redirection of savings inflows must continue to meet French people's preferences in terms of risk, reward and liquidity.

Not all French people's savings, and the associated inflows, will be immediately and fully available to finance investments in the ecological transition. Indeed, the EET will be based in part on long-term projects, which require significant investments. To finance these needs, it is therefore preferable to mobilise resources with the same characteristics (long-term savings, which have a low level of risk and liquidity). Among these, life insurance and PER retirement savings plans have interesting characteristics. The remaining regulated and ordinary savings accounts are also of interest in view of their statistical consistency, even though these products are more liquid (for example, the Livret A is currently used to finance social housing). **Together, these savings products and investment vehicles account for more than half of French savings by amount (54%, ~€3,084 billion) and inflows (54%, €84 billion out of €154 billion between Q3 2021 and 2022). In addition, the French government already has tools that allow these savings to be partially earmarked for the transition.** The remaining 45% would be more difficult to mobilise (demand deposits and listed and unlisted equities).

French people make precautionary savings (preference for the most liquid and least risky products), **with this trend being confirmed in recent crises** (major financial crisis, sovereign

[32] Although they make up a significant portion of outstanding savings, unlisted equities are not considered in the rest of this report given their low liquidity and the limited capacity to mobilise this type of savings (founders' shares, business creation shares, etc.).

debt crisis, COVID)**. In particular, while the breakdown of savings between the various products is stable over time** (with a decrease in the share of traditional euro fund life insurance, which has seen several periods of net outflows against a backdrop of low interest rates), **the savings built up during the COVID crisis reinforced the underlying increase in the share allocated to current accounts and demand deposits** (from 9% of savings in 2012 to 14% in 2022).

In the short term, the current market environment (rise in interest rates, inflation, sharp decline in the equity and bond markets in 2022, uncertainty about the macroeconomic environment, risks facing the financial sector, etc.) **could make precautionary and regulated savings more attractive** (e.g. increase in risk aversion, rise in yields).

Structurally, changes in the structure of French savings also reflect longer-term challenges, with a rise in retirement savings products (individual, collective and mandatory company retirement savings plans) **and responsible investment** (gradual increase in the weight of ESG/SRI investments in investment strategies, fund labelling mechanisms, allocation of assets, increased controls, stricter regulation, etc.), **which have recorded stronger growth than the market overall in recent years**.

The proactive channelling of French savings towards the ecological and energy transition (EET) must be seen in light of **constraints on the channelling of inflows, outstanding amounts and the corresponding investments.** These constraints must be taken into account to ensure alignment with ambitions in terms of amounts and timing. Regulated savings product assets are of particular interest in our work: they are a safe haven for French households, while the portion centralised with the CDC as part of its general interest mission provides the government with a potentially powerful tool for financing the ecological transition.

The **constraints on investments already made** and **profitability and risk decisions** may limit the **mobilisation of financial savings** (e.g. savings invested in illiquid assets or assets that cannot be redirected without loss). However, the redirection of **gross inflows alone concerns relatively small amounts, which are incompatible with the size of the investments needed to finance the transition.** This makes it necessary to assess opportunities regarding the **speed of transfer or redirection of current financial savings** and the **choice between new and existing products**.

In line with structural trends in the fight against global warming and the rise of green finance, **savings products are already partly allocated to "green" investments**.

- **The main regulated savings products used to support the transition are products partially allocated to the National Savings Fund** (mainly Livret A and LDDS savings accounts). This represents around €500 billion, 60% of which is centralised in the National Savings Fund managed by the CDC. The remaining 40% are kept by the collecting banks on their balance sheets in the same way as bank accounts or deposit accounts. The centralised deposits are already partially invested in support of the transition (e.g. for the energy renovation of buildings, construction of buildings according to new environmental standards, green loans, green financial assets, etc.). In particular, since 2017, the equivalent of centralised annual inflows into LDDS accounts has been invested in "green" assets. More generally, half of long-term loans are directed towards green projects and Caisse des Dépôts has a responsible asset management policy, in line with current ESG issues and emission reduction targets compatible with the 1.5°C objective. For non-centralised savings, the collecting banks, which are required to allocate a minimum of 10% of the funds to the financing of projects contributing to the energy transition or the reduction of the climate footprint, easily meet this goal. In its report, the Banque de France,[33] which collects data on all identifiable loans contributing to the energy transition or the reduction of the climate footprint and which therefore contribute to the SNBC, calculates that banks meet the expected target for the decentralised funds of the Livret A and the LDDS more than ten times over. This relationship between resources and identifiable uses does not, however, mean there is a financial or accounting link between the two parties, as there is in the case of an investment. Projects (type, amount, sector, objective) addressed to banks by their customers and eligible for financing by banks as part of their responsible lending policy are not dependent on or linked to a particular type of financial resource on the bank's balance sheet. At this stage, banks are not reporting a lack of resources to finance their customers' projects, but rather a lack of customers wanting to undertake transition-related projects.

- **Some life insurance inflows and outstanding assets are gradually shifting towards EET financing.** Since the PACTE law (on the growth and transformation of businesses), insurers must systematically include a "green" unit-linked product in multi-vehicle policies. However, the possibilities for channelling existing products need to take into account certain constraints (e.g. solvency rules for investments in euro funds, the duty to advise investors, etc.), which could limit large-scale reallocations. New products (inspired, for example, by the euro-growth fund experience, which restricts liquidity but provides capital protection and a guaranteed return) have been considered and could meet the financing needs of part of the ecological transition (e.g. long-term investments, liquidity challenges, etc.), but with limits on the massive redirecting of outstanding assets and inflows (beyond issues relating to the simplicity of the product).

The redirecting of French households' savings to financing the ecological transition will have to take into account their preferences in terms of risk and reward. **The success of the solutions implemented will thus depend in part on the financial competitiveness of green investments** (including in terms of taxation and the environmental impacts of investments).

Various avenues can be considered to **encourage the redirection of French financial savings**

[33] Regulated Savings, 2021 Annual Report, Banque de France, here.

to the ecological transition, such as the systematic integration of "transition" investment profiles into product offerings under delegated management. The LDDS, a liquid, protected and tax-exempt savings product with the same use as the Livret A, could be better promoted among savers as being associated with the transition, and more of the assets in these accounts, in particular those centralised with CDC (60%), could be allocated to energy transition projects linked to social housing and the decarbonisation of urban areas (this would require a change in the legal and regulatory framework). With decentralised savings feeding banks' balance sheet resources, 75% of outstanding assets would be dedicated to financing the ecological transition and the social and solidarity-based economy.

The redirecting of French households' savings to financing the ecological transition will have to take into account their preferences in terms of risk and reward. **The success of the solutions implemented will thus depend in part on the financial competitiveness of green investments** (including in terms of taxation and the environmental impacts of investments).

I. Overview of household savings[34]

French households' financial savings have steadily increased over the last ten years, rising by 5% per year between 2012 and 2021. These stem from a high savings rate - among the highest in developed countries.

The rise was driven by:

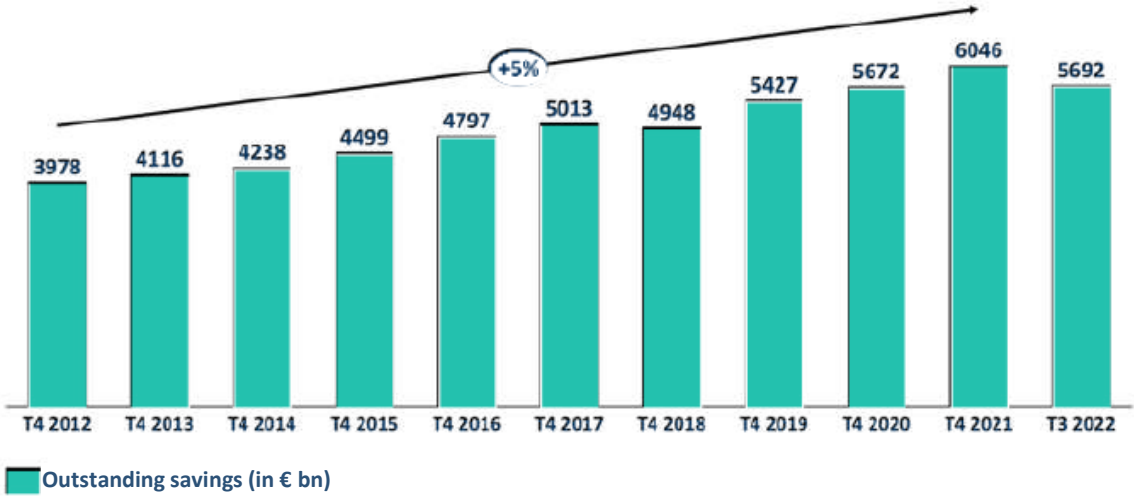
- A positive market effect over the period, which increased the value of assets under management and the vehicles in which certain savings products are invested;
- Positive net inflows over the long term, which have increased since COVID.

Since the beginning of 2022, the macroeconomic environment (e.g. inflation, rise in interest rates) has had a negative impact on the markets (decline in equity markets, negative impact of rising interest rates on asset valuations), the short- and medium-term trends of which are uncertain.

This negative impact resulted in a fall in financial savings in 2022 (-6% in outstanding financial savings between Q4 2021 and Q3 2022), with total savings stabilising at €5,692 billion in the third quarter[35].

[34] Regulated Savings, 2021 Annual Report, Banque de France, here.
[35] The markets rallied at the end of 2022, which may increase outstanding amounts due to the market effect.

Figure 4 - Outstanding household financial savings (2012 – 2022) [36]



Net inflows were positive in 2022, amounting to more than €157 billion between Q3-2021 and Q3-2022, after climbing to more than €200 billion in 2020, supported by the COVID effect.

Precautionary savings are a powerful savings driver in France, resulting in strong inflows in times of crisis or uncertainty.

Figure 5 - Household financial savings inflows (2012 – 2022) [37]

Among the various savings products favoured by the French, life insurance is currently the preferred investment (in terms of financial savings).

Accordingly, life insurance accounts for nearly a third of financial savings (including insurance-based PER retirement savings plans). Other preferred investment solutions are unlisted equities (20%), regulated savings (15%) and demand deposits (14%). Unlisted shares include, among others, shares held by company directors and founders. As a result, this type of savings will be little or not considered in the rest of the paper.

[36] Banque de France.
[37] Banque de France, Household savings.

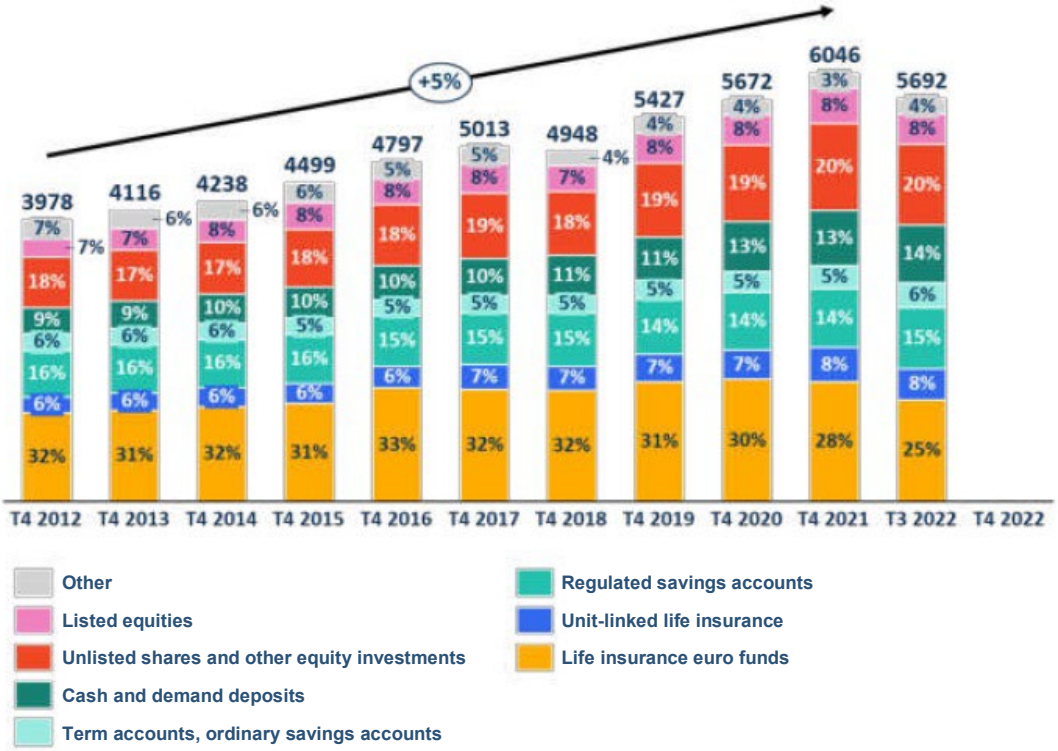
Table 1 French savings - Q3 2022[37]

Financial investments	Outstanding amounts (in € bn, in Q3 2022)	Share of outstanding amounts (as a %)
Main financial investments	**5,691.6**	**100**
Fixed income products	**3,597.5**	**63.2**
Life insurance and retirement savings in euros	***1,436.0***	***29.2***
Regulated savings accounts	***862.3***	***15.2***
Cash and demand deposits	***817.7***	*14.4*
Other interest-bearing bank deposits (saving accounts, term accounts)	*344.5*	*6.1*
Indirectly-held debt securities (UCIs)	*96.7*	*1.7*
Directly-held debt securities	*36.1*	*0.6*
Money market funds	*4.2*	*0.1*
Equity products	**2,012.2**	**35.4**
Unlisted shares and other equity investments	***1,143.4***	***20.1***
Unit-linked life insurance and retirement savings	*440.7*	*7.7*
Listed equities	*299.7*	*5.3*
Indirectly-held shares (UCIs)	*128.4*	*2.3*
Other (real estate and non-residents)	**81.9**	**1.4**
o/w real estate funds	*35.6*	*0.6*

Table French households' savings - Q3 2022 (IFD breakdown)[37]

Financial investments	Outstanding amounts (in € bn in Q3 2022)	Share of outstanding savings (%)
Main financial investments	**5,691.6**	**100**
Long-term savings products	**3,167.1**	**55.7**
Life insurance and retirement savings	***1,876.7***	***32.98***
o/w traditional euro funds	*1,136.0*	*25.2*
o/w unit-linked funds	*110.7*	*7.7*
Regulated savings accounts	***862.3***	***15.2***
Listed equities	***299.7***	***5.3***
Indirectly-held shares (UCIs)	***128.4***	***2.3***
Cash, demand deposits and similar	**1,299.2**	**22.8**
Cash and demand deposits	***817.7***	***14.4***
Other interest-bearing bank deposits (savings, term accounts)	*344.5*	*6.1*
Indirectly-held debt securities (UCIs)	*96.7*	*1.7*
Indirectly-held debt securities (UCIs)	*36.1*	*0.6*
Money market funds	*4.2*	*0.1*
Unlisted equities and other products	**1,225.3**	**21.5**
Unlisted shares and other equity investments	***1,143.4***	***20.1***
Other (including real estate and non-residents)	***81.9***	***1.4***

Figure 6 - Breakdown of household savings (2012 – 2022)[38,39]



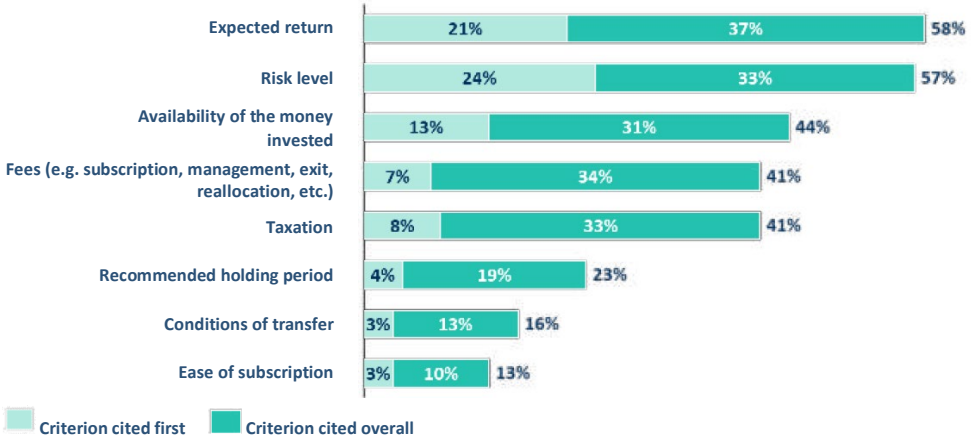
The share of each product among French households' financial savings is relatively stable.

However, a decline in the share of life insurance policies invested in euro funds has been observed in recent years (in particular due to the fall in yields in an environment of low interest rates, but also to the redirection of savings towards other products and other vehicles), offset by growth in the share of demand deposits and, to a lesser extent, unit-linked life insurance.

As the AMF points out, the main criteria for French savers when choosing a savings or investment product are the level of risk, the expected return and the availability of the money invested. How the money saved or invested is used is not considered in households' decisions.

[38] Household savings and financial assets, Banque de France.
[39] Other: Money market funds, real estate funds, non-resident funds, debt securities (direct and indirect holdings).

Figure 7 - Ranking of the criteria for choosing a savings or investment product[40]



This ranking is aligned with the predominance of euro-based life insurance products, unlisted equities and regulated savings in French people's savings.

II. Overview of the economic and financial environment and household savings

The current environment and how it evolves may have a significant effect:

- The value of household savings and the share that can be mobilised to finance the ecological and energy transition could fall (as was the case in 2022, with a drop in outstanding savings despite positive net inflows);
- The behaviour of household savings (and therefore net inflows) is likely to be affected in the current inflationary and interest rate environment:
    - Inflows could decrease, driven by higher spending in times of inflation and fewer incentives to save (especially if returns are below inflation);
    - Conversely, the rise in interest rates could boost inflows;
    - Households could concentrate their savings on more liquid products;
    - Market uncertainty and risk aversion could lead to a decrease in the share of inflows to risky products or products with less protection.

These factors could lead to a reallocation of French savings towards more liquid and less risky products, particularly regulated savings accounts. The household savings rate is nevertheless expected to remain high.

According to several analyses[41], households' savings capacity (current and future) is slightly higher than the long-term average, while the opportunity to save is in line with the historical average. Conversely, decisions on

major purchases are expected to be below their historical average, with concerns about changes in the labour market remaining low (component below the historical level of concern) but more concerns about the financial situation.

[40] AMF.
[41] See for example https://www.caissedesdepots.fr/blog/article/apres-la-sur-epargne-covid-normalisation-et-perspectives.

As such, in 2023, the household savings rate is not expected to fluctuate widely, as downward forces (less forced withdrawal of savings due to future disinflation) offset upward forces (the appeal of saving versus spending due to the rise in interest rates). The reallocation of savings towards money market savings (term accounts, bank savings accounts, UCIs, etc.) and regulated savings should become more appealing as the ECB raises interest rates, at the expense of flows into current accounts (the effort needed to reallocate savings outside current accounts will produce greater rewards). The impact on traditional euro life insurance and riskier vehicles remains to be seen.

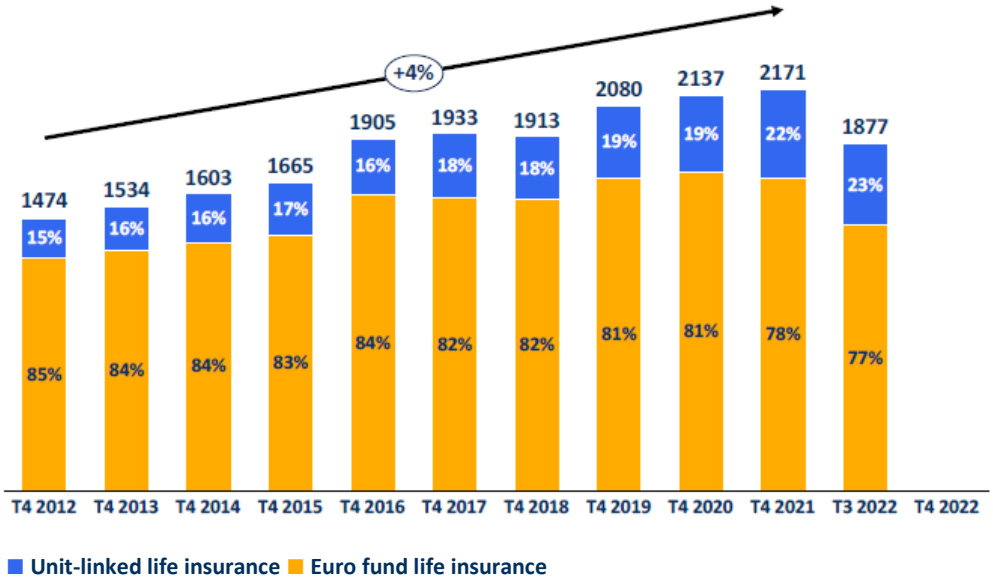
However, there are major uncertainties as to short- and medium-term developments (e.g. the change in the economic and financial outlook, decline in household confidence, precautionary savings, etc.).

III. Presentation of the main savings product families

a. Life insurance and retirement savings

At the end of 2021, life insurance and retirement savings assets amounted to €2,171 billion, more than 75% of which were invested in euro vehicles and the rest in unit-linked products, up 4% per year over the last ten years

Figure 8 - Life insurance and retirement savings assets (2012-2022)[42]



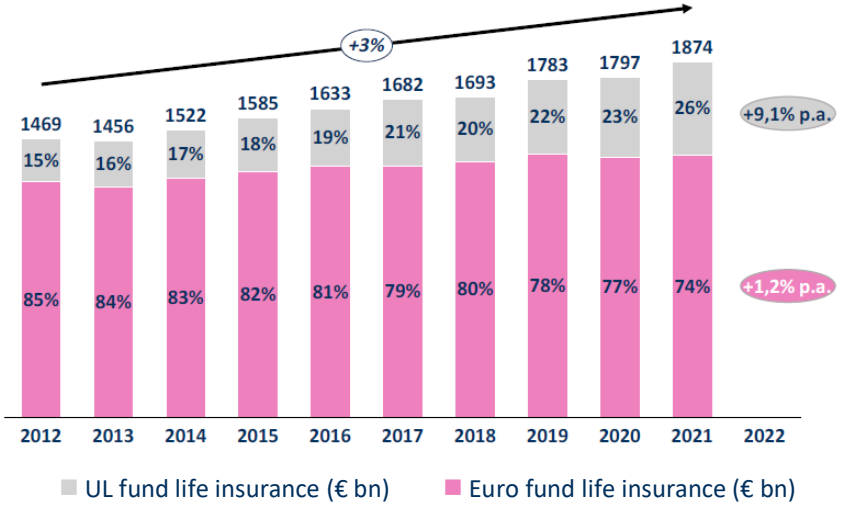
a.1. *Life insurance*

At the end of 2021, life insurance totalled around €1,900 billion in assets under management[43], three quarters of which in euro fund life insurance vehicles and one quarter in

[42] Banque de France, Household savings.
[43] Key French insurance data in 2021, France Assureurs.

unit-linked fund life insurance. Over the past 10 years, life insurance assets have grown by around 3% per year, particularly due to the growth of UL funds.

Figure 9 Life insurance assets under management (2012 - 2021)[44]



These assets are mainly invested in long-term instruments, mostly bonds, with 34% invested in corporate bonds, 29% in sovereign bonds and 22% in equities.

Table 2 Financing the economy - Life insurance and retirement savings (end of 2021)[45]

	Euro fund life insurance		Unit-linked life insurance		Life insurance, total	
	in € bn	%	in € bn	%	in € bn	%
Companies	**1,062**	**55.4%**	**419**	**83.5%**	**1,481**	**61%**
o/w equities	231	12%	286	57%	517	21%
o/w corporate bonds	736	38.4%	86	17.2%	822	34%
o/w commercial real estate	95	5%	47	9.3%	142	6%
Sovereign bonds	**670**	**35%**	**26**	**5.2%**	**696**	**29%**
Residential property	**14**	**0.7%**	**7**	**1.4%**	**21**	**1%**
Other	**169**	**8.8%**	**50**	**9.9%**	**219**	**9%**
Total	**1,916**	**100%**	**502**	**100%**	**2,418**	**100%**

The attractiveness of life insurance is based on its ability to meet several savings requirements and criteria for French people:

- Euro vehicles have a low level of risk with capital protection
- UL funds are particularly profitable
- Capital gains tax is particularly advantageous
- It allows the transfer of wealth at a low cost

These various factors are offset by the relative illiquidity of life insurance, which remains non-transferable and loses its tax advantages in the event of withdrawal in the first eight years.

[44] Key French insurance data in 2021, France Assureurs.
[45] France Assureurs – the difference between the investment values presented in the table and the assets under management provided by the Banque de France and France Assureurs corresponds to mathematical provisions , which only reflect direct business in France (and not business under acceptance or carried out abroad).

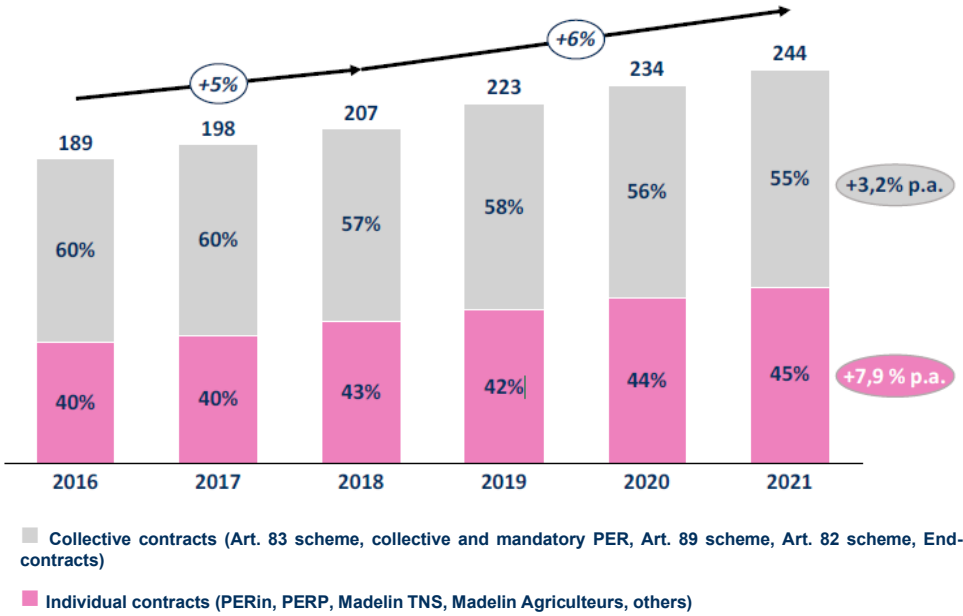
- Euro-growth life insurance is a third type of life insurance, a hybrid between euro fund life insurance and unit-linked funds, with assets under management totalling €4.7 billion at the end of 2021. It is based on capital protection over eight years and not permanently as for euro funds. This allows for greater investment flexibility and better profitability than the euro fund with a capital guarantee on exit. Its complexity and lower liquidity compared to other life insurance products explain the relatively low success of this savings product. Given savers' expectations regarding investments in favour of the transition and the capital protection over an eight-year horizon, which makes it possible to promote long-term investment, specific constraints regarding the use of this type of product to finance the ecological transition could be envisaged and could potentially help revive interest in euro-growth funds.

a.2. Retirement savings

At the end of 2021, retirement savings totalled €244 billion[46], with 45% held in individual policies and 55% in group policies.

Since 2019 and the Pacte law reforming retirement savings and promoting the retirement savings plan (PER), there has been an acceleration in the growth of retirement savings, and in particular an increase in the share of individual savings.

Figure 10 Retirement savings assets – insurance-based PER (2016 – 2021)[46]



The PER is positioned as a retirement savings product. It is a very long-term savings product with savings meant to be locked in until retirement (there are several possibilities for early withdrawal). It is therefore categorised as a very illiquid product, like life insurance, but is

[46] Key French insurance data in 2021, France Assureurs – insurance-based PER only.

transferable, unlike life insurance.

Its appeal is based on:

- Tax breaks on payments, allowing savers to avoid paying tax on a significant portion of their income
- Average profitability higher than that of regulated savings accounts (~4-5%) - A tax advantage on withdrawal in the form of an annuity on retirement
- Early release options (for the purchase of a main residence, for example)

PER investments are largely managed under delegation by the organisations with which they are contracted. These managed strategies are generally adjusted to the policyholder's age and risk/reward preferences. PER managers most often offer the possibility of prioritising investments in products for the ecological transition, those with a social impact or that support SMEs/ISEs. Since the PACTE law, all company retirement savings schemes have been required to offer at least one solidarity fund, one fund contributing to the energy and ecological transition and one SRI fund.

b. Employee savings and collective company retirement savings

Outstanding employee savings assets totalled €167.6 billion at the end of 2021[47], including €26 billion in collective company retirement savings (PERCO and company PER plans). The remaining €141 billion are invested in company or inter-company savings plans (PEE or PEI respectively).

Savings are already partially allocated to SRI and the social and solidarity economy, with €52.4 billion currently invested in SRI funds and €14.1 billion in solidarity funds. This is explained by the obligation since 2010 to offer at least one solidarity-based employee mutual fund, which in the vast majority of cases are also SRI funds.

The liquidity rules differ depending on whether the savings are held in a PEE/PEI or a collective company retirement savings plan:

- A company savings plan (PEE/PEI) locks in investments for five years (with withdrawal terms substantially identical to those of the PER),
- Collective company retirement savings plans follow the same principles as those described in the "Retirement savings" section above

The tax benefits for employee savings apply to mandatory and optional profit-sharing schemes and/or employer contributions: the amounts received are exempt from income tax (up to a certain amount).

Like PER investments, employee savings are largely managed under delegated management agreements.

[47] Employee savings and collective company retirement savings, 2021 survey, French Financial Management Association (AFG).

c. *Regulated savings*

Regulated savings products currently account for around 14% of French savings, and are the number two preferred investment family in France, behind life insurance. Regulated savings include regulated savings products (Livret A, LDDS, LEP and Livret Jeune) as well as home savings products (PEL and CEL) and the PEP savings plan, which has not been marketed since 2003.

Regulated savings product assets are of particular interest for the financing of projects with a high capital requirement because the portion of these savings centralised at CDC can be mobilised and redirected by the government via CDC's investment management to finance politically and strategically important projects for a very low cost.

Table 3 Breakdown of outstanding amounts held in regulated savings products[48]

Savings product	Outstanding amounts (in € bn, at 31/12/21)	Share among interest-bearing deposits (as a %)	Share among financial investments (as a %)
Regulated savings accounts	**833.7**	**72**	**13.3**
Livret A	324.3	28	5.33
Livret Jeune	5.4	0.47	0.03
LEP	38.3	3.31	0.63
LDDS	125.9	10.9	2.09
CEL	31.6	2.73	0.52
PEP	13.3	1.20	0.23
PEL	291.3	25.1	4.33

Regulated savings accounts centralised at CDC (Livret A, LDDS, LEP) currently account for around 60% of regulated savings deposits. The PEL, which remains on banks' balance sheets, accounts for more than a third.

c.1. *Home savings plan (PEL)*

There are two parts to the PEL:

- An interest-bearing savings product with a guaranteed rate, a minimum term of four years and deposits possible for up to ten years, plus up to five years during which the PEL continues to receive interest, but with deposits no longer possible

- A property loan available at a rate set when the PEL is opened

There are no age or nationality requirements for opening a PEL account. The PEL may be held alongside other regulated savings products. The maximum amount of payments into a PEL is set at €61,200, but the account balance may exceed this ceiling after adding interest. After the initial maturity of four years, the PEL may be extended from year to year until it reaches a maximum term of ten years. The corresponding home savings loan, of up to €92,000, must be used to carry out one of the following transactions:

[48] Banque de France, Household savings.

- Purchase of main home (new or existing property);
- Construction of main home (purchase of land and construction works);
- Extension, repair or improvement works on the main home (adding an extra storey, energy savings, renovation of the façade of a co-owned building, etc.);
- Acquisition of shares in a residential real estate investment company (SCPI).

As an example, for any PEL open since 1 January 2023, the gross interest rate is 2% and the guaranteed loan rate is 3.2% over 15 years. However, rates for older PEL accounts can be much higher.

12.2 million home savings plans were open at the end of 2021[49], with outstanding savings totalling nearly €300 billion. 72% of PEL accounts are less than 10 years old, and nearly two-thirds have lower interest rates than regulated savings accounts, while the remaining third are older PELs with much higher interest rates than Livret A savings accounts.

Table 4 Breakdown of PEL accounts by interest rate (2021)[50]

Interest rate applicable to the PEL	Share in volume (number) of PEL	Share of PEL savings
Interest rate <= 2.00%	*33%*	*19%*
Interest rate = 2.50%	*42%*	*44%*
Interest rate >= 3.50% and <=4.50%	*22%*	*26%*
Interest rate >= 5.25% and <=6.00%	*4%*	*9%*
Interest rate >=7.50% and <=10%	*1%*	*2%*

[49] Regulated savings, 2021 Annual Report, Banque de France.
[50] Regulated savings, 2021 Annual Report, Banque de France.

Table 5 Breakdown of PEL accounts by age (2021) [50]

Age of PEL	Share in volume (number) of PEL	Share of PEL savings
<= 1 year	5%	2%
>1 year & <= 5 years	15%	8%
>5 years & <= 10 years	52%	52%
>10 years & <= 20 years	21%	25%
>20 years	7%	13%

Over the past decade, the PEL has become less attractive as a financing solution for obtaining a loan to purchase a home. As low borrowing rates (a consequence of the macroeconomic environment and monetary policies targeting low interest rates) became more attractive than the subsidised PEL rate, households preferred to take out a loan directly, with the PEL being seen as an investment product competing with regulated accounts:

- The interest rates on older PEL accounts may be higher than those on the Livret A/LDDS
- The upper limit on savings is higher
- Illiquidity is limited: for withdrawals within the first two years, the rate of return is reviewed, beyond this the interest generated is earned, even on amounts withdrawn in the first four years (minimum duration of the PEL)

With 15-year borrowing rates at 3% on average, and the macroeconomic outlook suggesting that borrowing rates will remain high for some time, the PEL could return to its original purpose as a financing solution for the purchase of a home. While in recent years many households have become homeowners without having to use their PEL, this may be less true in the coming years. The use of older PEL accounts will depend on the return sought by the holders of these products.

They may also remain an attractive savings product.

c.2. Regulated accounts and centralisation in the CDC National Savings Fund

Regulated accounts are one of the core elements of French savings, with over €450 billion held in these accounts at the end of 2021[51].

The main regulated accounts, which are the Livret A, the LDDS and the LEP, have different access and remuneration terms but are based on the same main principles:

- They are extremely liquid, as deposits and withdrawals can be made at any time
- Interest is tax-exempt
- A portion of deposits is held by the collecting banks and not centralised, while around 60% is centralised in the National Savings Fund managed by Caisse des Dépôts et Consignations
- Interest rates are attractive: 3% for the Livret A and LDDS, 6.1% for the LEP

[51] Regulated Savings, 2021 Annual Report, Banque de France.

- Total savings are capped at: €22,950 for the Livret A, €12,000 for the LDDS and €7,700 for the LEP

The eligibility criteria are different for each of these accounts:

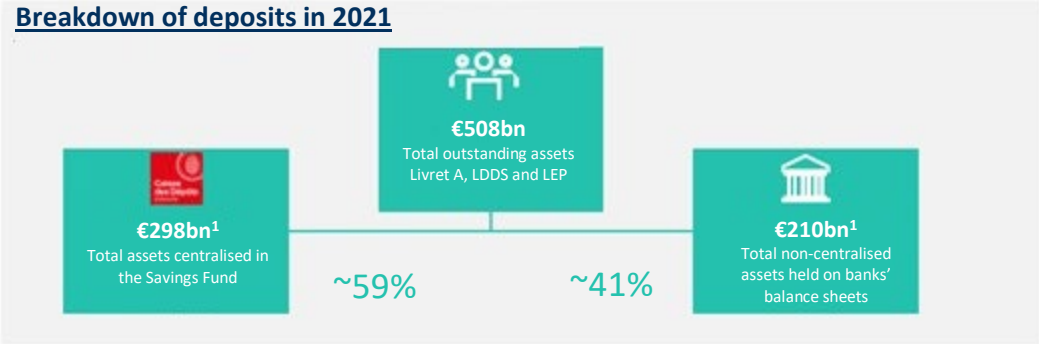
- Livret A: everyone has the right to hold a Livret A. There are no conditions of age, nationality or tax residence in France – only one regulated savings account per person is authorised
- LDDS: any taxpayer can open one - only one per person is allowed, up to two per tax household
- LEP: available to persons over 18, tax resident in France and with income below a certain amount

At the end of 2021, there were[51]:

- 55.7 million Livret A accounts (including 54.9 million held by individuals), an 81% coverage rate for individuals
- 24.5 million LDDS accounts, a coverage rate of approximately 46%
- 7.9 million LEP accounts out of approximately 18 million potential holders, a 33% coverage rate
- Currently, 7.8% of Livret A holders have total savings in excess of the regulatory limit, while this rate is 22% on the LDDS

The management of assets is shared between centralised and non-centralised components, and is governed by legislation and regulations.

Figure 11 Breakdown of regulated savings accounts – centralised/non-centralised management (2021)[52]



[52] 2021 annual report of the National Savings Fund

- Deposits centralised in the National Savings Fund with CDC: 60%, around €298 billion at end-2021[52]
    - These assets are mainly used to finance social housing. Guidelines for the use of assets in the National Savings Fund are set by the Minister for the Economy[53].
    - Around 60% are used to fund long-term loans in social cohesion programmes. The remaining 40% are invested in financial assets or other assets.
    - €171 billion of the €193 billion used for long-term loans are assigned to the ecological and social transition
    - Of the €12.8 billion in new loans, €11.8 billion are loans for the responsible economy and €1 billion for general interest projects
        - More specifically, of the €11.8 billion in loans allocated to social housing and urban policy granted in 2021, more than €10 billion were allocated to the creation of 85,300 new social housing units and €1.7 billion to the rehabilitation of 81,600 other housing units (including €538 million in eco-loans enabling the thermal renovation of 32,000 social housing units on very attractive terms, €420 million in fixed-rate loans to complement eco-loans granted in the same year, a total of nearly €1 billion in loans granted in 2021 by the National Savings Fund for thermal renovations of social housing).
        - Regulated savings also made it possible to finance €4.29 billion in loans contributing to the ecological transition, of which €3.97 billion for social housing (thermal renovation of social housing to improve energy efficiency and eliminate heat leaks; particular attention to the energy performance of social housing during its construction; more stringent certifications than applicable regulations for the entire housing stock, etc.)[54] and €320 million for public sector investments. All sources combined, loans contributing to the ecological transition exceeded €5.75 billion in 2021, nearly 48% of loans granted.

    - Caisse des Dépôts is committed to managing its portfolio of financial assets in the National Savings Fund responsibly and with a long-term view, by integrating ESG issues in the selection and monitoring of its investments and, more specifically, by taking into account the ecological transition:
        - As a shareholder, it plays an active role in ESG dialogue, defending transition-related initiatives and supporting the companies in which it invests in their transition
        - CDC applies an exclusion policy on activities that are not compatible with the commitments made by France in terms of climate, arms, human rights or health protection. On the climate, it considers the compatibility of its investments with a scenario of limiting global warming to 1.5°C

[53] Art. L221-5 and L221-7 of the French Monetary and Financial Code.
[54] Besides social housing loans, there are also loans dedicated to the ecological transition (e.g. green land use planning, city policy, etc.), for a more limited amount.

- It takes action to reduce the carbon footprint of its portfolios (-60% and -75% in the carbon footprint of the listed equity portfolio and the corporate bond portfolio, respectively, since 2014)

- Non-centralised deposits, which remain on the balance sheet of collecting banks: 40%, or around €210 billion[55] at end-2021:

- Banks are subject to **an obligation regarding the use of** non-centralised funds. Thus, 80% of funds must be dedicated to financing SMEs, a minimum of 10% must be used to finance the ecological transition and a minimum of 5% of the funds must be dedicated to financing the social and solidarity economy.[56] The Banque de France's annual report on regulated savings has a chapter on how centralised and non-centralised funds must be used[57]. With regard to the transition, the collecting banks, which are required to allocate a minimum of 10% of the funds to the financing of projects contributing to the energy transition or the reduction of the climate footprint, easily meet this goal. In its report, the Banque de France, which collects data on all identifiable loans contributing to the energy transition or the reduction of the climate footprint and which therefore contribute to the SNBC, calculates that the banks meet the expected target for the decentralised funds of the Livret A and the LDDS more than ten times over.

At the end of 2021, deposits in regulated savings accounts totalled €343.1 billion, while those in LDDS savings accounts stood at €126.2 billion, representing around a quarter of regulated savings. For decentralised assets, the obligation is for 15% to be allocated to financing for the ecological transition or the social and solidarity economy, as for the Livret A and the LDDS (the rest mainly targets financing for VSEs and SMEs). However, as shown annually by the Banque de France in its report on regulated savings, amounts held with banks and currently "allocated" to identifiable transition and social economy financing (many loans are not yet identifiable) exceed this obligation and are even higher than the total deposits collected for the LDDS. Furthermore, the obligation regarding the use made by the National Savings Fund is limited, and at the discretion of the Minister of the Economy. Greater clarity on the use made of centralised deposits could be ensured by regulatory means and by decision of the Minister of the Economy.

d. Equity investment vehicles: PEA and PEA-PME equity savings plans and securities accounts

French investors mainly use three equity investment products: ordinary securities accounts and PEA and PEA-PME equity savings plans. These products are used to house the securities owned by the investor and differ in terms of the tax advantages available on the profits they generate.

At the end of 2021, PEA and PEA-PME plan assets amounted to €111.9 billion and €2.3 billion respectively, up sharply since 2020, mainly due to the rise in the stock markets.

Both the PEA and the PEA-PME are relatively liquid products, even if investing in equities is by

[55] 2021 annual report of the National Savings Fund.
[56] Order of 4 December 2008 relating to the rules for the use of funds collected under Livret A and LDDS regulated savings accounts.
[57] Regulated Savings, 2021 Annual Report, Banque de France, here.

nature a long-term investment. They have a minimum term of five years, any early withdrawal or redemption implies the closure of the plan and profits are taxed at a rate of 12.8%. In the event of withdrawal after five years, capital gains are exempt from income tax (up to a limit of 10% of the amount of the investments each year).

The difference between PEA-PME and traditional PEA (beyond the differences in eligible assets) is that the PEA-PME allows a higher amount to be invested in shares (€225,000 vs. €150,000 subject to any sums invested in a traditional PEA, which are taken into account when calculating the total amount invested), provided the sums are invested in the shares of SMEs and mid-caps.

At present, there is no specific incentive or labelling scheme for equity investment vehicles that only or partially invest in green equities.

2. Review of current financing solutions

The review of the resources that could be mobilised to support the ecological transition must consider the solutions already available in France, both for individuals and businesses. The aim is to consider financial resources with current public and private financial instruments that support the transition in order to identify their limits and thus the levers for action.

First of all, the transition-related nature of a project to be financed does not by definition render all current financing solutions, particularly bank loans, inoperative or inappropriate, whether for individuals or businesses. The financial mechanisms described below complement the savings that households can use for their project and traditional bank financing solutions such as home loans and consumer loans, which are widely accessible and competitive. The same applies to businesses (investment loans in particular). Thus, even before the existence of “dedicated” financing solutions for the ecological transition, all current solutions for financing any project, including those aimed at the transition, are valid and relevant.

a. Current transition financing solutions for individuals in France

With regard to private individuals, observations confirm that there are several products that meet the challenges of the ecological transition in terms of energy renovation of homes and the acquisition of electric vehicles.

In addition to traditional home loans, consumer loans and home renovation loans, banks offer a number of transition financing products that are not sufficiently leveraged by individuals. Indeed, energy renovations and transition work is only rarely initiated by households, even though financing solutions are available. The financing solutions available are therefore not a sufficient trigger or incentivising argument for the creation of projects, as the levers available to banks are limited. In other words, the obstacles to the deployment of transition projects do not seem to be linked to a lack of financing (traditional or dedicated), but rather to the absence or insufficiency of renovation and energy transition projects carried out by households.

i. Financing solutions for the energy renovation of homes

Banks offer a range of regulated financing solutions to enable the energy renovation of homes, which can be supplemented by public aid and support schemes exclusively dedicated to energy renovation. Banks also offer their customers competitive financing offers (home loans and consumer credit).

The regulated financing solutions offered by banks are as follows:

- Interest-free loan (éco-PTZ),
- Social home ownership loan (PAS),
- Capped interest loan (CP),
- Home savings loan from a home savings plan (PEL),

- Home savings loan from a home savings account (CEL),
- Loan backed by LDDS account savings.

The 2023 finance bill allocated around €5 billion for energy renovations, mainly through MaPrimeRénov' (€2.5 billion), the reduced VAT rate of 5.5% for energy renovation works (€2 billion) and the éco-PTZ zero-interest eco loan (€40 million). The éco-PTZ ultimately represents a minor share, with €30 million in 2021 and €34 million in 2022 (sources: SGFGAS (a home ownership guarantee body)). However, this cost is expected to increase over time given the recent increase in demand and the rise in interest rates, which makes this solution more attractive despite the mandatory formalities required by regulation.

- ***Éco-PTZ loans***

Éco-PTZ loans (interest-free eco loans) – renewed until 2023 – distributed by all institutions

The éco-PTZ is an interest-free loan. It is intended to finance:

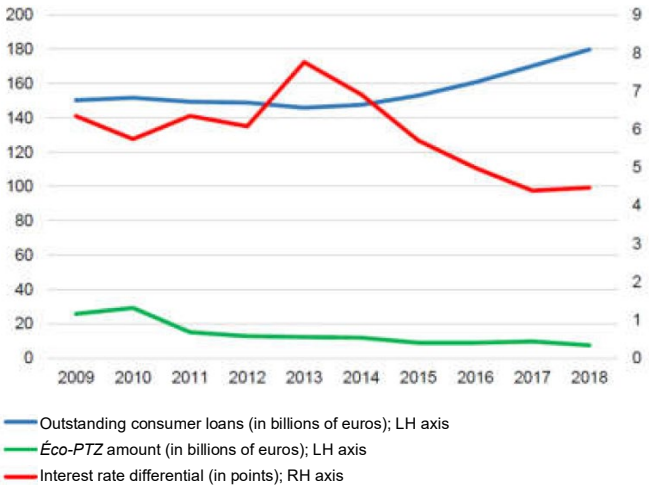
- occasional renovation work to improve energy performance (e.g. insulation, change of windows and/or heating);
- multiple types of renovation work to achieve a minimum energy performance;
- non-collective sanitation rehabilitation works by a non-energy consuming device (list of specific works set out by decree).

The maximum amount the bank can lend is €50,000, over a maximum period of 20 years. There are no income conditions specific to this loan. The borrower must own the property as their main home (or rented), and the property must have been built more than two years ago. Since August 2019, it has been possible to combine two éco-PTZ loans for the same home.

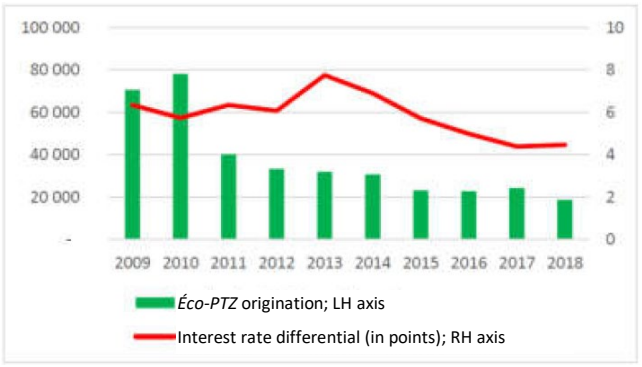
When an éco-PTZ loan is granted, the difference between the zero rate of interest on the loan (or non-interest-bearing repayable advance) and the market rate is awarded to the credit institution granting the loan in the form of a tax credit. The tax credit paid to the credit institution in respect of an éco-PTZ in year n is spread over the five years after year n, i.e. from year n+1 to year n+5. The éco-PTZ cost the government €30 million in 2021 and €34 million in 2022 (sources: SGFGAS). But this cost is likely to increase over time given the recent increase in demand and rising interest rates.

As the éco-PTZ is a regulated product, subject to ex-post controls with the possibility of disqualification, **there are many constraints for customers (producing quotes, invoices, ensuring that the contractors are duly RGE-certified, etc.).** It is therefore a relatively complex product, which was less attractive when interest rates were low. Since the launch of the éco-PTZ, banks have provided strong support to the scheme, but its complexity partly explains why take-up has been limited to a few tens of thousands per year. All banks distribute the éco-PTZ.

Comparative change in éco-PTZ loan origination and consumer loans:
Outstanding amounts



Loan origination in number



Sources: SGFGAS, Banque de France, FBF

In practice, in addition to household savings, energy renovation projects presented by customers to their banks are financed by an accessible and competitive loan: either by a **consumer loan**, which is unconstrained and available very quickly at historically low rates, by an **éco-PTZ**, a regulated product that requires a longer set-up time, or by a **mortgage loan** at the time of purchase, or a combination of these loans.

Banks do not have a major influence in the decision to undertake work. With regard to the customer experience in deciding and preparing an energy-saving project, renovation firms and energy providers are currently more influential in decisions to undertake energy-saving work. Banks only intervene at a later stage, if financing is necessary. The customer contacts the bank after having made the investment decision.

Only 32% of energy renovation work is financed by bank loans[58]. Most projects are self-financed by households (mobilisation of their savings), often without even informing the bank.

The Mon éco-PTZ Prime Rénov' scheme to finance out-of-pocket expenses for energy renovation work

A Mon éco-PTZ Prime Rénov' loan of up to €30,000 can be used to finance the remaining cost of energy renovation works eligible for the MaPrimeRénov' grant under the conditions specified by a decree of 30 March 2022. This provision came into force on 1 July 2022 and some banks have been able to offer it since 17 November. Provided for by the 2022 Finance Act and detailed in the decree of 30 March 2022, this scheme allows households wishing to carry out energy renovation works eligible for MaPrimeRénov' assistance to benefit much more simply from an éco-PTZ to finance their out-of-pocket expenses. This new zero-interest eco-loan simplifies the applicant's formalities with their bank.

[58] ADEME TREMI survey in 2018.

Customers can request an éco-PTZ Prime Rénov' from their bank based on the notification of approval from MaPrimeRénov' sent by the National Housing Agency (Anah). The bank simply analyses their repayment capacity to grant the éco-PTZ.

- ***Other regulated financing offers***

Social home ownership loan (PAS)
The PAS is a capped-rate property loan intended to finance the purchase of a property or to carry out work aimed at improving the energy performance of a property. The minimum amount granted by the bank is €4,000. The PAS can be repaid over a period of between 5 and 35 years.
Unlike the éco-PTZ, the PAS is granted to people with low incomes (the eligibility criteria depend on the location of the home concerned and the number of occupants). The borrower must own the property as their main home. The PAS must be secured by a real security interest (mortgage or equivalent), but this guarantee is exempt from land registration taxes. Processing fees are capped. Notary fees are reduced.

Capped interest loan (CP)
The CP is a capped-rate property loan intended to finance the purchase of a property or to carry out work aimed at improving the energy performance of a property. The minimum amount granted by the bank is €4,000. The loan can be repaid over a period of 5 to 35 years. This loan is not means-tested, the borrower must own the property as their main home.

The PAS and the PC may be supplemented by other financing products, in particular the éco-PTZ or the Action Logement housing loan for workers.

Home savings loan from a home savings plan (PEL):
The loan is granted if the customer has a PEL, the interest rate on the loan depends on the date on which the PEL was opened. It is intended to finance the purchase of a property or to carry out work aimed at improving the energy performance of a property. The maximum amount of the loan is €92,000. The amount of the loan granted depends in particular on the amount of interest earned on the PEL. The term of the loan can be from 2 to 15 years.

Since 2011, a state top-up has been paid. This top-up is capped and conditional and is equal to a percentage of the interest earned on the plan's expiry date. The state top-up is equal to two-fifths of the interest paid by the account-holding institution to the saver and is capped at €1,525. The state top-up is waived when the maximum amount has been reached, i.e. €1,525, if the PEL is more than 10 years old and if the PEL was closed in the first four years.

Home savings loan from a home savings account (CEL):
In the same way as a PEL, the loan is granted if the customer has a CEL. The interest rate on the loan depends on the date on which the CEL was opened. It is intended to finance the purchase of a property or to carry out work aimed at improving the energy performance of a property. The amount of the loan depends on its term and the interest earned during the savings phase. Its maximum amount is €23,000. The term of the loan is 2 to 15 years. The CEL does not entitle the holder to the state top-up.

Loan backed by LDDS account savings

This loan may have different commercial names depending on the bank (“ecological loan”, “LDDS loan”, “eco-loan” or “sustainable development and solidarity loan” - formerly CODEVI). It is an uncapped loan. Banks must use the money deposited in LDDS savings accounts to provide loans for improving the energy performance of housing, at attractive rates. However, there are no rates imposed by the public authorities. This loan is intended to finance work aimed at improving the energy performance of a property (primary or secondary residence). The terms for granting the loan may vary between banks, as they are free to set the amount and duration of the loan, depending on the application (nature of the work and the borrower’s solvency).

Unregulated financing offers

Banks also offer unregulated financing solutions for energy renovation work (loans for energy saving works, loans for owners of homes that leak heat, purchases of equipment powered by renewable energies, etc.).

As a reminder, the transition-related nature of a project does not render traditional bank financing solutions ineffective or inappropriate. These solutions (home loans and consumer loans) are easily accessible and involve fewer formalities and no constraints for the borrower in terms of the work to be financed. The bank may not be aware of the transition-related nature of all or part of the work to be financed, and, in the case of consumer loans, may not even be aware of how the funds are used since these loans are by definition not granted for a specific purpose and can be freely used by the borrower.

- ***Public assistance and support schemes***

A single website, France-renov.gouv.fr

The France-renov.gouv.fr website was launched in January 2022 with the aim of informing, guiding and supporting households, particularly those with the lowest incomes, in their renovation efforts. This is a public service dedicated to housing renovation, led by the state with local authorities and steered by the National Housing Agency (ANAH).

It offers various services: simulations on available financial aid, a directory of RGE-certified contractors (who are recognised as offering services to protect the environment), details of the nearest Espace Conseil France Rénov' help centre.

MaPrimeRénov'

Formerly known as the energy transition tax credit (CITE), the MaPrimeRénov' scheme is aimed at all households as well as co-ownership associations and landlords. The amount available under the scheme is calculated according to the applicant's income and the environmental gain from the works. It is available to all homeowners with no income cap, whether the home is occupied by themselves or rented out. The home must have been built at least 15 years ago or at least two years ago when replacing a fuel-oil boiler.

MaPrimeRénov' Sérénité

MaPrimeRénov' Sérénité provides advice and financial assistance to help households with "low" to "very low" incomes (according to the National Housing Agency definition)[59] in their overall energy renovation project for their homes. Landlords and co-ownership associations are also eligible. Eligible homes must be more than 15 years old and the works must be carried out by an RGE-certified company or contractor (recognised as offering services to protect the environment).

The "Coup de pouce économies d'énergie" energy saving scheme

This scheme provides grants to finance certain energy renovation work. All households are eligible. The scheme is available in several forms: the heating boost grant, the insulation grant, the energy-efficient thermostat grant, and the multiple renovations grant. The amount of the grant depends on household income. Grants are paid by companies that have signed the "Energy savings boost" charter - these are mainly energy sellers.

This scheme can be combined with MaPrimeRénov' and the éco-PTZ. However, it cannot be combined with solutions offered by players eligible for the CEE energy savings certificate scheme.

Energy cheque

The energy cheque is a personal aid for the payment of housing energy bills. It was rolled out in 2018 to replace social energy tariffs. It can vary between €48 and €277 per year. The energy cheque is intended for people on low incomes. Each year, the tax authorities draw up the list of beneficiaries based on the household's reference taxable income and the composition of the household determined in terms of consumption units (CU). The energy cheque is automatically

[59] https://www.anah.fr/proprietaires/proprietaires-occupants/les-conditions-de-ressources/

sent by post to the beneficiary's home address (the last address known by the authorities).

5.5% VAT rate for energy improvement works

Certain home renovation works may be eligible for VAT at a reduced rate of 5.5%. Owner-occupiers, landlords or owners' associations, tenants, persons occupying a property free of charge, and non-trading real estate companies are eligible. The home must have been completed more than two years ago. It can be a house or an apartment and can be occupied as a primary or secondary residence.

Exemption from property tax for energy saving works

Some local authorities (municipalities, departments, etc.) temporarily exempt households that carry out energy-saving work from property tax. The exemption may be total or partial. This exemption may be requested by homeowners, occupants or landlords carrying out energy saving works.

Local aid

Local aid is also available to **improve the energy performance of housing** identified by the National Agency for Housing Information (ANIL).

Use of the various schemes

According to the Observatoire de la rénovation énergétique, in 2019, 2.4 million homes in mainland France received renovation aid in the form of energy-savings certificates (CEE) (1.7 million homes for an estimated gain of 3.2 MWh/year per home), the energy transition tax credit (875,000 homes for a gain of 3.9 MWh/year per home) or the "Habiter Mieux Sérénité" scheme[60] (44,000 homes for a gain of 14.7 MWh/year per home), for all types of renovation initiatives. The renovation measures targeted are not the same depending on the aid (e.g. air-to-air heat pumps, 800,000 of which were sold in 2021, are subsidised by the CEE and not by MaPrimeRénov').

Evaluation of MaPrimeRénov' by France Stratégie – December 2022

The MaPrimeRénov' (MPR) scheme exceeded its objectives (640,000 applications approved in 2021 for a target of 400,000). It only marginally serves collective housing, which nevertheless accounts for nearly half of main homes (4% of subsidised renovations, for a total of €25 million). The beneficiaries are, in order: very low-income households with 45% of the total, followed by intermediate-income households with 30%, then low-income households with 23% and finally high-income households with 2%. The system mainly supports single-action renovations (installation of pellet stoves, air-to-water heat pumps, etc.), with multiple renovations representing a minimal share of applications approved in 2021 (2,026 applications, 0.3% of those approved). As the MPR scheme focuses on single-action renovations, **the scheme has shortcomings in terms of reducing final energy consumption and does not meet its assigned objectives** (combating fuel poverty and eliminating heat leaks).

[60] In 2022, the Habiter Mieux Sérénité scheme was replaced by the "MaPrimeRénov' Sérénité" scheme, which is aimed at the same recipients and at unchanged rates.

In particular, the France Stratégie report emphasises that **the amount payable out-of-pocket remains high for households, even low-income ones**: for the installation of an air-to-water heat pump, the aid totals €7,000 (€3,000 via the MPR, €4,000 via the CEE), while the average cost is more than €13,000. However, the net present value (NPV) of the investments was calculated using individual data from MPR applications, by comparing the gain associated with the decrease in the annual energy bill with the net cost of the works. The results show that **the NPV is positive, regardless of the type of household, when combining all the available aid and when the energy source prior to the works is electricity.**

ii. Financing solutions for clean mobility (new or used clean vehicles)

- ***Bank loans***

There are no problems with the supply of and access to consumer credit to finance the purchase of a vehicle, including "clean" new or used vehicles as part of a responsible lending practice (analysis of the borrower's repayment capacity): 90% of outstanding consumer loans are managed by banks and their subsidiaries. The remaining loans are managed by retailers, automotive captives, brokers and comparators.

For several years now, the automotive market has shifted towards hire-purchase and lease financing, reflecting a shift in consumer behaviour from ownership to use.

- ***Government schemes***

Trial of a zero-interest loan for the purchase of an electric or hybrid vehicle in low-emission zones

In January 2023 and for a period of two years, a zero-interest loan for the purchase of electric or hybrid vehicles was launched as a trial in low-emission zones[61]. This interest-free loan is available to residents or micro-enterprises domiciled in low-emission zones and is open to people whose tax income does not exceed €14,000 per year, or micro-enterprises.

This system aims to support the renewal of the vehicle fleet following the extension of low-emission zones, which restrict access for the most polluting vehicles. The loan is granted for the purchase of a vehicle with a maximum value of €45,000 for a car, or €60,000 for a van, with a gross vehicle weight of 2.6 tonnes and CO_2 emissions of less than 50 grams per kilometre. Only electric vehicles and some plug-in hybrid electric vehicles meet this threshold.

Banks and other lenders granting these interest-free loans do not receive any particular guarantee for the loans granted to borrowers, whose creditworthiness they must assess, but **they**

[61] Decree no. 2022-615 of 22 April 2022 on the experimentation of a non-interest bearing loan to finance the purchase of a vehicle with carbon dioxide emissions less than or equal to 50 grams per kilometre.

receive tax reductions equivalent to the amount of interest they would have received at normal interest rates.

Vehicle scrappage bonus (PAC)

The scrappage bonus is a **measure encouraging households and businesses to replace their old vehicles with environmentally efficient vehicles**. Since 2023, it has been reserved for households whose reference taxable income per unit is less than or equal to €22,983. In order to benefit, an old polluting vehicle must be returned for destruction in the three months preceding or six months following the invoice date for the new vehicle purchased or leased and a low-emission vehicle meeting certain criteria must be purchased or leased.

The system benefits the user and the community by speeding up the replacement of old vehicles with vehicles that consume less energy, are less polluting and are less costly to maintain. It nevertheless generates additional costs by advancing the replacement of the vehicle and the obligation to choose an eligible new vehicle.

The socio-economic gain of the scrappage bonus for 2021 is estimated at €47 million before tax, according to the General Commission for Sustainable Development (CGDD)[62]. Between 2015 and 2021, nearly 910,000 cars were replaced, reducing fine particle emissions by 680 tonnes and greenhouse gas emissions by nearly 1.6 million tonnes. In 2021, 110,000 scrappage bonuses were awarded and diesel vehicles accounted for 67% of vehicles scrapped. The share of electric vehicles in vehicles purchased under the scrappage scheme has risen sharply, from 15% to 37%, far higher than the share of electric vehicles in the new-vehicle market (10%).

b. Current financing solutions for businesses

Businesses have access to a range of solutions to finance an investment or expense that supports the ecological transition. Upstream of the financial instruments, there are also solutions available to assist with the implementation of an ecological transition approach (diagnostic tools available from the Chambers of Commerce (CCI), the environment agency (ADEME), Bpifrance, etc.), which are listed in a France Nation Verte report on solutions for the ecological transition of VSEs and SMEs[63]. The main complementary and/or specific tools available to finance an environmental transition project are green and/or sustainable bonds, as well as green and/or sustainable loans, alongside traditional bank financing solutions (investment loans), which are also appropriate, particularly for VSEs and SMEs. There are also public support mechanisms similar to those available to individuals (energy-savings certificates (CEE scheme), clean mobility assistance, etc.).

[62] https://www.notre-environnement.gouv.fr/actualites/breves/article/quel-est-le-bilan-de-la-prime-a-la- conversion-des-vehicules#:~:text=En%202021%2C%20110%20000%20primes,du%20neuf%20(10%20%25).
[63] France Nation Verte (February 2023), *The main mechanisms for the ecological transition of VSEs and SMEs* [link]

i. Green bonds and sustainable bonds

Green and/or sustainable bonds are among the leading financial instruments associated with sustainable finance[64]: they are thus an important lever for financing projects linked to the ecological transition**. These bonds operate in the same way as traditional bonds, but they incorporate standards that qualify the bond as "green", "social" or "sustainable", and meet reporting requirements to ensure the proper allocation of the funds raised**.

Green and/or sustainable bonds now cover a **multitude of situations**, subject to various non-binding standards. Among the leading standards are the Green Bond Principles, established by the International Capital Market Association (ICMA) in 2013, which are based on four pillars on which issuers must report. These are the use of proceeds, the process for evaluating and selecting projects, the management of funds, and reporting. For green bonds and social bonds, issuers must follow voluntary ICMA standards on these pillars.

Regarding the type of activity that the bond will finance, the ICMA provides examples of eligible activities but is not prescriptive (e.g. energy efficiency for green bonds, social housing for social bonds).

Sustainability bonds combine environmental and social objectives in a single product.

Sustainability-Linked Bonds (SLBs) have financial characteristics (particularly interest rates) that vary depending on whether or not the issuer meets sustainability/ESG objectives. The targets are set in advance in the issue contract: the issuer must commit to ambitious targets, dated and measured using key performance indicators (KPIs) and assessed against sustainability performance targets (SPTs). The parties must:

1) Select the KPIs (e.g. carbon emissions)
2) Calibrate the SPTs (e.g. target carbon emissions)
3) Set the financial terms (adjustment in interest rate, thresholds to be reached)
4) Define the expected level of reporting
5) Agree rules for independent verification (at least annually by a trusted third party)

In 2021, French banks structured €225 billion in green bonds, social bonds, sustainability bonds and sustainability-linked bonds on behalf of clients around the world, representing a share of the global market of around 17% (source: Bloomberg league tables). This amount is gradually invested by issuers to finance their transition.

While voluntary standards such as those established by the ICMA are multiplying, there is currently no binding legal framework for the selection of projects, reporting or the issuance of green securities. In 2021, the European Union presented a proposal for a regulation establishing European Green Bonds (EuGB) to regulate the use of the term "European Green Bond". A provisional agreement was reached in February 2023 on the requirements applicable to EuGB issuers: the bonds will have to relate to one of the activities covered by the six environmental

[64] https://abc-economie.banque-france.fr/sites/default/files/medias/documents/20211221_mot_actu_obligation_verte_v5.pdf

objectives of the Taxonomy, issuers will have to act transparently by publishing regular reports and issues will be monitored by external auditors[65].

Without a legal definition of such tools, the green and responsible bond market still suffers from a lack of reliability and harmonisation, particularly with regard to the green qualification of the projects financed. In 2020, the Climate Bond Initiative indicated that the majority of bonds were not aligned with the 2°C trajectory established by the Paris Agreement.

ii. Green loans and sustainability-linked loans

Green loans are credit instruments granted to finance or refinance projects directly related to the ecological transition. Like green bonds, there are currently no specific harmonised rules. Some international financial associations such as the Loan Market Association (LMA), the Loan Syndications and Trading Association (LSTA) and the Asia Pacific Loan Market Association (APLMA) have published green lending principles.

There are green loans and sustainability-linked loans. In this respect, the LMA proposes voluntary standards that make it possible to classify a loan as “green”, “social”, “sustainable” or “sustainability-linked”. The principles laid down are similar to those of the ICMA.

In order for a **green loan** or **social loan** to be aligned with the LMA standard, borrowers must comply with the following conditions:

1) Target the use of funds on specific sustainability activities or projects (use of proceeds)
2) Describe the project selection and evaluation process (expected environmental and/or social benefits, criteria, methodology)
3) Describe the fund management process (transparency, segregation of funds)
4) Produce an annual report on the use of proceeds (up to the total allocation of funds)

Sustainability-Linked Loans (SLLs), sometimes also referred to as “ESG-linked loans” or “impact loans”, are financial products whose financial terms may vary depending on whether or not predetermined sustainability/ESG performance targets are met. SLLs are based on the same five principles as SLBs. However, unlike green loans, SLLs are not granted to finance a project directly related to the ecological transition (although a green loan can also be *sustainability-linked*). In the case of SLLs, the focus is not on the use of the loan, but on **ESG performance**: the borrower must prove to lenders that its sustainability efforts are sufficient to unlock the right to a lower interest rate and therefore a lower cost of credit.

From a legal point of view, the SLL mechanism is interesting in that it creates a right that lenders can enforce against the borrower before the courts. The green loan agreement may even include sanctions for non-compliance with the environmental and social provisions.

The French Banking Federation (FBF) has identified the amounts made available through green loans dedicated to financing the transition at the end of 2021[66]. Loans financing the

[65] EU Council Press Release, Sustainable finance: Provisional agreement reached on European green bonds, 28 February 2023 [link].
[66] FBF (2023), Inventory of financing solutions for the ecological transition offered by French banks (loans and bond issues). Source: Dealogic league tables.

transition in all sectors of the global economy totalled €100 billion in outstanding green or sustainable loans on the balance sheets of the seven biggest French banks at the end of 2021. €29 billion in new loans qualified as green or sustainable were granted in 2021, with four French banks ranked among the top 10 players in the global green loans market with a market share of around 18% in 2021. The loans granted (corporate loans, project financing, asset financing) cover all types of economic sectors, mainly including renewable energy, thermal renovation of buildings, sustainable infrastructure and sustainable mobility solutions.

Loans for renewable energy projects:

- €42 billion at end-2021 in outstanding loans for renewable energy projects
- €14 billion in new loans granted in 2021

Given the voluntary nature of the standards mentioned above, there is no commonly accepted and standardised definition for this inventory and these amounts cover various situations.

iii. Bpifrance loans to VSEs and SMEs

ADEME-Bpifrance Green Loan

Developed in partnership with ADEME, the purpose of the ADEME-Bpifrance Green Loan is to encourage VSEs and SMEs to undertake ecological and energy transition projects. It allows businesses to co-finance, in particular with banks, investment programmes aimed at:

- limiting and reducing the environmental impacts of processes, particularly in a circular economy approach;
- investing in “zero carbon” mobility for employees and goods;
- innovating to bring to market products and services that protect the environment and/or reduce energy consumption.

This loan is intended for VSEs/SMEs over three years old, in all sectors, that have received a “Diag Éco-Flux” assessment or assistance from ADEME over the past three years. These companies can receive a loan of between €10,000 and €1,000,000, systematically combined with co-financing of the same amount and granted without any collateral pledge of the company’s assets or the director’s assets, at a subsidised rate. The loan is repayable over a period of two to ten years, with a capital repayment deferral of up to two years.

Green loan

The Bpifrance green loan is granted to VSEs, SMEs and mid-caps over three years old to finance an ecological and energy transition programme, without any collateral pledge of the company’s assets or the director’s assets, with the aim of:

- encouraging the transition of SMEs and mid-caps investing to become more competitive by improving the environmental performance of their industrial processes or products;
- promoting the growth of businesses positioned on the energy and environmental value chain, as well as those that provide the innovations in technologies and processes that contribute to the transition of companies.

Businesses can receive a loan of €50,000 to €5,000,000, within the limit of their equity and quasi-equity, repayable over a period of two to ten years, with a possible repayment deferral of up to two years. This loan is systematically associated with co-financing of the same amount.

Energy savings loan

This loan can be used to co-finance equipment eligible for energy savings certificates in the "tertiary building" and "industrial" sectors, as well as related services, equipment and works (in particular energy audit or diagnosis, installation of equipment, tools, etc.) up to a limit of 40%. It is offered at a preferential rate thanks to the funds from the CEE PRO-INNO-50 Programme, for VSEs and SMEs over three years of age engaging in an investment programme with the aim of improving their energy efficiency.

Businesses can receive a loan ranging from €10,000 to €500,000, within the limit of their equity and quasi-equity. The loan is repayable over a period of three to seven years, with a possible repayment deferral of up to two years, and is systematically associated with co-financing of the same amount. It is granted without any collateral pledge of the company's assets or on the director's assets.

Climate action loan

This loan is used to finance ecological and energy transition projects run by VSEs and SMEs over three years old and with fewer than 50 employees. The loan is taken out 100% online via the Bpifrance Flash platform (https://flash.bpifrance.fr/).

Businesses can receive a loan ranging from €10,000 to €75,000. The term is adjustable from three, to five or seven years, including a deferred capital repayment period of nine months, one year and two years respectively. This loan is systematically combined with co-financing of the same amount and is granted without any collateral pledge of the company's assets or on the director's assets.

iii. Public support schemes

- ***Bpifrance's initiatives to support VSEs and SMEs in the ecological transition***

Bpifrance already has a variety of technical and financial support tools to support VSEs, SMEs and ISEs in the early stages of their transition. VSEs, SMEs and mid-caps have fewer resources to reduce their carbon emissions than large groups. Accelerating industrial decarbonisation requires financial incentives and support. Today, industrial SMEs mainly finance their R&D investments in cash (87% of industrial SMEs vs. 5% raising funds)[67]. Support for R&D funding is therefore a priority.

On the technical side, Bpifrance, in collaboration with ADEME, offers a number of tools to raise awareness, structure and strengthen the transition. The services range from online self-assessment to environmental strategy consulting and diagnostics:

- Diag Eco Flux to analyse and identify savings in terms of material flows (water, waste,

[67] Bpifrance figures.

energy),
- Diag decarbon'action to carry out a carbon review,
- Diag perf'immo to carry out an energy audit of buildings and define an action plan in line with the tertiary decree,
- Diag écoconception to review the production model.

These services have a cost but are subsidised to minimise the company's out-of-pocket expenses.

As part of the Fonds Amorçage Industrie (industry seed fund), for industrial startups and SMEs, Bpifrance also offers support from an expert specialising in the industrial field to define an industrialisation strategy.

Bpifrance supports innovation in its €3 billion deeptech plan launched in 2019, which aims to stimulate creation with an annual objective of 500 deeptech startups created and support for the growth of the most promising companies. Bpifrance's financing mechanisms helped 553 start-ups in the sector in 2021.

Bpifrance also offers financing to initiate the development of projects, always with a view to supporting research and development:

- The Première Usine call for projects, which aims to accelerate the emergence of initial industrialisation successes by industrial start-ups or innovative SMEs/mid-caps (for projects exceeding €5 million).
- The Fonds National Venture Industriel (FNVI) call for projects, launched in December 2022, is a new lever of action for start-ups and innovative industrial SMEs. €350 million is allocated to the FNVI.
- ***Aid for energy renovation***

Tax credit for VSEs and SMEs for the energy renovation of tertiary premises

This tax credit covers work in a tertiary use building undertaken between 1 January 2023 and 31 December 2024 and carried out by an RGE-certified professional in the following areas: insulation (attics, walls, roofs, terraces), collective solar water heater, heat pump, collective biomass boiler, mechanical ventilation, connection of a tertiary building to a heat or cooling network, acquisition and installation of a biomass boiler, heating and ventilation regulation/programming systems.

This tax credit may be combined with other aid (energy savings certificates in particular). It can cover up to 30% of eligible expenses, within a limit of €25,000 per company.

Energy-savings certificates (CEE)

The energy-savings certificate (CEE) system is one of the main instruments of the policy for limiting energy demand**. It is a state-sponsored scheme that commits energy suppliers and distributors to finance energy renovation works in all sectors of activity (residential, tertiary, industrial, agricultural, transport, etc.).** Businesses can improve their energy efficiency under the CEE system thanks to a reduction in their operating costs, help with financing

energy renovation works and/or advice from their suppliers (the obligors), and an increase their asset value by carrying out energy renovation works.

- ***Aid for clean mobility***

Scrappage bonus for the purchase of a clean light commercial vehicle

Professionals can obtain a scrappage bonus to help them purchase a new or used low-emission vehicle, in exchange for scrapping a Crit'Air 3 rated or older car or van (diesel engine vehicles first registered before 2011 or petrol engine vehicles first registered before 2006). Aid of up to €3,000 is available for the purchase of a new or used Crit'Air 1 vehicle with CO_2 emissions less than or equal to 127 g/km (or 137 g/km if the vehicle is more than six months old) and up to €9,000 for the purchase of a new or used electric or plug-in hybrid electric vehicle. It can also be combined with the eco-bonus.

- ***Miscellaneous aid***

ADEME Tremplin grant

This is a grant of between €5k and €200k for businesses undertaking small research or investment projects on specific ecological issues. The eligible measures and the associated aid packages are set out in a predetermined list. The grant application for may cover several actions at the same time.

ADEME Research, Development and Innovation grant

This is a co-financing solution offered by ADEME on a wide range of actions ranging from thesis to innovation projects related to the ecological transition for five categories of tools: the financing of around fifty theses per year; an R&D programme through competitive calls for research projects; participation in eco-innovation single point-of-contact in certain regions; the France 2030 Programme and associated calls for projects. ADEME may decide to co-finance projects outside its calls for projects.

ADEME assistance with research and advice

This is a grant from the ADEME for assessment and research carried out for the company by an expert on topics related to the ecological transition.

ADEME investment grant

The ADEME investment grant is available for investment projects by companies on topics related to the ecological transition. The amount awarded varies depending on the project.

c. Current European financing solutions available to businesses to decarbonise the French economy

a. Recovery and Resilience Facility (RRF)

The Recovery and Resilience Facility is a temporary stimulus package set up in February 2019 with the aim of mitigating the economic and social consequences of the COVID-19 pandemic and making European economies and societies more sustainable, more resilient and better prepared for the challenges and opportunities arising from the ecological and digital transitions.

The RRF is helping the EU achieve its goal of climate neutrality by 2050 and is putting Europe on the path to digital transition while creating jobs and stimulating growth[68].

- **€723 billion** to support the recovery and **accelerate the climate** and digital transitions of Member States
- **€37.5 billion in subsidies for France over 2021-2026** (€12.5 billion already received). The **investments financed by the RRF have been identified** in the National Recovery and Resilience Plan (PNRR), including €300 million for the decarbonisation of industry.
- **Payment of funds is subject to a strict assessment by the European Commission** of compliance with predefined commitments related to the implementation of investments.

b. European Investment Bank Group initiatives

The European Investment Bank (EIB) is one of the world's leading sponsors of climate action. Each year, the EIB provides financing totalling **€70 billion**, with the aim of devoting at least 50% of its annual financing to climate action from 2025. The EIB Group has set itself three major climate targets, including devoting 50% of its lending to climate action and environmental sustainability, supporting **€1 trillion of investment in climate action and environmental sustainability in the critical decade to 2030** and, from 2021, **aligning all its new activities with the principles and objectives of the Paris Agreement for addressing climate change[69].**

The EIB uses traditional and varied instruments: **direct or intermediated loans, venture debt, guarantees, equity investments in venture capital or private equity funds**. These instruments are chosen according to the profiles of the project initiators. The EIB works with both the public and private sectors to boost investment in climate action, environmental sustainability and inclusive development. Large companies and major projects are supported through direct loans, while smaller projects are supported through loans or other forms of assistance to intermediaries, such as local banks, which in turn provide financing to small companies. The projects financed are carried out in sectors such as renewable energy, energy efficiency, networks and storage, electric vehicle charging infrastructure, technologies such as low-carbon

[68] https://commission.europa.eu/business-economy-euro/economic-recovery/recovery-and-resilience- facility_fr
[69] EIB (2023), Climate action and environmental sustainability: Overview [link].

hydrogen, etc.

In 2021, **France was the leading beneficiary with €13.9 billion, €9.2 billion of which came from the EIB (two-thirds dedicated to initiatives to combat or mitigate global warming).** In 2022, the share of EIB investment devoted to climate action and environmental sustainability projects reached €36.5 billion, or 58% of its total investments.

c. InvestEU programme

The InvestEU programme brings together the European Fund for Strategic Investments (EFSI) and 13 other EU financial instruments in a single structure. Its objective is to **give an additional boost to sustainable investment, innovation, social inclusion and job creation in Europe.**

The programme has three building blocks: the **InvestEU fund**, the **InvestEU Advisory Hub** and the **InvestEU Portal**. The European Investment Bank Group is the main implementing partner of the InvestEU programme, with a 75% share. The remaining 25% is implemented by other partners: in France, these are Caisse des Dépôts et Consignations (€350 million, 40% of which is “green”) and Bpifrance (amount under negotiation).

The InvestEU fund is expected to stimulate more than €372 billion in public and private investments. **An EU budget guarantee of €26.2 billion covers the investments of the European Investment Bank Group and other financial partners, with the aim of de-risking the balance sheets of financial partners and enabling them to finance riskier projects**.

Among the projects supported, the main priority (38%) is **sustainable infrastructure** (transport, energy, water and waste treatment). The other three priorities are research, innovation and digital transformation, small and medium-sized companies and social investment and skills.

d. REPowerEU

In response to the new geopolitical realities of the energy market (Russian invasion of Ukraine), the REPowerEU plan aims to achieve energy savings, produce clean energy (and therefore decarbonise energy) and diversify energy supply sources. It is based on **financial** and legal measures aimed at building the new energy infrastructure and systems that Europe needs.

Among the financial measures, the **Recovery and Resilience Facility** (RRF) provides additional European funds for the implementation of the REPowerEU plan.

Member States can use the remaining RRF loans, **currently totalling €225 billion**, and new RRF grants financed by the sale of Emission Trading System (ETS) allowances, for up to **€20**

billion. As such, the payment of REPowerEU grants is subject to the same constraints as those of the RRF (strict assessment by the Commission of compliance with objectives; considerable reporting and audit requirements).

The REPowerEU plan also mobilises other sources of financing, namely: the Cohesion Policy Fund, the European Agricultural Fund for Rural Development, the Connecting Europe Facility, the Innovation Fund, national and European funding in support of REPowerEU objectives, national fiscal measures, private investment and EIB support.

France has received €2.3 billion in subsidies and between €300 million and €600 million in transfers from the Brexit adjustment reserve (BAR).

e. European carbon market innovation fund

The Innovation Fund is fed by revenues from the Emission Trading System (ETS). It enables the financing of **innovative and flagship projects in sectors covered by the ETS** (industry, electricity production, aviation, shipping) enabling significant emission reductions via **calls for projects.** Its volume is estimated at 535 million ETS allowances by 2030, representing **€43 billion** with a carbon price of €80/tCO_2e.

The **French return rate is around 14%** based on the first calls for projects:

- Carbon capture projects at the Eqiom cement plant (Lumbres, Nord-Pas-de-Calais) and the Chaux et Dolomies du Boulonnais cement plant with Air Liquide
- Production of lithium-ion batteries by ERAMET
- Production of photovoltaic panels by REC Solar and the CEA
- Development of innovative batteries for the automotive sector by Arkema
- Development of sailing boats equipped with wind propulsion technology by Chantiers de l'Atlantique

Conclusion

There has been an increase in the number of financing instruments available to businesses and individuals, including both public aid and private financing schemes, to support ecological transition projects. This diversity of tools alone does not seem to be generating sufficient interest, at this stage, among companies, public actors and households to initiate EET projects that can be financed by current resources. Over and above the shortage of projects, there can be many difficulties related to the financing of these projects: a lack of financial solutions to cover the level of risk inherent in certain highly innovative projects, implementation procedures that are unsuited to the current challenges, a lack of visibility of the solutions available, administrative complexity and the need to obtain multiple aid packages that are too small, etc.

However, it is important to capitalise on these experiences at all levels to simplify the solutions and roll out the most efficient systems at scale so this ecosystem encourages players to take action to achieve climate objectives.

Chapter III

Ecological transition financing action plan: recommendations of the Institute for Sustainable Finance

The fight against climate change and the reindustrialisation of France are now priorities, the success of which requires considerable investment in research and development, the transformation of industrial processes and new infrastructure in all key sectors of the economy. The French economy has the means to make these investments, in particular thanks to household savings, which have never been so large and abundant. A major issue we have sought to address in this report, besides identifying financial resources, is the need to consider the economic profitability of investment projects. Currently, there is a shortage of actual projects rather than of resources available for their funding. One of the major challenges of the ecological transition for France is to encourage key players (companies, households, public players) to initiate projects in this area.

Create economic incentives to initiate transition projects

A major issue addressed in this report, besides identifying financial resources, is the need to consider the economic profitability of investment projects. Indeed, the key challenge is to encourage major players (companies, households, public authorities) to take action by initiating transition-related projects. As the transition has a low value in use, the costs of this transformation must be shared to create the conditions for a sustainable ecological transition market and establish the necessary new economic equilibrium. Succeeding in the ecological transition means above all enabling the creation of solid business cases that combine a facilitating legal framework, quality infrastructure, public coordination and private initiative.

Make France more attractive and meet climate objectives

To make France more attractive and ensure it meets its climate goals, the government has prepared a draft green industry law with two objectives: to make France the champion of clean technologies and support industries with their decarbonisation to ensure the country's industrial and energy sovereignty.

Successfully decarbonising the economy and reindustrialising the country means successfully managing two requirements:

- mobilising financing, in particular savings invested in debt and equity, in support of the necessary investments. This means using financial savings to back investments in the ecological transition;
- finding the economic equilibrium of ecological transition projects to make them sustainable over time. The public authorities must ensure the creation of a market for the ecological transition using the four tools at its disposal (taxation, subsidies, the cost of financing, state guarantees and tax credits).

To meet this challenge, the Institute for Sustainable Finance has focused its proposals on three areas of action, described below:

1) Clearly define how the resources mobilised will be used;
2) Increase the economic profitability of the ecological transition for project owners, investors and individuals;
3) Mobilise financial resources for the ecological transition.

1. Clearly define how the resources mobilised will be used and what projects can be financed

Before the financing is mobilised, the purpose for which it will be used must be clearly defined. The first step is therefore to clearly identify the economic activities and financial products that contribute to the ecological transition. Project financing is by nature easier to identify and a detailed list of activities will make it easy to ascertain the financing and investments that contribute to it. However, for corporate debt financing (loans or investments), the destination of financing is inherently untraceable. It is therefore necessary to clearly define criteria that can easily determine what qualifies as "transition financing" for the companies that benefit from it.

To avoid any risk of greenwashing and confusion, it will be necessary to distinguish clearly between activities relating to the ecological transition and those that are already considered "environmentally sustainable" within the meaning of the European Taxonomy. The proposals below relate exclusively to the transition. The aim is to define "ecological transition projects", "companies in transition" and finally the financial products that contribute to financing the transition.

Proposal 1a: Clearly define a list of priority activities and projects to be financed under the ecological transition, which could be awarded an "ecological transition project" label

First, it is necessary to define a precise list of priority and eligible activities and projects in order to clarify the allocation of financial savings and constraints on their use in order to better identify what contributes to the ecological transition.

The European Taxonomy of Environmentally Sustainable Activities, as its name suggests, defines activities that are already "sustainable". It therefore does not address the issue of activities in transition.

This does not entail building a parallel Taxonomy but instead **drawing up a list of priority transition activities as part of a "green" industrial strategy for France and Europe.**

Within this framework, priority investment areas could also be identified to integrate the objective of supporting local areas the most affected by deindustrialisation. The definition of "green" projects should take into account their contribution to reducing greenhouse gas emissions and the country's objectives of reindustrialisation in sectors that are deemed priorities.

This list of projects will require consensus among public and private stakeholders and will be regularly updated to take into account scientific and technological developments. It should thus be built with industrial companies and public actors, supported by scientific analysis. This work could potentially be carried out by the IFD, which will report on its work to the Ecological Transition Financing Committee.

This identification work has already been initiated as part of the proposed Net Zero Industry Act regulation. The European Commission is drawing up a list of "priority" net zero technologies on which public and private efforts must be focused as part of the EU's green reindustrialisation. This list could be a basis for discussion to be adjusted to France's specific context.

As an indication, based on the financing needs identified in the first section of this report and the

Net Zero Industry Act, the following could be considered transition activities:

1) Construction
    a. Renovation of residential properties to reduce carbon emissions and low-carbon construction
    b. Changing heating energy sources (end of fuel oil, transition from gas to heat pumps and decarbonisation of gas)
    c. Renovation of tertiary buildings and non-private residential buildings (state-owned buildings, social housing landlords, local authorities and businesses)
2) Transport
    a. Decarbonisation with the use of low-carbon engines and increased fuel efficiency (electrification, alternative fuels, increased fuel efficiency)
    b. Support for change in transport methods
    c. Demand management (reduction in number of journeys and increase in occupancy)
3) Energy
    a. Transformation of the energy mix (solar energy, wind energy, batteries and other energy storage solutions such as pumped energy transfer stations, heat pumps and geothermal energy, electrolysers and fuel cells, biogas/biomethane, power network technologies, sustainable alternative fuel technologies, nuclear energy)
    b. Network development and adaptation (batteries and energy storage, network flexibility, new energy infrastructure such as hydrogen)
4) Industry
    a. Transformation of the energy mix in industry (stop using coal, integration of thermal renewable energies, electrification of heat production and increase in energy efficiency)
    b. Process change (process electrification, replacement of methane by hydrogen, new innovative processes)
    c. Development of carbon capture, use and storage (for the decarbonisation of final emissions)
5) Agriculture and forestry
    a. Change in livestock farming practices (increase in the production of vegetable proteins, change in the diet of livestock, limitation of waste)
    b. Changes in field crop practices (increase in organic and legume production areas)
    c. Transformation of energy uses: reduction in energy consumption of buildings, conversion of agricultural machinery)
    d. Reforestation and maintenance of existing forests and land (increased carbon storage through long-life wood products, reduced soil sealing, adaptation of forests to climate change)
6) Waste
    a. Reduction in mineral waste production: eco-design of mineral products and increase in the life of products, reduction in organic waste)
    b. Recovery of residual waste (reuse, sorting of bio-waste at source, reuse, repair, recycling, energy recovery)
    c. Reduction and recovery of residual emissions (biogas capture, sludge treatment by anaerobic digestion)

Proposal 1b: Determine the conditions that businesses must meet to be able to consider that the financing and investments they receive are part of the transition

Financing the transition involves supporting the transformation of the business models or production methods of the most carbon-intensive companies. In addition to financing dedicated projects, assets or activities, it is also crucial to establish a framework to enable financial institutions to assess whether "corporate" investments or loans, which are not earmarked for a particular project, contribute to the transition. It would therefore be useful to define clear criteria to assess whether a business active in a sector with the highest greenhouse gas emissions is indeed in transition.

Under the CSRD (and probably the CSDDD[70]), companies will be obliged to publish a transition plan: ESRS E1, Disclosure requirement E1-1 "Transition plan for climate change mitigation". The effective publication of this plan, as required by the regulations, will necessarily be a prerequisite for the analysis of the investor or financer.

While the regulation sets out the content of the plan, at this stage it does not give any indication of the analysis to be carried out to assess its credibility and its ability to contribute to the objectives of the Paris Agreement. The analysis criteria could therefore be clarified based on existing initiatives. Assessment methodologies such as the ACT (Assessing low-Carbon Transition) method have been developed to support these analyses and already provide a solid foundation. The IFD project on non-financial analysis focuses in detail on the analysis criteria of a transition plan. This work could therefore usefully feed into this proposal or even constitute a preamble to it.

For example, the analysis criteria could relate to:

- The consistency of GHG emission reduction targets with the objectives of the Paris Agreement, the EU target of carbon neutrality by 2050 and Fit for 55, and the national low-carbon strategy: for example by ensuring that these targets are aligned with the target decarbonisation trajectory of the business sector in question, where such a trajectory is available.
- The definition of intermediate targets;
- The resources implemented (financial and human resources, action plans, limited use of carbon offsetting mechanisms, after having exhausted reduction efforts, etc.);
- The quality of the associated governance.

By sector, limits could be set for the amount of investments (CapEx) in activities aligned with the Taxonomy or falling within the scope of the transition (see proposal no. 1a) in relation to CapEx in high-emission activities. Similarly, energy efficiency criteria for electricity production could apply for utilities, with trajectories set for absolute GHG emission limits. Again, it will be a matter of building on existing initiatives.

[70] Corporate Sustainability Due Diligence Directive.

The question of labelling companies that meet these criteria as “companies in transition” remains up for debate at this stage. This would imply that the assessment carried out is “enforceable” and it is difficult to consider this without having established the reference framework for analysis more precisely. Such labelling would also require the involvement of an external third party.

Proposal 2: Create an “Ecological transition” label for financial products

To foster better identification and monitoring of financing for the transition and the decarbonisation of our economy, it would be useful to create an “Ecological transition” label designed as a transition financing classification and not only as a savings product label. This proposal could, of course, only be worked on after the transition criteria for the underlying assets are defined (see proposals 1a and 1b).

Such a label would also serve savers, even if this is not its primary purpose. Consequently, its interaction with current labels will need to be carefully studied. This work should ideally be carried out at European level.

In France, the SRI label (a general ESG label) and the Greenfin label (restrictive label, applicable to funds that invest in already “green” companies) currently coexist for investment funds. Greenfin certification does not allow investments in companies undergoing an energy transition. However, with a view to decarbonising industry, it is essential to have a forward-looking view of companies and to encourage their transformation, regardless of their current emissions situation.

The SRI label, which is currently being overhauled, is likely to include transition criteria for assets with major climate impacts (subject to final decisions and publication of the final reference framework). The overhaul of the SRI label was decided as a basis on which more demanding criteria can be defined. The transition criteria proposed as part of the consultation on the new SRI label reference framework will ensure that issuers from sectors with high greenhouse gas emissions are duly engaged in the transition. However, the SRI label is a general label not intended to specifically promote the financing of the transition. It does not impose a minimum share of underlying assets in transition and a fund manager may therefore choose not to invest in any company in transition. The objective would therefore be to develop products whose primary objective is to contribute to the transition.

For funds, the precise criteria would be discussed in an *ad hoc* taskforce. In particular, they could be based on the following elements:

- Minimum share invested in “transition projects” (included in the list of activities established under proposal no. 1a) or companies in transition (in high-impact sectors (high GHG emissions) whose companies meet the precise transition criteria, see proposal no. 1b);
- Obligation to analyse the credibility of issuers’ transition plans and their alignment with the target decarbonisation trajectory of each issuer’s business sector (scenarios and targets could be set by sector);
- Obligation to monitor the trajectory of issuers receiving investments or financing in sectors with a high climate impact and to engage with issuers in the event of any deviation (dialogue with company managers to request corrective actions and definition of an escalation process or even a divestment decision). For bank financing, this could

affect the decision to grant credit or the cost of credit).

- Minimum portion to be invested in companies having the majority of their activities in the European Union in order to promote transition investments (particularly industrial investments) in Europe.

Funds with the “ecological transition” label should be included in the financial products that must already include socially responsible investment, ecological and solidarity-based transition funds (employee savings, life insurance, insurance PER). These “transition” investments would be distinct from “green” investments (already aligned with the European Taxonomy).

More generally, this label should also apply to all private equity funds, subject to appropriate criteria, to facilitate their fundraising, particularly among institutional investors. These funds represent an ecosystem with specific resources and action levers, closely involved with companies’ managers and operations, able to successfully complete the necessary transformation of the economy by making long-term investments.

2. Increase the economic profitability of the ecological transition for project owners, investors and individuals

Financial players note a shortage of projects in the energy and ecological transition. There are two paths to be followed to ramp up these projects: (i) the creation of an environment that makes investing in France attractive; (ii) the development of conditions that make transition projects more profitable.

Enabling companies to invest in the ecological transition presupposes, above all, a global ecosystem that makes investing in France attractive via several strategic components:

1) The development and consolidation of an infrastructure network commensurate with the challenges of the ecological transition, particularly for the transport of goods (rail freight, inter-modal connections, development of electric charging stations, modernisation of French ports, etc.) and energy production, transmission and distribution (guarantee of low energy prices, increase in electricity network capacity, adaptation to the intermittent nature of renewable energy, development of a hydrogen network, etc.) to enable the sustainable development of a low-carbon industrial fabric;

2) An education system that includes the ecological transition among the core skills to be acquired (upgrading of related teaching jobs, development of sectors of excellence, particularly in technical schools, etc.);

3) Access to low-price energy to guarantee the sustainability of industrial investments, particularly in the energy transition.

These conditions are essential to establish a favourable environment to encourage investments in support of the energy and ecological transition. However, they are partially outside the IFD's remit and will require strong political will.

The next step is to create the conditions for a sustainable transition market and to find the necessary new economic equilibrium. Two key issues in investment decisions are reward and risk. Whether for individuals, businesses or investors, projects linked to the transition often do not currently meet the reward and risk criteria required to encourage action. For example, one of the obstacles to the thermal renovation of homes, besides operational considerations, has been the low economic interest for households: until recently, the return on investment arising from the savings made was too uncertain and too long term to guarantee an economic interest. To ensure a just transition, additional investment costs cannot be borne solely by households, under regulatory constraints, or only by businesses, because these additional costs will inevitably be passed on to the prices of goods and services (if this proves difficult or impossible, it will exacerbate the shortage of investments) and therefore ultimately to the consumer. The transition to more sustainable systems will only be possible if governments and businesses work to reduce social inequalities and improve access to greener goods and services.

One solution would obviously be to integrate the cost of carbon, which would impact the profitability of projects, while taking into account the societal impacts on consumers. However, as this necessary condition does not fall within the scope of the financing plan, it is not further developed in the report.

Beyond this, the aim is to implement financial instruments to promote the economic equilibrium of investments for both individuals and businesses.

a. Increase the economic profitability of transition projects for companies

Proposal 3: Accelerate the tax amortisation of EET investments

The ecological transition requires significant private sector investment in sectors in which economic profitability is not yet certain. To encourage companies to make these investments, it would be possible to allow accelerated tax amortisation of investments in the ecological transition (as defined in proposal 1). The aim would be to target and calibrate this proposal with the public authorities to avoid unintended consequences and limit the impact on public finances.

This mechanism would make it possible to **foster the financing of the renovation of tertiary real estate assets to reduce their carbon emissions**; this issue is sometimes reduced to the thermal renovation of housing. However, existing real estate also includes considerable tertiary and commercial assets and energy consumption is not the only way to improve a building's carbon footprint. These assets are often held by companies or private lessors who pool their assets in real estate funds. Accelerated tax amortisation of investments in the energy renovation works that real estate investment funds could encourage would accelerate the deployment of these investments and would represent a fair equivalent to the aid already available to individual property owners.

Proposal 4: Create a state guarantee fund for green investments, particularly for more strategic investments, and/or investments driven by SMEs/mid-caps

Some investments for the ecological transition involve risk-taking and must be considered as part of a global transition of society. Many of the technologies under development for the transition are still not very mature and therefore present a higher risk: action must be taken upstream to promote these projects. It is up to the state, as coordinator of the ecological transition, to bear the cost of coordination and uncertainty specific to the transition in order to make some of the necessary investments viable and to initiate investments that will demonstrate business cases.

In particular, a state guarantee is necessary for infrastructure financing. The ecological transition requires massive investments in new infrastructure (electric charging stations, hydrogen-adapted gas infrastructure, rail freight, renewable energy production and distribution, electrification, adaptation of the electricity network to the intermittence of renewable energies, new forms of mobility, etc.). All of this can only make an environmentally coherent and economically viable whole if these technologies are established in a system. As central planner, the state should act as guarantor of the whole to ensure the financial sustainability of these projects, which are mainly funded by private financing.

Proposal:

The IFD proposes the creation of a guarantee fund based on the model of the "Junker plan" of the European Fund for Strategic Investments (EFSI) which, with an initial allocation of €21 billion and leverage, guaranteed more than €335 billion of private investment throughout the European Union over three years to revive the economy after the crisis.

The IFD proposes developing a state guarantee fund to back transition investments, especially in infrastructure and innovative technologies, in particular by SMEs and mid-caps, which are considered riskier and therefore more difficult to finance today.

- This fund would be endowed with €5 billion to be used to guarantee more than €50 billion of investments over five years, i.e. 15-20% of the additional investment needs for the EET. This guarantee would enable SMEs to obtain financing at costs comparable to those of the largest companies already present in the ecological transition markets. By way of comparison, the Junker plan had a ratio of 1 to 16 because it guaranteed already mature technology projects. The IFD instead expects a leverage ratio of 1 to 10 given the relatively higher risk associated with investments in the transition (technologies that are sometimes still poorly developed, emerging markets, financing of ISEs and SMEs, etc.).
- The fund would be managed by public financial institutions involved in financing the transition (Bpifrance, Ademe, AFD for overseas territories, etc.).
- Eligibility criteria must be clearly defined to avoid windfall effects and channel resources towards major EET projects. The state would be responsible for defining the strategic priorities in its ecological planning role (see proposal 1).
- It would guarantee 80% or even 90% of these investments, as in the case of state-guaranteed loans issued during the health crisis. An 80% guarantee is possible under current European texts[71], while a 90% guarantee requires greater supervision and can only be temporary.
- This fund could be split into several thematic segments to focus on financing the
    - major infrastructure projects needed to ensure the success of the ecological transition (charging stations, rail freight, electricity network adapted to the intermittent nature of renewable energy, etc.);
    - Innovative transition technologies (electric vehicles, energy efficiency technologies, CO_2 capture, etc.);
    - R&D, particularly VSEs, SMEs and mid-caps (development of green hydrogen, new energy sources, etc.).

Particular attention will need to be paid to R&D financing for VSEs, SMEs and mid-caps. Today, industrial SMEs mainly use their cash to finance their R&D investments (87% of industrial SMEs vs. 5% that raise funds). Support for R&D funding is therefore a priority. The aim is to support players by granting them specific R&D aid in more liquid forms.

b. Help individuals invest in the ecological transition

Households have an important role to play in the ecological transition, in particular by investing in thermal renovations and low-carbon vehicles. To ensure the thermal renovation of homes and encourage the purchase of clean vehicles at scale, these investments must be made more attractive, their results must be made more certain and their economic profitability must be ensured for households. The combination of the éco-PTZ, enhanced aid packages such as MaPrimeRénov', the energy savings achieved, and the clear risk of a fall in the asset price with

[71] https://eur-lex.europa.eu/legal-content/FR/TXT/?uri=uriserv:OJ.C_.2008.155.01.0010.01.FRA&toc=OJ:C:2008:155:FULL

additional tax depreciation should make housing renovations to reduce carbon emissions and the purchase of low-carbon vehicles more attractive, while spreading the necessary public spending over time.

In addition to economic profitability, renovations to reduce carbon emissions will become essential for property owners due to changes in the legal framework concerning the letting of homes that leak heat. There is a risk of unrealised capital loss on rental properties. A study by Deepki[72], without constituting a review of realised or unrealised capital losses due to the absence of energy renovations, shows that, for energy-intensive tertiary buildings, the cost of the full transition (works and indirect costs, such as moving or no longer collecting rent during the works) amounts to between 4% and 25% of the asset value depending on the region. This may, therefore, with no discounting assumption, provide an indication as to expected capital losses.

In addition, carrying out thermal renovations is a complex administrative and operational process for households. Households need to make multiple applications for funding (one for MaPrimeRénov', one for energy-savings certificates, one for the éco-PTZ), the cash advance can be significant and carrying out the work is costly in terms of time and energy (contacting the various contractors, the inconvenience of works carried out over several weeks, etc.). In addition to economic incentives, **the public authorities must ensure fluidity in the use of the measures by households, in particular by consolidating the France Renov single point-of-contact and generalising an integrated approach to building renovation** to facilitate **support and reduce the administrative procedures that currently hinder the thermal renovation of homes.**

Proposal 5: Roll out the éco-PTZ (zero-interest eco-loan) at scale for housing renovations to reduce carbon emissions and extend it to all household EET investments

The éco-PTZ is used to finance energy renovation work in a home. It is distributed by all banking institutions.

Although the éco-PTZ is available to all households, few currently make use of it. However, there has been a sharp increase in demand recently due to constraints on the letting of homes that leak heat and the rise in energy prices. Demand tripled between 2017 (24,315 loans granted) and 2022 (72,020 loans granted) (source: SGFGAS). The éco-PTZ is also starting to benefit from its image, which must be capitalised on by perpetuating and expanding the scheme.

A recent positive development was the introduction of Mon Eco PTZ Prime Rénov', which simplifies access to the éco-PTZ for households benefiting from MaPrimeRénov'. This package is an illustration of what needs to be pursued: simplifying and giving visibility to current systems over time.

Proposal: The éco-PTZ is an effective solution and the experience and visibility acquired must be leveraged. The aim is to establish it as a long-term solution not subject to annual finance bills. Here are some suggestions for how to extend and broaden its use:

[72] https://content.deepki.com/fr/white_paper_esg_asset_value?utm_medium=organic&utm_source=whitepaper_page&utm_campaign=02_2023_FR_ESG_ASSET_VALUE_WHITE_PAPER&utm_content=white_paper

- **The éco-PTZ should be allowed to finance 100% of the investment effort** to avoid households having to make a cash contribution, as this most often discourages the completion of the work.
- **Broaden the scope of éco-PTZ financing:** Energy sovereignty is a priority. Households may want to insulate their homes but also produce energy (solar panels, geothermal energy, wind turbines, etc.) or buy an electric vehicle. The éco-PTZ could also finance these types of household investment. A single loan for all purposes would improve its visibility.
- **Facilitate the mechanism that makes it possible to take out an éco-PTZ loan at the same time as a loan to purchase a home and finance refurbishments.** In practice, eco-renovation works are carried out when purchasing a property. This would make it easier for new homeowners to take out a loan in two parts: one part for the purchase and comfort-related renovation of the property (at the market rate) and one part for the thermal renovation of the property (at zero rate). Repayments would be combined, with a lower overall rate.
- **Simplify decision-making for properties in co-ownership and access to the éco-PTZ for collectively-owned buildings.** Very few thermal renovations are carried out in co-owned buildings because of the cumbersome decision-making process and the difficulties in financing such projects. A loan associated with the property and not the person could also be considered for co-ownership properties, under which the amount payable would be assigned by the previous owner at the time of sale via a notarial deed. [73]

The aim would be to target and calibrate this proposal with the public authorities to avoid unintended consequences and limit the impact on public finances.

Proposal 6: Make household investments in the ecological transition tax deductible

Households have an important role to play in the ecological transition, in particular by investing in thermal renovations and low-carbon vehicles. To ensure the thermal renovation of homes and encourage the purchase of clean vehicles at scale, these investments must be made more attractive and their economic profitability must be ensured for households. The combination of the éco-PTZ and the energy savings achieved, plus additional tax depreciation should make thermal renovations of homes and the purchase of low-carbon vehicles more attractive, while spreading the necessary public spending over time. Supporting households in these major organisational projects must remain a priority and “Mon Accompagnateur Renov” (a government scheme providing support with energy renovation works) is a good example of the direction to take if this scheme can be rolled out at scale.

Proposal: To simplify administrative procedures, the aim would be to shift public expenditure away from subsidies (in particular by limiting the MaPrimeRénov’ grant and bonuses for the purchase of a clean vehicle to the lowest-income households) and instead provide financing to make household EET investments tax deductible. In particular, this would make it possible to

[73] This proposal requires a detailed analysis of the processes to be implemented to ensure compliance with debt ratios.

spread the state's financial effort over time. Analysis involving the various stakeholders to define and confirm the benefits of such a change and the conditions for its success will be necessary to involve all stakeholders and ensure their appropriation of the system. The aim would be to target and calibrate this proposal with the public authorities to avoid unintended consequences and limit the impact on public finances.

3. Redirect savings to finance the ecological transition

The financial savings landscape in France has changed very little over nearly 40 years. In particular, it was built around the objectives of home ownership and precautionary savings in a country where retirement planning is dominated by compulsory pay-as-you-go pension systems. Today, there is a need to redefine the landscape to adapt it to the challenges of our time and to massively redirect individual investors' new and outstanding savings towards financing the ecological transition.

The IFD proposes using all current financial savings schemes to serve the ecological transition by encouraging the greener use of these savings, in particular:

- Regulated savings, in particular through the Caisse des Dépôts et Consignations National Savings Fund;
- Long-term financial savings, including life insurance products and retirement savings plans.

a. Strengthen regulated savings schemes to support the ecological transition

The IFD proposes encouraging the allocation of regulated savings inflows that already contribute to the financing of the ecological transition, in particular the Livret A, the LDDS and the PEL, so that these savings can be mobilised, in line with needs, in parallel with the implementation of ecological transition projects. There are already mechanisms in place for allocating these savings to the EET, either via the CDC National Savings Fund or banks' balance sheets, but these mechanisms need to be clarified and strengthened.

Proposal 7: Increase the share of the National Savings Fund that finances housing renovations to reduce carbon emissions, low-carbon construction and energy infrastructure projects that are key to the ecological transition

The particular feature of the Caisse des Dépôts et Consignations National Savings Fund is its ability to financially support public policy with significant resources over long periods, for projects with significant positive externalities. It is a major asset in financing social housing policy and urban policy. Its role in financing the ecological transition can be further strengthened.

The allocation of centralised savings is determined mainly by law and certain procedures are specified by decree:

- Article L221-7 of the French Monetary and Financial Code provides that Livret A and LDDS savings account deposits are "used first and foremost to finance social housing". Article L221-5 also specifies the priority for financing urban policy.
  Finally, Article L221-7 specifies that part of the savings may be freely placed on the financial markets (equities, loans, investment funds, etc.)
- A decree specifies the terms and conditions without ever specifying the portion that

must be allocated to each of the priorities (Decree No. 2011-275 of 16 March 2011 on the remuneration of the collection networks for the Livret A and the LDDS savings accounts, the centralisation scheme for deposits collected and the remuneration of the PEP popular savings account).

Today, among centralised savings, the vast majority of financing allocated to social housing is used for construction. For example, in 2021, €11.8 billion in loans were granted for the construction of new homes (85,300 in 2021) and the rehabilitation of homes. More specifically for thermal renovation, €538 million in eco-loans were signed in 2021, enabling the renovation of 32,000 social housing units, in addition to €420 million in fixed-rate loans to complement the eco-loan, i.e. a total of around €1 billion for thermal renovation of social housing in 2021, representing a ratio of 1 to 12 between thermal renovation and the construction of new housing.

Proposals:

- The National Savings Fund must continue to be used to finance social housing and urban policy, which remain a priority. However, the government could set a target for it to be used more to finance renovations to reduce the carbon emissions of social housing and public buildings. Social housing players are now setting an example in terms of renovations to reduce carbon emissions, but the climate emergency requires an acceleration of the pace. This would not require any change in the law, but a clarification of Caisse des Dépôts' investment policy.
- While the ecological transition is indeed a priority of the National Savings Fund, with budgets specifically allocated to it, the government could enshrine the financing of the ecological transition as a priority alongside social housing and urban policy. Although the current framework already partially allows this, it would provide National Savings Fund asset managers with greater financial capacity (without ruling out the financing of social housing) to finance large, strategic transition infrastructure projects that require large long-term loans, with significant positive externalities. The National Savings Fund is already helping many local authorities invest in the transition, but it could also involve new projects on a national scale (energy infrastructure, transport and mobility, etc.).

Proposal 8: Establish dialogue between the public authorities and the banks that hold regulated savings to continuously adapt the banking offer to growing financing needs

Regulated savings deposits held in banks' balance sheets are already subject to an obligation to allocate 10% to financing the EET (and 80% to SMEs and 5% to the ESS). Banks now largely fulfil this ambition: in its report, the Banque de France, which collects data on all identifiable loans contributing to the ecological transition, calculates that banks meet the expected target for the decentralised funds of the Livret A and the LDDS more than ten times over. There is therefore no need at this stage to increase the required allocation to the transition. Such a measure would create an imbalance between the current need for financing and the resources mobilised.

However, while there are insufficient projects to go further, the pace of transition investments is currently well below the pace needed to make the transition a success. If France were to make the necessary investments for the transition, financing capacities would need to be increased

and banks would be very much in demand. The aim is to establish a mechanism for dialogue and monitoring banks' efforts to finance the ecological transition to ensure the smooth financing of all transition projects.

Proposals:

- The IFD proposes that banks regularly report on their financing of the ecological transition to monitor changes in the growth of these investments.
- Targets for financing allocated to the ecological transition could be set collectively based on this monitoring and the anticipated increase in demand for financing. Public authorities and financial institutions would thus have the continuous objective of inventing new financing solutions adapted to needs.
- The Ecological Transition Financing Committee would be at the heart of this task of monitoring and co-building financing solutions with financial institutions and public authorities.
- In the long term, it could be possible to increase the maximum amount that can be held in the LDDS account if the financing needs of the ecological transition so require.

Proposal 9: Encourage the financing of thermal renovations via the PEL home savings loan by creating a mechanism to encourage holders to use their savings for this purpose

At the end of January 2023, outstanding PEL home savings totalled €282 billion, according to the Banque de France.

Today, the PEL has often lost its original use, which was to finance the purchase of a home or renovations, as the context made low-rate traditional home loans available for many years. Given its attractive interest rates, especially for very old PELs, savers no longer release their savings to apply for a loan. The challenge is therefore to offer conditions to encourage savers who are already homeowners to use their PEL to finance the thermal renovation of their home, without removing the primary objective of the PEL - home ownership - which could become relevant again with the current rise in interest rates.

Proposals: The PEL is a costly product for banks that now only marginally fulfils its primary use, which is home ownership. It is necessary to start thinking about its future and its use, in particular to finance renovations carried out by households to reduce their home's carbon emissions.

An interest bonus of 0.5 percentage points could be granted on the release of savings from a PEL account provided that these savings are used to finance the renovation of the saver's home to reduce its carbon emissions (for example, when applying for an éco-PTZ), regardless of the PEL interest rate, with a maximum bonus to be defined. To speed up the release of savings to ramp up renovation work before 2030, this window of opportunity should be left open for a limited time (five years for example) and subject to the age of the PEL savings account. The objective would be to encourage households that are already homeowners to use their PEL to finance renovations.

b. Direct life insurance and retirement savings assets towards long-term investments in the ecological transition

Two long-term savings mechanisms can be allocated to financing EET investments, which are long-term projects and have a time horizons aligned with such investments: life insurance products and retirement savings plans.

Proposal 10: Direct life insurance savings towards transition financing

Life insurance funds invest in all economic financing vehicles (government bonds, corporate bonds, listed equities, etc.). They have significant firepower in the real economy.

At the end of 2021, traditional euro life insurance products comprised 35% sovereign bonds, 38.4% corporate bonds and 12% equities[74]. Unit-linked life insurance policies and pension funds comprised 57% equities, 17.2% corporate bonds, 9.3% corporate real estate and 5.2% sovereign bonds.

At present, 6.3% of euro fund life insurance assets are considered "green"[75] [26% of unit-linked life insurance assets invested in responsible, green or solidarity-based securities (including 3.2% with the Greenfin label)].

Proposal 10a: Develop an "Ecological transition" label for life insurance products

Proposal: On a voluntary basis, insurers would be given the opportunity to assign compliant traditional euro and euro-growth life insurance products as "Ecological transition" funds. The insurer would commit to investing a portion of the fund in "green" and transition assets as defined in proposal 2.

Proposal 10b: Strengthen private equity investments (particularly in companies in transition) in unit-linked life insurance policies by including at least one unit of account invested in private equity.

Proposal 11: Direct PER retirement savings funds more towards long-term investments

In general, in addition to life insurance, retirement savings – like employee savings – are very long-term savings that should, particularly when managed under delegated management services, be more widely invested in financing the growth of unlisted French and European SMEs and mid-caps, among which industrial companies are well placed. Investment in unlisted companies through private equity funds provides both diversification for savers and professional support for the company, increasing the performance of the investment.

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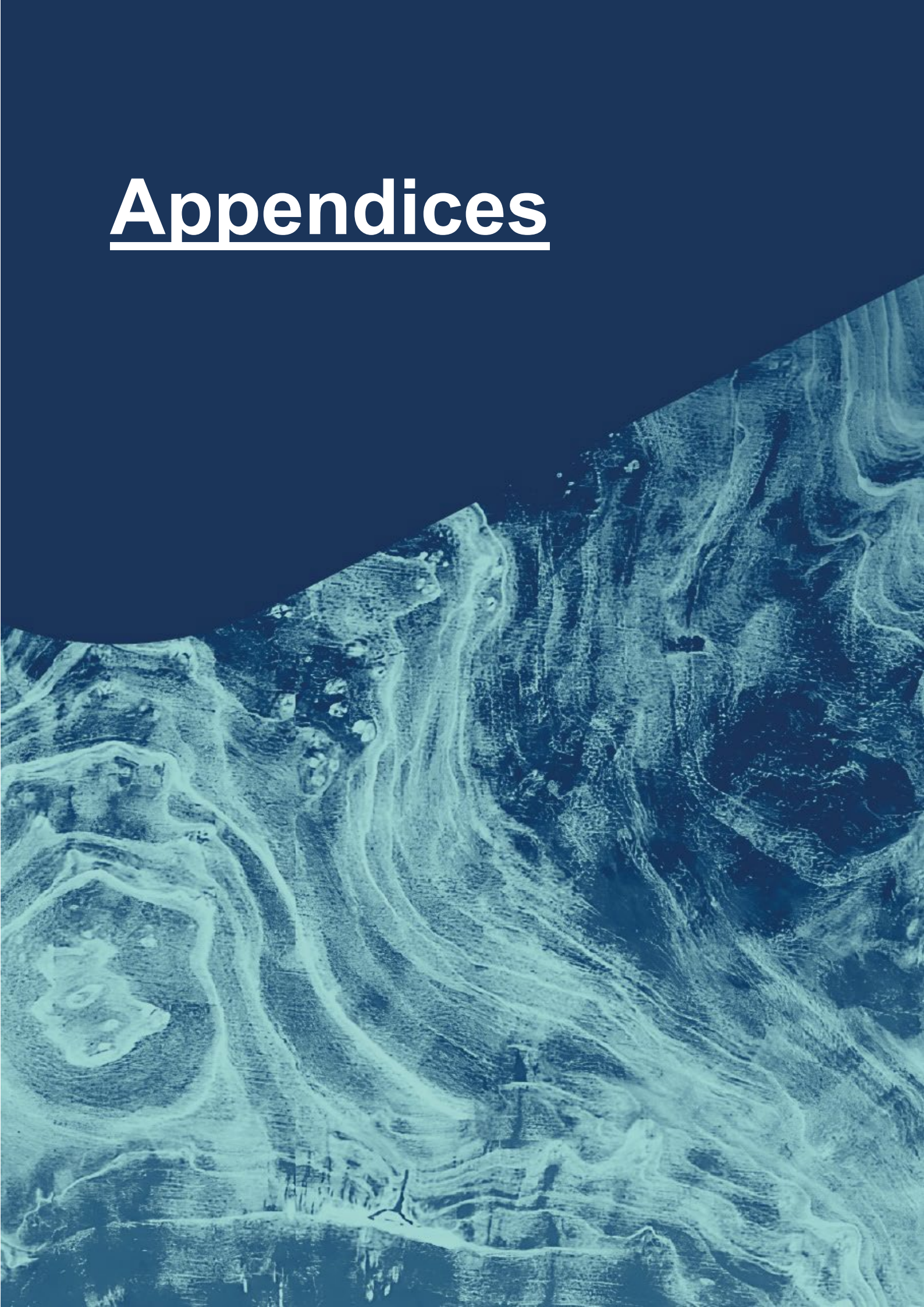
[74] Report by France Assureurs: https://www.franceassureurs.fr/wp-content/uploads/2022/09/2022-03-30- dossier-journalistes-franceassureurs cdp-1 and https://www.franceassureurs.fr/wp- content/uploads/2022/09/livre-blanc-6-assurance-vie-interctif.pdf (p.39).

[75] "Insurance and sustainable finance - Key figures 2021" report by France Assureurs.

Proposal:

- Include a minimum share of private equity investments (particularly in companies in transition) in the PER: include an allocation in transition investments up to ten years before the retirement age to finance unlisted SMEs and mid-caps and diversify French people's savings. A minimum investment in private equity funds could be established for dynamic and balanced investment profiles.
- Allow "Transition"-labelled funds to be taken into account for the obligation to list certified funds in company savings plans (PEE) and company retirement savings funds (PER).
- Reduce social security contribution for investments in collective PER funds that offer Transition-certified funds. Currently, employee savings invested in a collective PER are subject to lower social security contributions (16% instead of 20%) if the collective PER offers a fund invested in SME-ISE securities. A similar measure for funds financing green or transition industries, or an even greater incentive (0% social security contribution), could be proposed.

Appendices



1. Engagement letter from Minister Bruno Le Maire to Yves Perrier

MINISTRY
FOR THE ECONOMY,
FINANCE AND INDUSTRIAL AND DIGITAL SOVEREIGNTY
Freedom
Equality
Fraternity

THE MINISTER **Paris, 04 NOV. 2022**

Our references: MEFI-D22-05278

Dear Mr President,

Almost a year ago, I entrusted you with an assignment to address how to mobilise the financial sector to help decarbonise the economy. In the conclusions of your report, you proposed the establishment of the Paris marketplace Ecological Transition Financing Committee (CFTE).

As part of the strategic environmental planning currently under way by the Government, a forum for coordination between professionals, particularly industrial players, and financiers is essential in order to mobilise the financial resources and financial instruments required for the ecological transition in France. I therefore wish for you to set up this committee.

The CFTE's priority should be the mobilisation of financial assets in support of the transition. It will aim to align private sector financial resources and instruments (from banks, insurers, investment funds) with decarbonisation strategies defined by sector. Its discussions must be sector-based and should, as a priority, concern sectors with a high environmental impact - industry, transport, construction, energy, agriculture and waste. To this end, decarbonisation trajectories should be combined with investment trajectories, with multi-year objectives and intermediate milestones. The financial instruments proposed by the CFTE may concern both households and companies.

Mr Yves Perrier
Chairman
Amundi
91 boulevard Pasteur
75015 Paris

139 rue de Bercy
75572 Paris Cedex 12

[illegible text]

The CFTE may also, on a cross-cutting basis, play a role in defining the strategic guidelines of the Paris marketplace in terms of decarbonisation. It will be able to set investment objectives in activities aligned with the European environmental taxonomy and coordinate market initiatives in terms of transparency and labelling, for example.

To implement this roadmap and fully mobilise stakeholders, the CFTE must be established under the auspices of market representative bodies and be part of a co-construction approach with the government. In this regard, it will bring together representatives of the different types of financial players, the main economic sectors, as well as personalities recognised for their independent scientific expertise in defining decarbonisation strategies. Players wishing to join the CFTE approach, either directly or through representatives, will commit to adopting transparent and measurable investment objectives in the decarbonisation of the French economy. I am counting on the full commitment of the players you select and the sectors they represent. Faced with the climate emergency, the Paris marketplace must act.

The public authorities will play their full role in successfully planning the financing allocated to the transition, in facilitating the implementation of the new financial instruments that are necessary and in achieving concrete results in line with our collective ambitions. Thus, to contribute to the success of this roadmap, the government departments, in particular the Ministry for the Economy, Finance and Industrial and Digital Sovereignty, will contribute to the technical expertise needed to define documented financial trajectories.

I ask you to inform me, by 15 November 2022, of the composition, organisation and work plan that you recommend for the implementation of the CFTE, in line with the government's priorities for the ecological transition. The committee should be able to start its work in December.

Yours sincerely,

[signature]

Bruno LE MAIRE

2. Response to the engagement letter from Yves Perrier to Bruno Le Maire

Mr Bruno Le Maire
Minister for the Economy, Finance and
Industrial and Digital Sovereignty,
139, rue de Bercy
75572 Paris Cedex 07

Paris, 29 November 2022

Dear Minister,

In a letter dated 4 November, as part of the environmental planning currently being prepared by the government and following the report I submitted to you in March 2022 on the Paris financial centre and the framework for action that would enable it to meet the challenge of the climate transition, you kindly entrusted me with the task of establishing the Paris marketplace Ecological Transition Financing Committee (CFTE).

This Committee will be the political body for market coordination and strategic guidance, determining the financing plan for the country's energy transition in a spirit of co-construction. The CFTE will complement the IFD, created by Paris EUROPLACE in October with the objective of being the market body responsible for coordinating and implementing the transition. The IFD will focus on the projects listed in the report that I submitted to you in March 2022, as well as addressing solutions for financing the transition.

1/ Accordingly, the projects to be carried out by the CFTE are as follows: the identification of needs and a timetable, and financing solutions.

a) Identification of needs:

a. In the energy sector: upgrading and extension of nuclear power generation, development of new nuclear sectors; ramp-up of renewable energies, in particular offshore wind and solar power: green hydrogen; upgrading of hydro-power infrastructure.
b. For industrial companies, particularly those with the highest emissions: heavy industries such as metallurgy; cement; chemicals; glass: construction with the rise of decarbonised materials (bio-sourced or recycle); transport with the electrification of vehicles and the construction of battery sectors, the ramp-up of rail and the development of hydrogen-powered aircraft.
c. Investments to be made in agriculture and the agri-food sector
d. Investments to be made by individuals, mainly in improving the carbon efficiency of their homes - insulation and heating or cooling systems - and in decarbonising their modes of transport - purchasing electric vehicles.
e. Investments in climate change adaptation

For each of these types of expenditure, additional investments over and above those relating to the normal course of the economy must be identified through to 2030, with the target timetable for their achievement, so as to be able to meet the carbon neutrality objective by 2050. This identification of investment needs will be based on the work carried out by the General Secretariat for Ecological Planning, the Ministry of the Ecological Transition and Territorial Cohesion, the Ministry for the Economy, Finance and Industrial and Digital Sovereignty and the professional federations.

b) **Financing terms** for these different types of additional Investments
   a. The first step will be to establish a private financing model in line with the planned public financing. The financing needs of individuals for housing or mobility must be considered and specific solutions found
   b. The second stage must determine the most appropriate financing techniques, in particular by considering incentives to direct available financial savings towards investments in the transition and to enable sufficient funds to be raised on the markets.

In addition, the priority projects listed in the report I submitted to you last March will be implemented, in particular the implementation of methods for calculating carbon equivalent emissions by sector of activity and the standardisation of non-financial analysis methods, which will fall within the framework of the standards currently being drawn up by the EFRAG and the ISSB. A progress update on these projects will be made during CFTE meetings.

A joint taskforce between the IFD and the French Treasury should be set up by the end of the year to complete work on the identification of needs and financing solutions.

A first CFTE kick-off meeting could be scheduled in January 2023, then a second at the end of the first quarter of 2023, and a third at the end of the second quarter of 2023, to present the overall plan.

2/ With regard to the composition and working methods of the CFTE:

In the appendix to this letter, I submit the composition of the CFTE which, in the same way as the composition of the IFD Board, brings together representatives of companies, financial institutions, experts and supervisory authorities, as well as experienced economists for their expertise on climate and sustainable finance topics. Some are members of the IFD Board, which will facilitate exchanges and the implementation of CFTE decisions. Based on the work and the consensus formalised by the IFD, the CFTE is expected to meet at least three times a year, under the chairmanship of the Minister in charge of Finance, with its secretariat being provided by the French Treasury.

This co-construction approach should make it possible to find concrete, operational and appropriate solutions, by those responsible for implementing them.

I hope that these proposals will meet your expectations and thank you once again for the trust you have placed in me.
Yours sincerely,

[signature]
Yves Perrier

Composition of the Marketplace Ecological Transition Financing Committee
(Updated May 2023)

Chairmanship:
Bruno Le Maire, Minister for the Economy, Finance and Industrial and Digital Sovereignty

Secretary:
French Treasury, with the IFD

Members:
Yves Perrier, President of the IFD, Vice-President of Paris Europlace, Chairman of the Edmond de Rothschild Group

Companies:
Jacques Aschenbroich, Chairman of Orange (Vice-President of the IFD)
Edward Bouygues, Deputy CEO of Bouygues
Jean-Pierre Clamadieu, Chairman of ENGIE (member of the IFD Board of Directors)
Christiane Lambert, former President of FNSEA, President of COPACOGECA
Veronique Morali, Chairwoman of the Board of Webedia
Augustin de Romanet, Chairman of ADP, Chairman of Paris EUROPLACE
Jean-Dominique Senard, Chairman of Renault Group (member of the IFD Board of Directors)

Financial institutions:
Jean-Laurent Bonnafé, CEO of BNP Paribas
Philippe Brassac, CEO of CASA
Slawomir Krupa, CEO of Societe Generale
Nicolas Namias, CEO of BPCE
Laurence Parisot, Chairman of Citigroup France (member of the IFD Board of Directors)
Vanessa Holtz, CEO of Bank of America Securities Europe
Fanny Picard, CEO and founder of Alter Equity

Experts:
Jean-Marc Jancovici, founder and partner, The Shift Project
Baptiste Perrissin-Fabert, Executive Director of Expertise and Programmes at ADEME
Benoît Leguet, CEO of the I4CE (Institute for Climate Economics)

Economists:
Christian Gollier, economist, CEO of TSE
Natacha Valla, Economist, Dean of the School of Management and Impact at Sciences Po

Supervisory authorities:
Marie-Anne Barbat-Layani, Chairman of the AMF
Thomas Lesueur, Commissioner-General for Sustainable Development, Director of CGDD
Robert Ophèle, Chairman of the French Accounting Standards Authority
François Villeroy de Galhau, Governor of the Banque de France

3. List of members of the Institute for Sustainable Finance taskforce and members interviewed during the preparation of the report

Public authorities

Banque de France

Jean Boissinot, Secretary General of the Network for Greening the Financial System

BpiFrance

Morgane Merlo, coordination of the climate plan

General Commission for Sustainable Development (CGDD), Ministry of Ecological Transition

Manon Cognard, Sustainable Finance & CSR Project Manager

Caisse des Dépôts et Consignations

Kosta Kastrinidis, Head of Loans, Banque des Territoires

French Treasury, Ministry for the Economy and Finance

Pierre Chabrol, Deputy Head of Corporate Finance and Financial Markets

Laura Berthet, Head of the Climate, Environment and Agriculture Office

Logan Gourmand, Deputy Head of the Climate, Environment and Agriculture Office

Benjamin Dartevelle, Head of Sustainable Finance Office

Iban Olaondo, Deputy Head of Sustainable Finance Office

General Secretariat for Ecological Planning

Louis Boillot, Finance Inspector

Léa Boudet, Programme Director for the Financing of Ecological and Energy Transitions

Xavier Bonnet, Programme Director for the Economics and Financing of the Ecological and Energy Transition

Professional federations

Association française des entreprises privées

Nicolas Boquet, Environment-Energy Director

Association Française de la Gestion Financière

Laure Delahousse, Deputy CEO

Adina Gurau Audibert, Head of Asset Management & Risk Management

Fédération Bancaire Française

Karen Degouve, Climate Director

France Assureurs

Philippe Taffin, Head of Finance & Investments

France Invest

Alexis Dupont, CEO

Damien Brisemontier, Head of Institutional Affairs and Sustainable Finance

Mouvement des Entreprises de France (MEDEF)

Jean-Baptiste Baroni, Deputy Climate Policy Director

Association Française des Sociétés de Placement Immobilier (ASPIM)

Véronique Donnadieu, Executive Director

Julien Mauffrey, Research Director

Anne-Laure Bouin, SRI strategy

Financial companies

Abeille Assurances

Jean-François Coppenolle, Climate and ESG Investment Director

Amundi

Stanislas Pottier, Senior Advisor

Pierre Blanchet, Head of Business Development & Operations

Bank of America

Salvatore Serravalle, Senior Vice President for Public Policy

BNP Paribas

Marc Christiaen, Head of Sustainable Finance, Corporate Clients France

Citigroup

Catherine Oulès, Senior Advisor

CPR Asset Management

Vanessa Cottet, Head of ESG

Edmond de Rothschild SA

Mathilde Lemoine, Director of Economic Research

Euronext

Camille Leca, Head of ESG and Sustainable Finance

Groupama

Nourdine Mellouki, Active ESG Asset Allocation Manager

La Banque Postale

Pierre-Alix Binet, Director of Public Affairs

Laurent Bortoli, Head of Lending and Borrower Insurance

Natixis

Cédric Merle, Head of Expertise & Innovation

Non-financial companies

Engie

Jean-Pierre Clamadieu, Chairman of the Board of Directors

Laure Philippon, CSR strategy and sustainable finance director

Associations, Civil Society and Research

Institut Louis Bachelier

Stéphane Voisin, Sustainable Finance Research Programs

Paris Europlace

Jean-Charles Simon, CEO

Olivier Vigna, Deputy CEO

Rexecode

Denis Ferrand, CEO

Raphaël Trotignon, Chief Economist of the Energy-Climate Division

Toulouse School of Economics

Christian Gollier, CEO

I4CE (Institute for Climate Economics)

Louise Kessler, Economics Programme Director

Maxime Ledez, Researcher

Solène Métayer, Researcher

Hadrien Hainaut, Project Manager

Institute for Sustainable Finance

Pauline Becquey, Managing Director

Camille Buewaert, Project Manager

Vincent Burnand, Project Manager

Independent experts

Jacques de Laroisère, former governor of the Banque de France

Michel Laviale, Chairman of the ORSE finance club

Philippe Henry, Strategic Board Advisor Paris Europlace

4. List of interviews conducted as part of the IFD's work

Public authorities

BpiFrance

Isabelle Albertalli, Climate Director

Morgane Merlo, Climate Plan Coordination

Caisse des Dépôts et Consignations

François-Louis Ricard, Chief Financial Officer of the National Savings Fund

Kosta Kastrinidis, Head of Loans, Banque des Territoires

Pierre Laurent, Head of Development, Banque des Territoires

General Commission for Sustainable Development (CGDD), Ministry of Ecological Transition

Antoine Comte Bellot, Project Director

Companies

Air Liquide

Jacques Molgo, Deputy CFO

Guillaume De Smedt, Deputy Vice President Sustainability

EDF Group

Elisabeth-Anne Bertin, EDF Group Strategy Department, Energy Markets and Sustainable Finance Delegate

Hervé Chefdeville, EDF Corporate Finance Department, Head of Group Guarantees

Philippe Ringenbach, NEoT Capital, CEO

Pierre de Raphelis-Soissan, Hynamics, Global Business Development Director.

Engie

Laure Philippon, CSR strategy and sustainable finance director

Christophe Thomas, Head of Department, Engie France Renouvelables

Jean-Marc Turchini, Head of Corporate Finance, Engie SA

Green Got

Maud Caillaux, co-founder, CEO

Aurélie Baulard, PA to the CEO

La Nef

Ivan Chaleil, Member of the Management Board, Sales Director

Renault

Patrick Claude, Head of Financial Services

Associations, Civil Society and Research

Shift Project

Alain Grandjean, Founder and Expert

PACE Nation

Shay Singh, Fellow

Kristina Klimovich, Fellow

Focus by sector

1. Construction

Investment needs for the decarbonisation of buildings, where the majority of emissions are concentrated in residential heating, are driven by thermal renovation, including changing heating energy sources.

The additional investment needs to decarbonise this sector are between €10 billion and €20 billion/year on average over the next decade compared to the current period, depending on the assumptions used (pace of renovations, targeted labels, current and future costs, etc.). In a very ambitious scenario (complete elimination of homes leaking heat by 2030) these additional investment needs could reach up to €40 billion/year.

Last year saw an increase in investments (+€1.4 billion in 2021 compared with 2019), due to the post-Covid recovery and public support measures (France Relance). There are thus no guarantees that this increase marks a lasting upward trend.

Furthermore, the total amount of investments to be made in this sector is likely to be affected by investments in new construction, which could lead to a shift in the nature of investments within the sector. Current investments in new construction could fall in order to meet climate and soil sealing targets, to an extent that could make total investments in this sector in 2030 close to current levels, depending on the transition scenarios.

While major uncertainties remain regarding the effectiveness of renovations and the ability of players to initiate them, particularly among low-income households, the increase in the pace of renovation could be significantly hampered by insufficient labour availability or supply chain tensions.

a. Sector emissions, reduction target and main drivers of decarbonisation

Current situation: in 2021, the "Building use" sector accounted for 18% of total French greenhouse gas (GHG) emissions[76], i.e. 75 $MtCO_{2eq}$. In Secten accounting, used to report national emissions, the emissions attributed to this sector exclude those related to new construction, which are recorded in the industrial sector. "Building use" emissions fell by 19% between 1990 and 2021. This pace of decline is still too slow, particularly for tertiary buildings (-22% for residential and -14% for tertiary). While the second carbon budget for the sector (2019-2023) is expected to be respected, in particular thanks to mild winters, the first budget under the SNBC-1 (2015-2018) was not respected (+12%) and compliance with the third budget (2024-2028) is highly uncertain in the current business-as-usual emissions scenario.

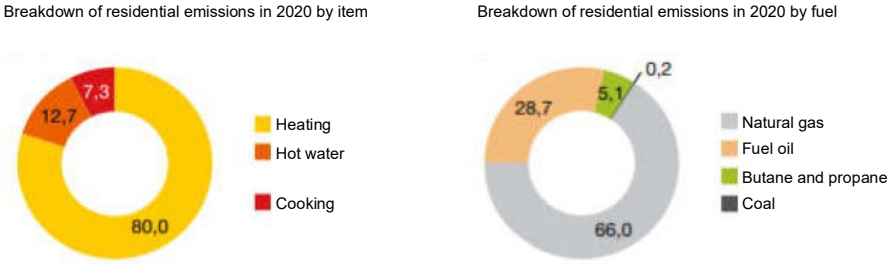
Target for 2030: The SNBC-2 sets a target for reducing sector emissions to 43.7 $MtCO_2eq$ in 2030 (reduction of 53% compared to 1990), requiring a reduction of 5.8% per year between 2021 and 2030. Given the further increase in France's 2030 GHG emission reduction target to 50% compared to 1990 (vs. -40% in the SNBC-2), the sector target would fall to 34.4 $MtCO_2eq$ in 2030. This would require an emissions reduction rate of -8.3% per year between 2021 and 2030, on average more than 4 times that achieved by the sector between 2015 and 2021 (-1.9%/year). The reduction effort for all sectors could be further increased following the recent deterioration in the performance of the national forest carbon sink.

Emission items: Emissions in the residential sector accounted for 64% of those in the sector, with non-residential emissions (tertiary, public buildings) accounting for the remaining 36%. Most of these emissions are due to CO_2 (85% of the total), the main source of which in 2020 was heating (80% of CO_2). In particular, natural gas

[76] Emissions attributed to the sector exclude those related to new construction, which are recorded in the industrial sector.

combustion accounts for 66% of the CO_2 emissions of residential buildings, far ahead of fuel oil (29%), although fuel oil emits more per unit of energy[77]. Private buildings (housing and private tertiary buildings) account for nearly three-quarters of the sector's GHG emissions (public buildings include buildings owned by the government, its operators, local authorities and social housing).

Chart: Breakdown of CO2 emissions from residential buildings in France



Note: only CO_2 emissions due to the combustion of fossil fuels are taken into account.
The carbon content of electricity and heat purchased from networks is not taken into account.
Emissions from construction activities are recorded in the category "Manufacturing and construction" (see p. 54).

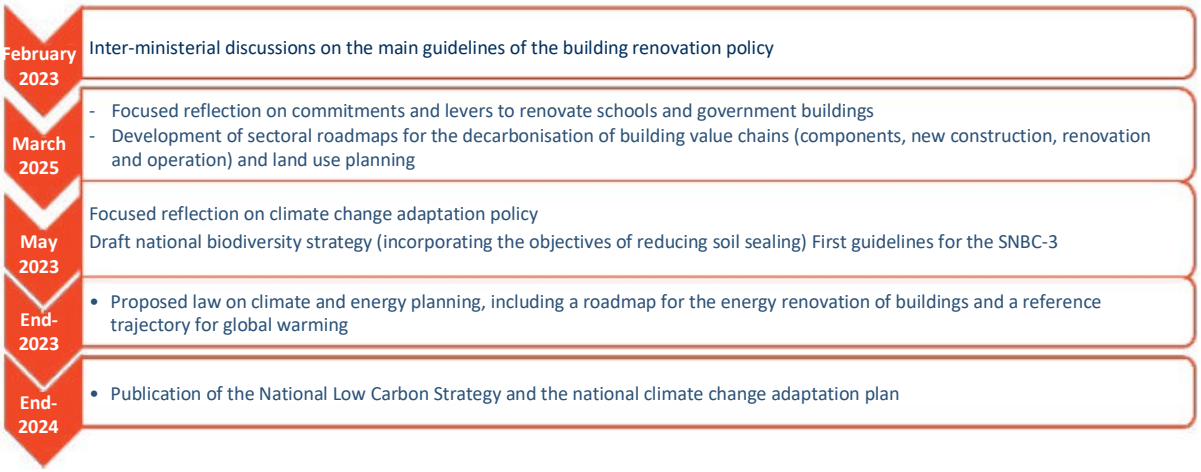
Source: SDES, December 2022, Key climate figures

Main decarbonisation levers: the current national low-carbon strategy (SNBC-2) identifies the main decarbonisation levers, which are still relevant:

1. Acceleration of energy renovation in the residential sector (increase in the pace of renovations, targeting of efficient renovations – and associated economic levers: strengthening of support for households, structuring of the sector, energy prices, etc.)
2. Change in heating energy sources (end of fuel oil, acceleration of the transition from gas to heat pumps, deployment and use of heating networks and increase in biogas incorporation rate)
3. Mobilisation of players besides households (faster decarbonisation by the state and social landlords, strengthening of support for local authorities and companies)
4. *Main uncertainty: the pace of new construction (cost-benefit analysis between emissions on construction and gains over the life of the building, compared to an existing building; conflicts with zero net soil sealing targets)*

Timetable: the timetable is provided for illustrative purposes, to present the key milestones of the ecological planning steps for the construction sector.

[77] Only direct emissions (scope 1) are attributed to the sector. Emissions related to electricity production are attributed to the Energy sector.



b. Investment needs

Climate investments in the sector amounted to €42 billion in 2021 (I4CE 2022), including €23 billion for the insulation and heating of new buildings and €20 billion in energy renovations (including €5 billion for tertiary buildings).

Gross additional investment needs for the renovation of buildings are estimated to be between €10 billion and €40 billion per year by 2030 depending on the scenario, **of which around €5 billion to €10 billion per year for tertiary buildings.** These estimates vary depending on the ambitions of the scenario considered (pace and type of renovation) and the reference point used: I4CE (2021) and Institut Rousseau (2022) put the figure at approximately +€20 billion/year, I4CE (2022) more recently revised its estimates to between +€10 billion and €20 billion/year, while Rexecode (2022) estimates additional investment needs at +€40 billion/year on average until 2030 due to more ambitious drivers (elimination of heat leaks by 2030 and transition to energy labels A and B before 2050) and its consideration of a less optimistic baseline scenario, with needs then decreasing between 2030 and 2050 in this scenario.

These amounts must therefore be considered in light of the underlying assumptions (reference point, transition scenario) but also the scope. The amounts vary depending on whether we consider gross investment needs for decarbonisation, net investment reallocation needs within the sector – including those not devoted to decarbonisation, or the total additional costs of these investments compared to non-decarbonised investments for the same purpose (e.g. non-energy renovations), or finally by accounting or not for potential savings linked to the energy bill over the life of the investment:

- Compared with the most recently observed investments in 2021, which were higher due to the post-Covid recovery and the public support provided by France Relance (+€1.4 billion between 2019 and 2021), considering a relatively homogeneous effort over time[78] and including current investments in renovations in stages, we can estimate gross investment needs for construction at between +€10 billion and +€20 billion/year (I4CE 2022, Institut Rousseau 2022). The increase in the target to be achieved for the sector in 2030 is expected to lead to an acceleration in the pace of renovation, outstripping current assessments, but the terms of which have not yet been defined to precisely calculate the impact on investment needs.
- Depending on the transition scenarios, the decrease in investments in new construction, often decided to meet soil sealing objectives, would limit the total surplus investment required in the sector to achieve

[78] i.e. not focused on overall renovations before 2030.

environmental objectives, thus leading to a reallocation of the nature of investments within the sector (ADEME 2022). The additional investment need across the sector could even be virtually zero for the most conservative construction scenarios (I4CE 2022).

- Savings on energy bills following home renovations could also reduce the total additional cost over the life of the investment. As an indication, and under certain assumptions, the French Treasury estimates these gains at around €7 billion/year[79] by 2030, mainly focused on the renovation of homes that leak heat, i.e. between one third and half of the total energy bill for these homes in 2030 (French Treasury);

c. Main uncertainties

The estimated amounts are particularly sensitive to assumptions regarding renovation cost trends, the effective quality of the works, consumer behaviour (risk of a post-renovation rebound effect), and the **cost of materials**, which may, for example, rise in the short term due to strong demand or economic shocks (impact of the Covid crisis and the war in Ukraine on supply chains, etc.). This uncertainty also applies to the capacity to trigger renovations on a large scale.

More specifically, the abatement cost of renovations varies greatly depending on the home. This is shown by the work of the Criqui Commission (France Stratégie)[80], which shows that abatement costs differ considerably depending on the characteristics of the home (surface area, heating method, etc.)[81] and the energy label targeted. These estimates also depend on the implementation of effective renovations and the rebound effects that follow the renovation of buildings that leak heat.

Given the size of the investment, the initiation of renovations is uncertain and will determine the actual renovation trajectory. Vulnerable households have low amounts of available capital as well as liquidity or even credit constraints.

Strong pressure on the availability of the renovation workforce could wipe out any increase in the pace of renovations. The sector is already facing a labour shortage, which is hampering the policy of support for renovations, particularly for single-family homes.

More broadly, the new construction trajectory will have a major impact on the sector's total investment needs. A conservative policy in terms of construction demand and supply would make it possible to redirect significant amounts to renovation work.

d. Parties involved

More than half of all building emissions come from private homes, requiring investment from homeowners, including the most vulnerable. Homeowners can benefit from support schemes[82], some of which are targeted at the poorest households. There is already a ban on letting homes that leak heat (from 2023 for the most energy-intensive housing units, 2025 for housing units rated G and 2028 for housing units rated F). The effectiveness of investment support will therefore play a key role in triggering renovations. For example, the leverage effect[83] of renovation subsidies granted by the French National Housing Agency (ANAH) is estimated at around 3 for

[79] Based on the number of socio-economically profitable renovations in 2025 and 2030 according to the Criqui Commission and making it possible to achieve the 2030 objectives of the SNBC-3. According to the European Commission's energy price assumptions.
[80] France Stratégie, Abatement costs, Part 5 – Housing.
[81] The median abatement cost of renovating a property with an energy efficiency rating (DPE) of G to rating B, with a switch to electric energy sources ranges from €35/$tCO_2^{20\ years}$ for a home previously heated by fuel oil, to €374/$tCO_2^{20\ years}$ for a home with electric heating.
[82] MaPrimeRénov' – MPR – including MPR Sérénité, éco-PTZ, energy saving certificates, etc.
[83] The leverage effect is the ratio between total investment and public investment. Public financing of 33% therefore corresponds to a leverage effect of 3.

renovations through owner-occupier actions in 2022 and 7 for overall renovations.

In France in 2021, the ordinary housing stock (37 million housing units) consisted of 82% main homes, 10% second homes and 8% vacant properties.[84] Among the 30 million households, 58% own their main home, 25% rent in the private sector, and 18% rent in the social housing sector. **Tenants will have little involvement in the energy renovation of buildings. Action will be driven mainly by households who own their main home, the owners of private rental homes and the state and social landlords for social housing.**

Social landlords manage around 5 million homes, 10% of which leak heat, and will be particularly affected by the renovation of housing stock. Like the housing units themselves, energy-intensive housing units are also concentrated: 10% of landlords own half of homes that leak heat. In 2013, 54% of social housing units were heated with gas and 7% with another carbon energy source. They have since benefited from aid such as the Eco-loan for social housing. The state has a real asset in driving the energy renovation of social housing by mobilising regulated savings accounts centralised with the Caisse des Dépôts et Consignations Savings Fund, which are directed towards financing social housing by law.

Local authorities account for more than 20% of emissions from the construction sector and will also have to participate in renovation efforts, as their properties are partly subject to the objectives of the French tertiary building eco-energy decree (DEET). €4 billion of the recovery plan was devoted to the renovation of public buildings belonging to local authorities and central government. Local authorities will also receive government funding from the €2 billion green fund.

In general, investments in new construction are governed by current energy regulations (RE2020).

[84] Housing key figures – 2022, French Ministry for the Ecological Transition and Territorial Cohesion.

Appendix 1 – Details of results

Studies	*Reference point*	*Scenario*	Renovation of residential properties	Renovation of tertiary buildings	**TOTAL Renovation**	New construction (insulation and heating)	**TOTAL with new construction**	Comments
Climate investments in 2021 (€ bn)								
I4CE 2022			15	5	**€20bn**	23	**€42bn**	
Average additional requirements over the period 2022-2030 (€ bn/year)								
Renovation focus								
I4CE 2021	*2019-2020*	*SNBC-2*	+23 (+2 with partial renovations)		**+€23bn/year** (+2 with renovations)			Assuming all renovations are effective
With new construction								
I4CE Landscape 2022	*2021*	*SNBC-2*	+7	+7	**+€14bn/year**	**-5**	**+€9bn/year**	Slowdown in new construction due to demographics
I4CE Landscape 2022 - ADEME scenarios	*2021*	*S2 ADEME*	+15	+3	**+€18bn/year**	**-15**	**+€3bn/year**	Conservative scenario for new construction
	2021	*S3 ADEME*	+5	+5	**+€10bn/year**	**-1**	**+€9bn/year**	Scenario with high-performance construction
By 2050								
Institut Rousseau 2022	*SNBC-2 BAU scenario*	*SNBC-2*	+15 to 2050	+6 to 2050	**21bn/year to 2050**			Renovations spread out to 2050
Rexecode 2022	*BAU scenario with historical emissions*	*SNBC-2*	+31 (+23 to 2050)	+10 (+12 to 2050)	**+€42bn/year** (+35 to 2050)			Overall proactive renovations
ADEME 2022	*2021*	*S2 ADEME*	+13 to 2050	+1 to 2050	**+€14bn/year to 2050**			Macroeconomic model based on strong fictitious price signals and cost-effective renovation

(*) Based on the potential for socio-economically profitable renovations by 2030.

Additional calculations:

- Savings on energy bills by 2030 for residential properties (French Treasury 2022): **€7bn/year** (rounding up)

Appendix 2 - Details of research studies

In a 2020 study, I4CE estimates the future investments needed for the renovation of private housing (including social housing) and tertiary buildings, and those related to the additional costs of new construction meeting current and expected future energy performance regulations, based on assumptions of changes in the housing stock resulting from documents and simulations in the SNBC-2 sector models. **In its 2021 Landscape**, I4CE limits its review to residential renovations due to uncertainties about the assumptions used for tertiary buildings and new construction. I4CE uses two scenarios: one in which renovations are carried out in stages, for which the investment needs are already met today, and the other in which they are completed in full (achieving low-energy building (BBC) status by the end of works), for which the current level of investment is very low and the needs very high (concentrated in the short and medium term). The scenario of renovations in stages is less ambitious than that of Rexecode, as buildings do not reach energy performance level B in 2050. **In the 2022 study**, I4CE reintegrates tertiary renovations and the additional costs of new construction and calculates the investment needs associated with the SNBC-2 scenario and the different scenarios of the ADEME Transition 2050 study.

Institut Rousseau (2022) bases its works on a scenario of an increase in the pace of renovations (955,000 per year) and the transition from renovation in stages to renovations to achieve low-energy building (BBC) status only, in order to estimate the additional investment (additional public and private sector costs, net of the redirection of funds towards other activities) compared to a business-as-usual scenario. The study does not include savings on the energy bill associated with renovations, which may have a negative impact on *net* investment needs.

Rexecode (2022) models an ambitious renovation scenario for residential properties (energy performance level B in 2050), compatible with the trajectory of the SNBC-2 and calculates an additional cost compared to a business-as-usual scenario. It projects the underlying improvement in the energy efficiency of homes observed over time. This trajectory assumes that new homes built before 2030 are class A or B, then class A only from 2030. In the scenario compatible with the SNBC-2 targets, all homes that "leak heat" (energy classes F and G) are eliminated by 2030 and the remaining homes are renovated to levels A or B by 2050. Additional investments in the residential sector are estimated at around €30 billion/year until 2030 and then around €18 billion/year between 2030 and 2050[85]. A similar methodology is followed for tertiary buildings and the compatible transition scenario involves the renovation (insulation and changes in heating systems) of 3% of total tertiary areas each year (resulting in all areas renovated by 2050). The study does not include savings on the energy bill.

ADEME (2022) recognises "green" investments in buildings as those that improve energy efficiency, for the work actually carried out. It uses a range corresponding to the median scenarios of the Transitions 2050 study (S2 and S3), which mobilise a set of behavioural and technological levers.

The French Treasury estimates the energy bill savings associated with the same renovations for existing residential properties, using SNBC-3 run 1 average energy costs up to 2030. The number of renovations considered (per pair of start and finish energy labels) corresponds to "socio-economically profitable" renovations within the meaning of the Climate Action Value (VAC), and allows compliance with climate objectives (including enhanced objectives under the Fit for 55 package) applied to the residential buildings sub-sector. These figures are based on a reference scenario without renovation.

[85] The abrupt "jump" from 2030 is due to the goal of eliminating homes that leak heat before 2030.

2. Road and rail transport

The additional gross investment needs to decarbonise the road and rail transport sector [86] are estimated at between +€10 billion and +€22 billion/year by 2030 compared with 2021, to meet the current target, before the increase provided for in the SNBC-3. In 2021, these investments amounted to €26 billion, with a significant increase of +€11 billion compared with 2019. This amount would cover additional investment related to transport and charging infrastructure as well as the purchase of low-carbon vehicles. For these vehicle purchases, the additional cost compared with a fossil fuel alternative (ICE vehicle) for similar use represents between one fifth and one third of the amount of the gross investments considered.

By factoring in investment trends in ICE vehicles, which may decrease under certain scenarios, the need for additional investments in the entire road and rail transport sector would be between +€13 billion and +€19 billion/year to ensure compliance with the SNBC-2, compared with current investments. These amounts depend heavily on the scenario used for the development of the private vehicle fleet. These scenarios are more or less ambitious in terms of changes in transport methods and a reduction in journeys.

Finally, deducting fuel cost savings reduces the net additional cost for buyers over the term of the investment. The French Treasury estimates the fuel cost savings made over the lifetime of low-carbon passenger vehicles registered between 2022 and 2030 at between €6 billion and €8 billion/year, compared with the purchase of ICE vehicles for equivalent use.

Investments in aviation and shipping are not covered by recent studies.

a. Emission reduction targets and main drivers

Current situation: In 2021, transport accounted for 30% of gross national greenhouse gas (GHG) emissions in France. In Secten accounting, used to report national emissions, the emissions attributed to this sector exclude those related to vehicle manufacturing, which are recorded in the industrial sector. Unlike other sectors, transport emissions increased between 1990 and 2019 (+9.5%), driven by the rise in journeys. They temporarily fell by 17% during the health crisis in 2020, with transport emissions alone accounting for more than half of the decline in GHG emissions over the year. These emissions picked up again in 2021 and have recently declined (-3% between Q3 2022 and Q3 2019). While the current carbon budget should be respected due to the health crisis, the sector did not comply with the first SNBC-1 carbon budget (8% overrun), and according to current trends, taking into account results up to 2021, the next budget (2024-2028) is not likely to be met either.

Target for 2030: The SNBC-2 sets a target for reducing emissions from the sector to 99.4 $MtCO_2eq$ in 2030 (reduction of -20% compared to 1990), requiring a reduction of -2.6% per year between 2021 and 2030. Given the increase in France's 2030 GHG emission reduction target to 50% compared to 1990 (vs. -40% in the SNBC-2), the sector's target would be revised to 87 $MtCO_2eq$ in 2030[87]. This would imply an emissions reduction rate of -4% per year between 2021 and 2030, more than 2.5 times that achieved by the sector on average between 2015 and 2021 (-1.5%/year). The emissions reduction effort for all sectors could be further increased following the recent deterioration in the performance of the national forest carbon sink.

[86] To date, the needs relating to the decarbonisation of shipping and air transport remain very little quantified and stabilised in studies - an approach is detailed in Appendix 3.

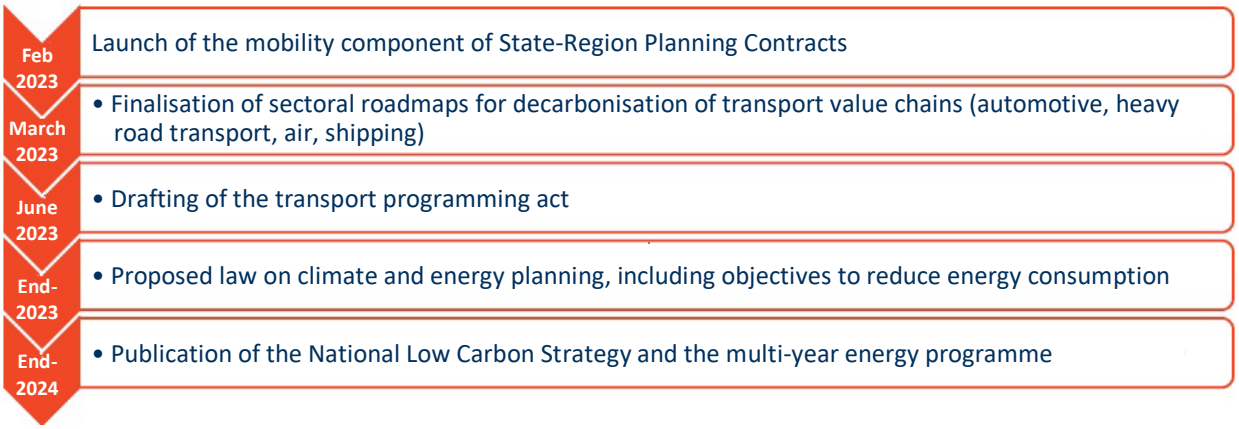
[87] Assuming a distribution of the additional national effort of 10 pts across all sectors. The effort will be broken down in more detail in the SNBC-3.

Emission items: In 2021, 97% of transport-induced GHG emissions were CO_2 emissions from fuel combustion. Road transport accounts for almost all (95%) of emissions from the transport sector, excluding international shipping and air transport. The majority of emissions related to road traffic are from passenger cars (52% in 2021), heavy goods vehicles (27%) and light commercial vehicles (18%) *(source Citepa, Secten 2022 format)*.

Main decarbonisation levers: the current national low-carbon strategy (SNBC-2) and discussions for the development of sectoral roadmaps for the decarbonisation of transport value chains identify the following main decarbonisation levers:

1. Management of mobility demand and changing uses (increase in occupancy, reduction of journeys – e.g. teleworking, town planning).
2. Support for changes in transport methods (walking, cycling, public transport, regeneration of the rail network);
3. Decarbonisation of vehicles (electrification of engines, increased efficiency of the remaining thermal combustion engines and incorporation of alternative fuels, development of charging infrastructure, reduction of vehicle mass);

Timetable: the timetable is provided for illustrative purposes, to present the key milestones of the ecological planning steps for the transport sector.



b. Investment needs

Climate investments in the transport sector amounted to €26 billion in 2021 (I4CE, 2022), mainly concentrated in low-carbon passenger vehicles (€12 billion) and transport infrastructure (€5 billion in rail and €6 billion in urban public transport).

To meet the objectives of the SNBC-2, studies estimate that additional gross investment needs to decarbonise the road and rail transport sector will amount to between €10 billion and €22 billion per year by 2030 compared to 2021, corresponding to total expenditure on low-carbon vehicles and transport and charging infrastructure. The lower end of the range corresponds to a very ambitious scenario regarding the low weight of electric vehicles and the low capacity cost of batteries.

The "additional cost" approach for purchasing investments

By considering only the additional cost of switching to a low-carbon vehicle compared with the acquisition of an ICE vehicle for equivalent use and the purchase of charging infrastructure, these amounts would be between +€5 billion and +€10 billion/year by 2030 compared with 2021.

Finally, taking into account the total change in the overall number of vehicles (low-carbon and ICE), total gross investments for road transport are expected to increase by €13 billion to €19 billion/year by 2030 compared with 2021 depending on assumptions on the number of vehicles.

These two types of estimates vary depending on:

i) The more or less ambitious scenario considered in terms of the mix between electric and ICE vehicles: For example, Rexecode has adopted a more ambitious but slower pace of transition to electric vehicles, leading to higher costs for the transition to low-carbon vehicles for 2050;

ii) The trajectory of the total number of vehicles considered, and more or less ambitious assumptions in terms of changes in transport methods and a reduction in journeys: certain transition scenarios, taking into account a significant change in transport choices and considerable fuel economy, lead to a decrease in investments in passenger vehicle purchases (all types combined) compared to today;

iii) The technological assumptions used, for example on the weight of vehicles and the low capacity costs of batteries, which affect the purchase price of vehicles: the SNBC-2 scenario, studied by I4CE in its 2022 Landscape of Climate Finance in France, is much more ambitious regarding the reduced weight of vehicles than ADEME;

iv) The reference point used (a reference point in a given year, or a business-as-usual scenario): in its 2022 Landscape, I4CE uses additional requirements of +€10 billion/year compared to the level of 2021, a year in which climate investments increased following the recovery in activity post-Covid and the public support provided by France Relance (+€11 billion invested in decarbonising transport in 2021 compared to 2019). To use 2021 as the reference year then assumes that this level of investment will be maintained over time, which is optimistic given the cyclical nature of the observed increase.

Finally, the fuel cost savings linked to the switch from ICE vehicles to electric vehicles should reduce the total additional cost of the additional investments to be made over the life of these vehicles. For information purposes, and under certain assumptions, in particular fuel and electricity prices, the French Treasury estimates fuel cost savings at between €6 billion and €8 billion per year over 2022-2030 (depending on the trajectory of the total number of vehicles), corresponding to the gains made over the lifetime of electric and plug-in hybrid passenger vehicles registered over the period in question, compared to purchases of ICE vehicles for equivalent use. The impact on the total fuel cost (for all newly registered passenger vehicles) depends on the scenario used for the number of registrations. For example, under the illustrative scenario based on the current underlying increase, the total fuel cost rises compared to 2021.

These amounts must therefore be considered in light of the underlying assumptions (reference point, transition scenario) but also the scope. The amounts vary depending on whether we consider gross investment needs for decarbonisation, net investment needs in the sector – including those not devoted to decarbonisation, or the total additional costs of these investments, by accounting or not for potential savings linked to the fuel cost over the life of the investment.

Compared with a weaker underlying trend and slower electrification, investments could accelerate as we approach 2050 to reach additional costs of +€32 billion/year, net of purchases of ICE vehicles and excluding fuel cost savings (Rexecode 2022). This additional cost is mainly due to the additional investments to be made in light commercial vehicles and heavy vehicles (+€17 billion/year by 2050). It is driven by the absence of a decline in demand for vehicles.

Investments in aviation and shipping are not covered by recent studies.

Scenarios of the French Infrastructure Advisory Board (COI)

In its December 2022 report[88], the Infrastructure Advisory Board puts the additional financing needs arising from several scenarios at €10 billion/year on average for 2030 for transport infrastructure, compared with the last five-year term.

However, these figures are not limited to decarbonisation needs alone, and include social and industrial mobility needs. Moreover, they concern a partial scope since they are limited to transport infrastructure, excluding charging infrastructure. As such, and given the difficulty of identifying the proportion related only to decarbonisation in these scenarios, the COI estimates are not included in the table below.

c. Main limits and uncertainties

Assumptions concerning total vehicle demand play a significant role in the final investment amounts. They are highly dependent on the mobilisation and effectiveness of behavioural levers.

In addition, vehicle purchase costs vary considerably according to vehicle weight and battery capacity costs, as evidenced by the difference of more than +€10 billion/year between the SNBC-2 scenario and the ADEME S2 and S3 (I4CE 2022) scenarios. These projections remain very uncertain today as the weight of vehicles does not seem to be decreasing significantly and there is no guarantee as to the achievement of assumptions on technical progress or the availability of critical materials.

Finally, the expected trajectories of energy prices affect the total cost of ownership of the vehicle and fuel cost savings. Fossil fuel and electricity price trajectories could be highly volatile and their fluctuations impact the net incremental costs of the transition.

d. Parties involved

Investments in low-carbon vehicles concern all players (households, companies and public administrations). The most affected players will be households dependent on private cars, road transport companies and economic sectors that use non-road vehicles (agricultural or construction vehicles). The purchase of a vehicle now accounts for around 3% of household budgets (smoothing out the expenditure) but requires a significant initial capital investment. Companies will also be affected by the need to replace their vehicle fleets in anticipation of the future

[88] COI, December 2022, Invest more and better in mobility to succeed in its transition.

ban on ICE vehicles and in order to comply with the renewal quotas introduced by the 2019 mobility orientation act. The players with the lowest investment capacity (low-income households, particularly those the most dependent on their vehicles such as those living in rural areas, and companies with low profitability) will be the most vulnerable in this transition.

However, savings on fuel and the lower maintenance costs of electric vehicles provide scope to reduce the overall investment in low-carbon vehicles. Vehicle use and fuel bills now account for more than 8% of household budgets. Taking into account future savings on the fuel bill, which are on average three times lower for a low-carbon private vehicle than for an ICE private vehicle (according to current assumptions), partially offsets the additional acquisition cost over the life of the low-carbon vehicle.

Appendix 1 – Details of results – for vehicles, the data are presented as total investments at the time of purchase with the additional costs of these investments shown in italics by comparison with the acquisition of an ICE vehicle for equivalent use

Studies	*Reference point*	Scenario	Transport infrastructure [89]	Refuelling/charging infrastructure	Low carbon private vehicles [90]	LCVs, HGVs, low-carbon buses and coaches	Shipping and aviation	**TOTAL Low-carbon investments**	Investments in ICE vehicles	TOTAL with low-carbon investments and ICE vehicles	Comments
Climate investments in 2021 (€ bn)											
I4CE 2022					12	[1]		**€26bn**	51	€78bn	
Average additional requirements over the period 2022-2030 (€ bn/year)											
All vehicles and transport infrastructure											
Rexecode 2022	*Business-as-usual (BAU) scenario*	*SNBC-2*			*Additional cost: +2 (+10 to 2050)*	*Additional cost: +10 (+17 to 2050)*		*+13 € bn/year (+32 to 2050)*	*NC*	*NC*	Additional acquisition cost - Slow transition scenario with no decrease in vehicle demand.
I4CE Landscape 2022	*2021*	*SNBC-2*	+4		+5 *Additional cost: +1*	+3 *Additional cost: +0.2*		**+€10bn/year** *Additional cost: +5*	+4 € bn/year	+€14bn/year	Very ambitious assumptions on the (low) weight of vehicles[91] and the (low) capacity cost of batteries - Increase in traffic, but less for non-light vehicles
I4CE 2022 Landscape - ADEME Scenarios	*2021*	*S2 ADEME*	+5		+15 *Additional cost: +4*	+3 *Additional cost: +0.4*		**+€22bn/year** *Additional cost: +9*	-9 € bn/year	+€13bn/year	Reduction in use (reduction in total number of vehicles) - Scenario based on the use of H_2
	2021	*S3 ADEME*	+3		+13 *Additional cost: +3*	+4 *Additional cost: +0.6*		**+€20bn/year** *Additional cost: +7*	-1 € bn/year	+€19bn/year	Less significant breakthrough in electric PVs before 2030
Private vehicles											
French Treasury 2022 Illustrative scenario of fuel cost savings for private vehicles only	*2021*	*SNBC-3*			BAU change in no. of vehicles*: +17 *Additional cost: +2.5*				BAU change in no. of vehicles*: -6	BAU change in no. of vehicles* +€11bn/year	According to French Treasury calculations, the reduction in fuel costs over the lifetime of vehicles registered between 2021 and 2030 would lower the cost compared to the fossil fuel alternative by: €6bn/year on average over 2021-2030 in the business-as-usual scenario for the number of registrations €8bn/year over 2021-2030 in the scenario with a decline in the number of registrations
					With change in transport methods and reduction in journeys*: +12 *Additional cost: +1.5*				With change in transport methods and reduction in journeys*: -9	With reduction in journeys*: +€3bn/year	

* Current business-as-usual change in number of vehicles - "Without behavioural assumptions and additional change in transport method": Scenario with the number of private vehicle registrations identical to the current business-as-usual scenario (including decarbonisation measures until the end of 2021); With reduction in journeys: Scenario with relative decrease in private vehicle registrations, resulting from the first technical round of the SNBC-3 (provisional).

[89] Urban public transport, railways, cycling facilities.
[90] Electric (BEV and PHEV) NGV and bioNGV, hydrogen, cycling.
[91] Investments for the SNBC-2 scenario are lower than for the ADEME scenarios: this is due to the very ambitious vehicle weight assumptions in the SNBC-2.

I4CE (2022) covers the additional investment costs in the state-owned rail network and sections under concession agreements, as well as metro, bus and tram lines and charging/refuelling infrastructure for alternative fuels (electricity, natural gas – NGV[92] and hydrogen). Also included are cycling facilities, bicycles, low-carbon private vehicles (BEV, HEV, PHEV and electric scooters), low-carbon commercial vehicles (electric, H2 and NGV, LCVs and HGVs) and low-carbon buses and coaches (electric, H2 and NGV). Fuel cost savings are not included, nor are investments in shipping and air transport.

Rexecode (2022) constructs a business-as-usual scenario extending historical trends (pre-2018) for the total number of vehicles, particularly concerning the fuel efficiency and fuel source of new vehicles[93], and not taking into account the target of ending sales of new ICE vehicles in 2035. In comparison, the transition scenario models a sharp acceleration in the penetration of electric vehicles. The additional investment cost compared to the business-as-usual scenario is calculated as the investment needed for the transition from the underlying climate trend to a scenario that meets our objectives[94]. This assessment therefore includes the redirection of investments at the aggregate level (amount of ICE vehicle investments reallocated to electric vehicles). Investments in charging infrastructure enabling the use of commercial transport vehicles are not quantified. Fuel cost savings are not included.

The French Treasury has estimated, by way of illustration, the investment needs for the specific scope of private vehicles. The objective is (i) to estimate the sensitivity of the results in relation to the method used by I4CE, based on purchase investment costs in the transport sector[95] and, (ii) to assess the approximate fuel cost savings arising from the purchase of electric rather than ICE vehicles. The total investments and fuel cost savings are based on the assumptions of changes in energy prices and vehicle registrations set out in the first technical round of the SNBC-3 (run 1), which is currently being developed (provisional assumptions). Taking into account the trajectory for the total number of vehicles (change in transport methods and reduced demand for vehicles) makes it possible to obtain the change in investment needs, net of investments in 2022 in the sector.

Figure 1: Calculation formula for net additional investment needs in the French Treasury methodology

$$€net_{veh\_i} = \frac{1}{2030-2022}\sum_{t=2022}^{2030} N_{veh\_i}^{t} \times (p_{veh\_i} + Opex_{veh\_i}^{t}) - N_{veh\_i}^{2021} \times (p_{veh\_i} + Opex_{veh\_i}^{2021})$$

With: $€net_{veh\_i}$ additional investment needs net of fuel cost savings for vehicles with veh_i motorisation (battery electric, plug-in hybrid and petrol or internal combustion), N^t the number of vehicles registered in year t, p the purchase price and $OpEx^t$ the cumulative fuel costs over the life of the vehicle (15 years).

[92] The "green" nature of NGV has not been established (in particular the life cycle GHG gain following the switch to NGV). If OpEx were considered, only the portion dedicated to bioNGV should be considered as a climate investment.
[93] The underlying trend leads to 30 MtCO2eq in 2050 (in 2019: 72 MtCO2eq), far higher than the sector's SNBC-2 target (5 MtCO2eq).
[94] Considering an *additional cost* on purchase of €12,000 and €4,000 for electric and hybrid vehicles respectively, compared to ICE vehicles, €250,000 for buses and coaches, €7,000 for vans, €25,000 for light trucks, €50,000 for special vehicles and €250,000 for road tractors.
[95] For electric vehicles, prices are based on the average basic prices of the 75% best-selling EVs in France and on the prices of the Criqui Commission for plug-in hybrid vehicles. The price of ICE vehicles is based on the average price recorded in the Argus trade journal in 2018. The price decrease used by I4CE in its 2022 Landscape for the ADEME S2 scenario is then applied.

In the transport sector, investments in the decarbonisation of the shipping and air sub-sectors are currently very little quantified and stabilised in studies.

1. Air transport

Air transport includes domestic and international freight and passenger transport activities and amounted to **3.3MtCO_2eq for domestic flights in 2021**, 3% of the greenhouse gas emissions of the transport sector under Secten accounting and **8.8MtCO_2eq for international flights** (not included in national accounts). This was **significantly lower than in the pre-Covid era** when emissions amounted to 5.0 and 19.2 MtCO_2eq respectively in 2019. **The airline sector is one of the sectors that has still not returned to pre-Covid level of activity**.

The sector's decarbonisation challenges are mainly based on:

- **Demand trends, with a reduction in the use of air transport in passenger and freight transport** induced by: potential changes in future flows (relocation, change in use and means of travel), the shift towards decarbonised transport options

- **Supply trends, with the development of more energy-efficient aircraft and sustainable fuels**

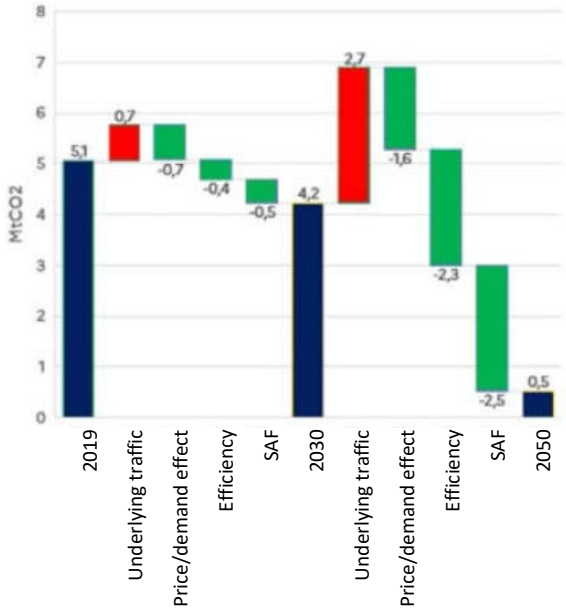
As part of the recovery plan, the French government committed €1.5 billion over three years between 2020 and 2022 to "make France one of the most advanced countries in clean aircraft technologies".

One of the **critical challenges for the aviation sector will be to reliably assess and integrate non-CO_2 impacts** (effects of nitrogen oxide, water vapour and aerosols) in the calculation of radiative forcing **into EET analyses and trajectories**.

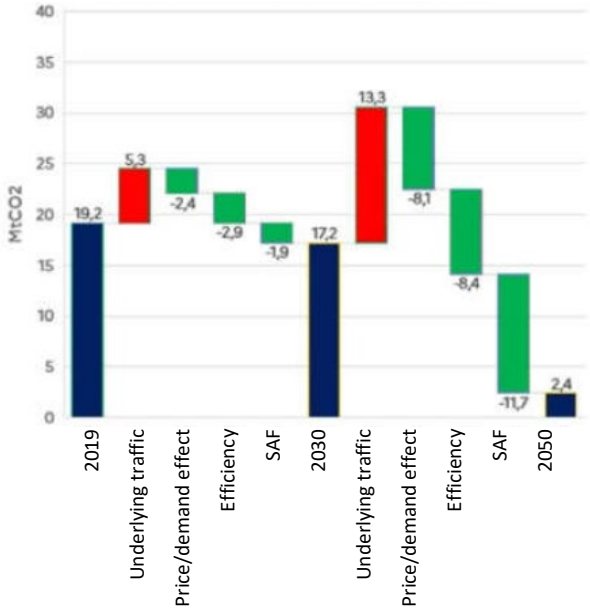
Future developments in the decarbonisation of the sector will be undertaken by governments, air transport companies and national and international bodies (e.g. ICAO).

In connection with the French General Commission for Sustainable Development (CGDD), the airline industry has set decarbonisation targets for 2030 and 2050. The main sources of decarbonisation are fuel efficiency and sustainable fuels (SAF).

Climate law art. 301 scenario: Acceleration - Domestic Traffic



Climate law art. 301 scenario: Acceleration - International Traffic



According to the sector's estimates, these transformations would represent significant additional CapEx and OpEx for the decarbonisation of air transport:

- Industrial investments in more efficient aircraft: €10 billion over 2023-2030
- Accelerated fleet renewal: additional CapEx of €400 million/year to renew aircraft fleets after 15 years rather than 20 years.
- Sustainable fuels three to six times more expensive than kerosene: additional OpEx of €2 billion in 2030.

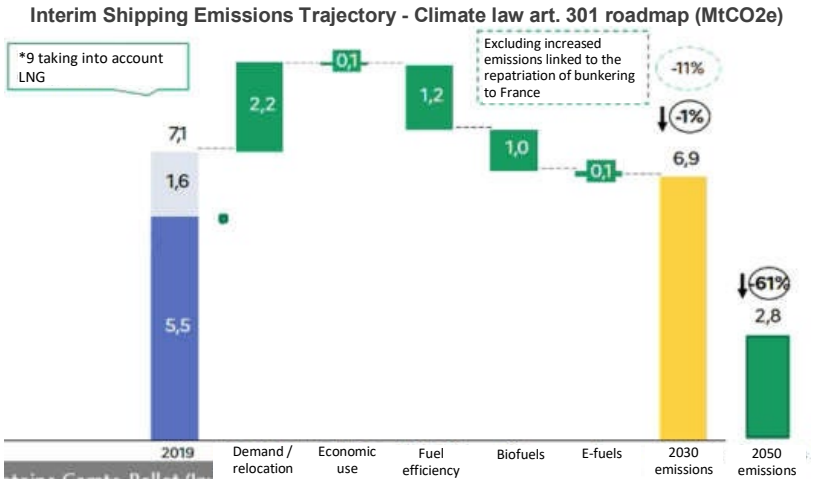
2. Shipping

Shipping (within the meaning of the Article 301 sector) represented 7.1MtCO₂eq in 2019, 6.4% of the greenhouse gas emissions of the transport sector under Secten accounting.

The sector's decarbonisation challenges are mainly based on:

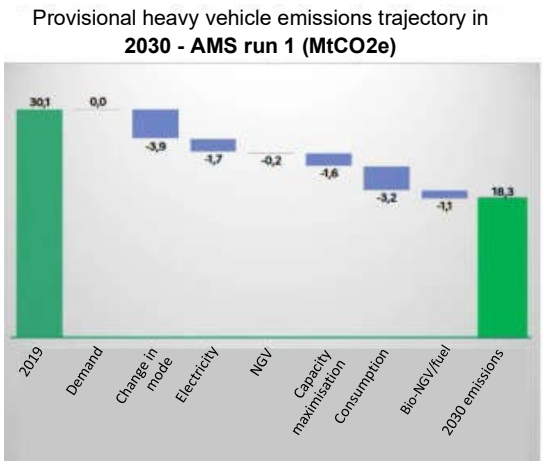
- Demand: annual growth in transport of 1.5% per year (UNCTAD forecasts), and relocation of 1.5% of work per year to France but leaving elsewhere (e.g. Rotterdam – a zero overall effect.
- Economic use: lower speed, fuel consumption = speed cubed; in practice, this lever has already been widely implemented.
- Fuel efficiency: reducing ship drag, improving propulsion efficiency and optimising on-board energy consumption, ecodesign, operational excellence.
- Biofuels: first and new generation, and e-fuels.

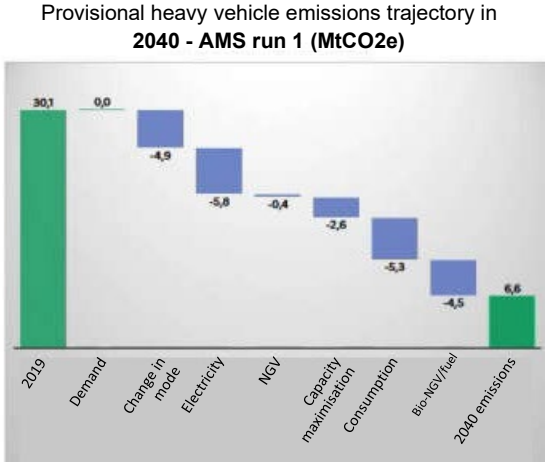
In connection with the CGDD's work, the shipping sector has set decarbonisation targets for 2030 and 2050. The main sources of decarbonisation are fuel efficiency and biofuels by 2030, with no details for 2050.



Appendix 4 – Focus on the decarbonisation of the heavy transport sector

In connection with the CGDD's work, the heavy transport sector has set decarbonisation targets for 2030 and 2040. The main sources of decarbonisation are changes in means of transport, fuel efficiency, electrification, and biofuels.





This decarbonisation trajectory must take into account the significant additional cost of electrification, both in terms of purchase and use. The additional cost of around €800 million over 2023-2025 and €2.3 billion over 2026-2030 for the purchase of electric vehicles according to the SNBC provisional trajectory, excluding charging stations, because the cost of an electric heavy goods vehicle is two to three times more expensive than a diesel vehicle. Thus, the total cost of ownership (TCO) of an electric HGV compared to a diesel HGV will remain unfavourable until 2030. The public authorities must take this additional cost into account insofar as the sector comprises many small businesses (62% of heavy goods vehicles belong to companies with fewer than 50 employees) and is exposed to international competition (in terms of tonne-km of goods transport by road, 42% of heavy goods vehicles have a foreign flag).

3. Energy

Investment needs for the decarbonisation of the energy sector are driven by the increase in production needs for electricity and low-carbon fuels and for electricity networks (transmission, distribution and flexibility).

The additional investment needs to decarbonise this sector could reach between +€3 billion and +€16 billion/year on average over the next decade compared to the recent period to achieve SNBC-2 targets by 2030, before the increase planned in the SNBC-3. The estimated needs vary according to the assumptions used and are the highest in the least energy-efficient scenarios. These investments temporarily increased in 2021 following the post-Covid recovery (€19 billion, +€4 billion compared with 2019).

Needs are expected to increase to between +€11 billion and +€16 billion/year by 2050 compared with 2019 to absorb the increase in electricity demand, with projects to build new nuclear reactors by 2044 already amounting to between +€2 billion and +€3 billion/year.

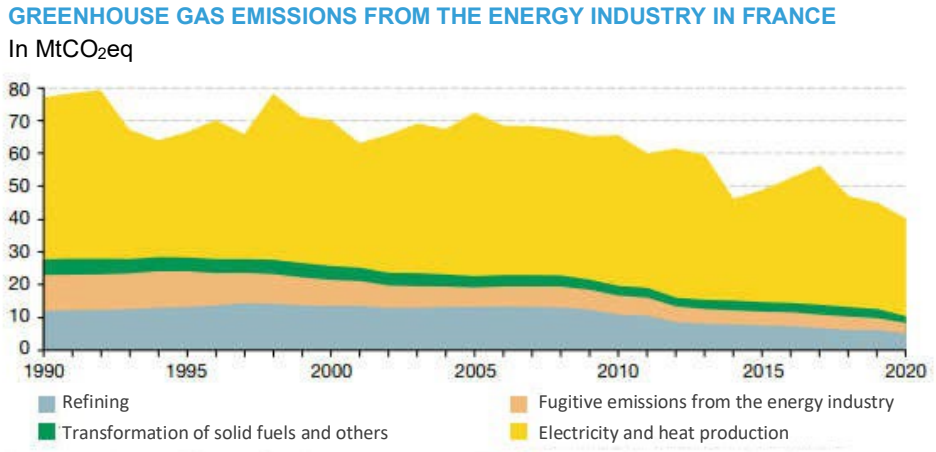
a. Emission reduction targets and main drivers

Current situation: The energy industry includes emissions from production (power plants, heat production, waste incineration with energy recovery), processing (refineries, processing of solid mineral fuels, etc.) and energy extraction and distribution (oil, natural gas, coal, etc.). Emissions from this sector have decreased since 1990, mainly due to the use of nuclear energy. In 2021, preliminary estimates put energy sector emissions at around 11% of gross national emissions in France, less than half the European average. However, the challenges facing the energy sector go beyond those relating solely to energy production, as 67% of gross French emissions were due to energy use in 2020.

Target for 2030: The SNBC-2 sets a target for reducing emissions from the sector to 31.3 $MtCO_2eq$ in 2030 (-60% compared to 1990), requiring a reduction of -3.7% per year between 2021 and 2030. By factoring in France's new 2030 target of a 50% reduction in GHG emissions compared to 1990 (versus -40% in the SNBC-2), and assuming an additional national effort of 10 pts per sector (the SNBC-3 will break down this effort in more detail), the sector's target would increase to 23.5 $MtCO_2eq$ in 2030. This would require a reduction of 6.7% in emissions per year between 2021 and 2030, an average rate of reduction in emissions more than 3.5 times that achieved by the sector between 2015 and 2021 (-1.9%/year). The recent deterioration in the performance of the national forest carbon sink further increases the decarbonisation target of all sectors, including energy. The multi-annual energy plan (PPE) sets the trajectories for the development of the various sectors of the French energy mix for a period of 10 years (2019-2028 for the PPE-2; 2023-2032 for the PPE-3 currently under discussion). For example, the PPE-2 provided for the doubling of installed renewable electricity generation capacity in 2028 (102 to 113 GW) compared to 2017, and biogas production injected into the network of between 14 and 22 TWh in 2028 compared to 0.4 TWh in 2017.

Emission items: Nationwide, there are still nine oil refineries, 12 gas-fired power plants and two coal-fired power plants scheduled to close in 2022, but whose operation has been extended due to the energy crisis. In 2021, electricity generation accounted for the bulk of the sector's emissions (44%), which mainly depend on climate variations and the availability of low-carbon sources. Oil refining, district heating and waste-to-energy each account for around 17% of emissions.

Chart: GHG emissions from the energy industry in France, broken down by activity



Note: Electricity and heat production includes waste incineration with energy recovery; here, heat deemed to be heat traded.
***Source**: EEA, 2022*

Source: SDES, December 2022, Key Climate Figures

Reading note: Emissions related to the transformation of solid fuels (coal and its derivatives) are, for the most part, related to the cokeries business.

Main drivers of decarbonisation: the current National Low Carbon Strategy (SNBC-2) and the multi-annual energy plan (PPE-2), supplemented by recent energy policy strategies, project an increase in electricity production to meet growing electrification and identify the main drivers of decarbonisation in the sector:

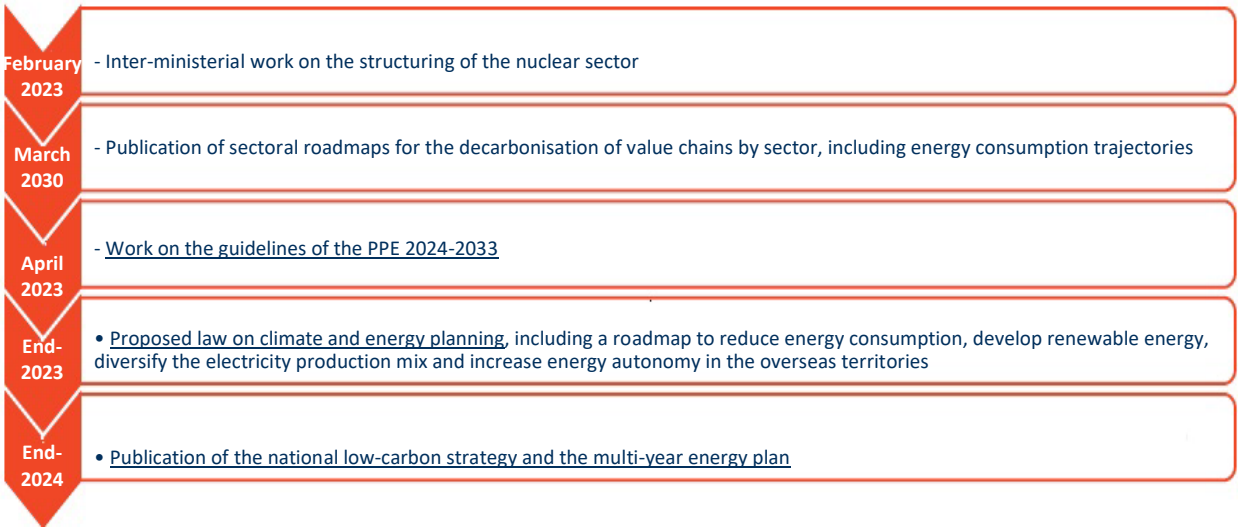
- Decarbonisation and increase in electricity production:
  - Support for the development of renewable electric energy: acceleration of the development of solar, offshore and onshore wind power;
  - Support for the production of low-carbon electricity excluding renewable energy: extension of the service life of existing nuclear plants and acceleration of nuclear development;
  - Exit from high-carbon electricity production methods: gas and coal;
  - Support for the development of low-carbon hydrogen;
  - Investments to improve the flexibility of the electrochemical storage network, dynamic demand management, controllable low-carbon power plants);
- Increase in low-carbon heat production:
  - Support for the development of low-carbon urban heat networks (geothermal strategy planning);
  - Energy recovery from biomass and waste (biogas, biofuels, renewable heat),

The sector will also be heavily impacted by changes in energy demand besides electricity, and therefore indirectly by the action of levers in the main consumer sectors, for example:

- Development of biomass fuel production (securing of second generation biofuel sources: development of the production and refining sector)
- Development of the production of low-carbon fuels excluding biomass (support for R&D and the development of synthetic fuels)
- Reduction in the consumption of fossil energy (continuation of cross-cutting energy efficiency policies: reduction in the heating temperature of buildings, management of transport demand, etc.)

The majority of emissions in the sector are subject to the European carbon trading market (EU ETS) and emissions targets set at European level and revised by the Fit for 55 package. The sector is also subject to rising European targets for the incorporation of renewable energies into energy consumption (45% by 2030) since the revision of the REPowerEU regulation.

Timetable:



b. Investment needs

Climate investments in the sector amounted to €19 billion in 2021 (I4CE 2022), mainly stemming from investments in renewable electricity production (€7 billion), supplemented by investments to improve the flexibility of electricity networks (€6 billion), in nuclear plants (€5 billion), in the production of biofuels, renewable gas and heat (€1 billion) and in heat networks (€0.3 billion).

Compared with 2019 (pre-Covid), additional gross climate investment needs in the sector would be between +€7 billion and +€16 billion/year to achieve the SNBC-2 decarbonisation targets in 2030 (I4CE 2021, Rexecode 2022, RTE 2022, ADEME 2022, Institut Rousseau 2022). These estimates vary according to the scenario applied, in particular assumptions regarding an increase in energy consumption by the rest of the economy, its electrification, as well as the incorporation of variable means of electricity generation (wind and solar in particular). **These investment needs would then increase by 2050 to between +€11 billion and +€16 billion per year due to the electrification of uses** leading to an increase in electricity demand (Rexecode 2022, Institut Rousseau 2022, ADEME 2022).

Compared with the investments recorded in 2021 (+€4 billion between 2019 and 2021) - which were higher due to the post-Covid recovery in activity, the public support provided by France Relance, particularly in the solar sector, and the recent cyclical increase in the costs of renewable energy projects - gross additional needs would be automatically lower (+€6bn/year in the I4CE 2022 Landscape), assuming that the recent increase observed continues. Depending on the scenario, the target level of investments for the climate could even already be reached by current investments (see table – I4CE 2022 scenarios).

Investments in new nuclear power

As part of the EPR2 programme[96], the government has assessed the investment costs for the construction of six new nuclear reactors, which has been approved. The coupling to the network of the first reactors is estimated to take place in 2035. These costs are estimated at €51.7 billion, spread over a total construction period of 25 years, corresponding to annual investments of around +€2 billion/year. However, the investments will certainly not be spread evenly over time. In addition, in a speech in Belfort in February 2022, the President of the Republic announced the launch of studies for the construction of eight additional EPR2.

c. Main limits and uncertainties

Investments in energy production will depend primarily on energy demand from other sectors and in particular on energy-use reduction assumptions. Energy use accounted for 67% of GHG emissions in France in 2020. Energy use concerns all sectors and the decarbonisation of energy production will depend on downstream uses. Depending on the scenario, the additional investment needs vary greatly, particularly for the production of renewable electricity and electrical systems.

The mobilisation of sufficient additional production capacity to meet the sharp increase in demand for low-carbon energy is uncertain, particularly due to network constraints but also technical and acceptability constraints. The decarbonisation of downstream sectors, which relies in particular on the electrification of processes, will increase the required capacities. The increase in production must be substantial and sufficient and is called into question by the availability of infrastructure, the speed of construction of infrastructure and the availability of labour, which may delay investments. The stability of electrical systems, particularly in periods of stress, will depend on the rate of incorporation of variable production methods and investments in storage solutions (fixed battery systems, etc.).

d. Parties involved

The capacity to mobilise substantial investments in capital-intensive projects (nuclear, wind farms, etc.) will be mainly a matter for the state, its operators and local authorities, as well as for energy companies. The infrastructure in question requires significant capital investments for the public sector but could weigh on household and business energy bills. The new mix and the financing tools mobilised (equity, public-private partnerships, remuneration contracts, regulated asset base, etc.) will impact the marginal cost of production and the purchase price of electricity, including through network tariffs.

Constraints on additional low-carbon fuel production capacity will also require the decarbonisation effort to be shared between certain non-electrifiable levers (biofuels, e-fuels, hydrogen, etc.).

[96] Government, February 2022, Work relating to new nuclear power – PPE 2019-2028.

Appendix 1 - Details of results

Study	*Reference point*	*Scenario*	Nuclear	Renewable electricity production	Production of biofuels, gas and renewable heat[97]	Heating networks	Electrical system[98]	**TOTAL**	Comments
Climate investments in 2021 (€ bn)									
I4CE 2022			5	7	1	0.3	6	**€19bn**	
Average additional requirements over the period 2022-2030 (€ bn/year)									
Excluding electrical networks									
I4CE 2021	*2019-2020*	*SNBC-2*		+5		+1		**+€6bn/year**	Lower installation costs in the pre-Covid period
Including electricity networks									
ADEME	*2021*	*S2 ADEME*	+2 (+1 to 2050)	+6 (+8 to 2050)	+1 (+4 to 2050)		NC	**+€9bn/year** (+13 to 2050)	Without taking into account post-Covid stimulus investments
		S3 ADEME	+2 (+1 to 2050)	+8 (+10 to 2050)	+3 (+4 to 2050)		NC	**+€13bn/year** (+15 to 2050)	
Rexecode	*Business-as-usual scenario*	*SNBC-2*	+1 (+4 to 2050)	+3 (+3 to 2050)	NC	NC	+3 (+4 to 2050)	**+€8bn/year** (+11 to 2050)	System costs based on a 40% share of total investments
RTE	*2012 – 2020*	*RTE scenarios*	NC	NC			NC	**+€7bn to +€12bn/year**	Range corresponding to the different scenarios
Institut Rousseau	*Business-as-usual scenario*	*SNBC-2*	+5		+5 (incl. hydrogen[99])	NC	+6	**+€16bn/year** to 2050	
Relative to the post-Covid recovery									
I4CE Landscape 2022	*2021*	*SNBC-2*	-0.3	+3	-0.4	+0.3	+4	**+€6bn/year**	Lower additional requirements due to the recent increase in costs over 2021, not corrected in projections.
I4CE Landscape 2022 – ADEME scenarios	*2021*	*S2 ADEME*	-1	-2	-0.5	+0.2	+2	**-€2bn/year** (-€1bn/year to 2050)	
		S3 ADEME	-0.6	0	-0.5	+0.2	+4	**+€3bn/year** (+€5bn/year to 2050)	Average of nuclear and renewable energy scenarios.

[97] Biomethane only for I4CE.
[98] Rexecode considers electricity distribution and transmission networks and Institut Rousseau also includes means of flexibility (new biogas and hydrogen plants). I4CE (2022) only includes network flexibility infrastructure as climate friendly (electrolysers, methanation, static batteries) and investments in the network itself. To address the same scope, we have included the investments in electricity networks, which they include but do not consider as being green.
[99] Institut Rousseau includes hydrogen in “green gases” or renewable gas, unlike the other studies, which only include biomethane investments.

Appendix 2 - Details of research studies

I4CE (2022) estimates the future investments needed in the renewable electricity and gas generation sector and heat networks, based on assumptions of generation capacity increases compatible with the current PPE, in a similar way to the case of construction and transport. The scope does not cover electricity networks.

ADEME (2022) estimates investment needs in the energy sector using macroeconomic modelling of the ThreeME model, like for the construction and transport sectors. Green investments in the energy sector are considered to be investments in nuclear, renewable (wind, solar and hydro), biogas and renewable heat production capacities. However, they correspond to capital consumption, which is accounted for as a fraction of the average cost of production, and not to the immediate costs of installing infrastructure. This impacts the reduction in costs, which comes later for ADEME. A range corresponding to scenarios 2 and 3 of the Transitions 2050 study is proposed.

RTE (2020) includes investments in renewable and nuclear production capacities (in the different scenarios studied).

Rexecode (2022) uses the assumptions for the additional cost of wind, solar and nuclear energy resulting from the RTE reports, and the additional cost of renewable heat from a previous study by ADEME[100], to calculate the associated additional investment costs. The additional investment for transmission networks is calculated on the basis of a share of 40% of the total additional investment[101]. The future electricity mix chosen in the scenario meeting the objectives of the SNBC corresponds to the N2 scenario of the RTE report (construction of 14 EPRs between 2035 and 2050, accelerated deployment of wind and solar power compared to the business-as-usual scenario) while the business-as-usual scenario includes no construction of new reactors (extension of existing nuclear power plants with gradual closure).

Institut Rousseau (2022) estimates the additional investment needed for the near-total decarbonisation (93%) of energy production as provided for in the SNBC-2 via the production of low-carbon electricity and the substitution of fossil gas by renewable (biomethane) or low-carbon (hydrogen) gases. The need to strengthen the electricity system and the development of the flexibility to enable the integration of these capacities (particularly renewable energies) are also taken into account. The various future electricity mix choices considered are those of the RTE Future Energies 2050 report (ranging from 100% renewable to 50% nuclear in 2050 depending on the variants), and the investment estimates are presented in the form of an average for the different scenarios. The sum of the additional average investment required for the production of renewable and nuclear electricity is estimated at €5 billion/year by Institut Rousseau (+/-€1 billion depending on the chosen production mix, among the variants of the RTE scenarios).

[100] "Renewable energy costs in France", 2016 edition, ADEME.
[101] The cost of the transmission and distribution networks in scenario N2 of the RTE report represents in fact around 40% of the full annualised costs of the scenario. An investment requirement for the networks of 40% of the total additional investment need is therefore applied, in proportion.

4. Industry

Additional investment needs for the decarbonisation of the industrial sector are estimated at between +€1.5 billion and +€3 billion/year to meet the SNBC-2 targets for 2030 (a total of between +€16 billion and +€25 billion by 2030), compared with the observed business-as-usual emission reduction trend.

Some of these decarbonisation needs are intended to be financed by redirecting investments within the sector from brown assets to green ones.

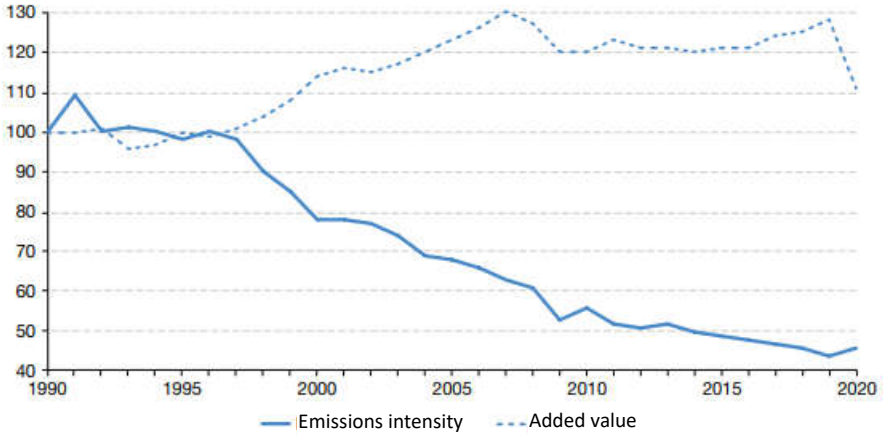
Investments already made under the France Relance and France 2030 schemes amount to more than €6.3 billion in public aid.

e. Sector emissions, reduction target and main drivers of decarbonisation

Current situation: In 2021, the "Manufacturing and construction" sector accounted for 19% of French greenhouse gas (GHG) emissions, totalling 79 $MtCO_2eq$. In Secten accounting, used to report national emissions, the emissions attributed to this sector include those related to new building construction. Emissions from the sector fell by 45% between 1990 and 2021, as the carbon intensity of production was more than halved, primarily by increasing energy efficiency and improving processes[102], alongside the introduction of the European emissions trading system (EU ETS) in 2005. Following the post-Covid recovery, the sector's emissions increased by +7% between 2020 and 2021.

Chart: GHG emissions intensity in manufacturing and construction in France

Index based on 100 in 1990



Note: emissions are related to the added value of manufacturing and construction.
Sources: *SDES, according to Insee, 2021; Citepa, Secten, 2022*

Source: SDES, December 2022, Key climate figures

Target for 2030: The SNBC-2 sets a target for reducing emissions from the sector to 55.3 $MtCO_2eq$ in 2030 (-61% compared to 1990), requiring a reduction of -3.7% per year between 2021 and 2030. By factoring in France's new 2030 target of a 50% reduction in GHG emissions compared to 1990 (versus -40% in the SNBC-2), and assuming an additional national effort of 10 pts per sector (the SNBC-3 will break down this effort in more detail), the sector's target would increase to 41 $MtCO_2eq$ in 2030, requiring a reduction in emissions of -6.9% per year between 2021 and 2030, or a rate of reduction more than five times higher than that achieved by the sector between 2015 and

[102] Romain Faquet and Anna Bornstein A. et Faquet R. (2021), "The decarbonisation of industry in France", Trésor-Éco, no. 291.

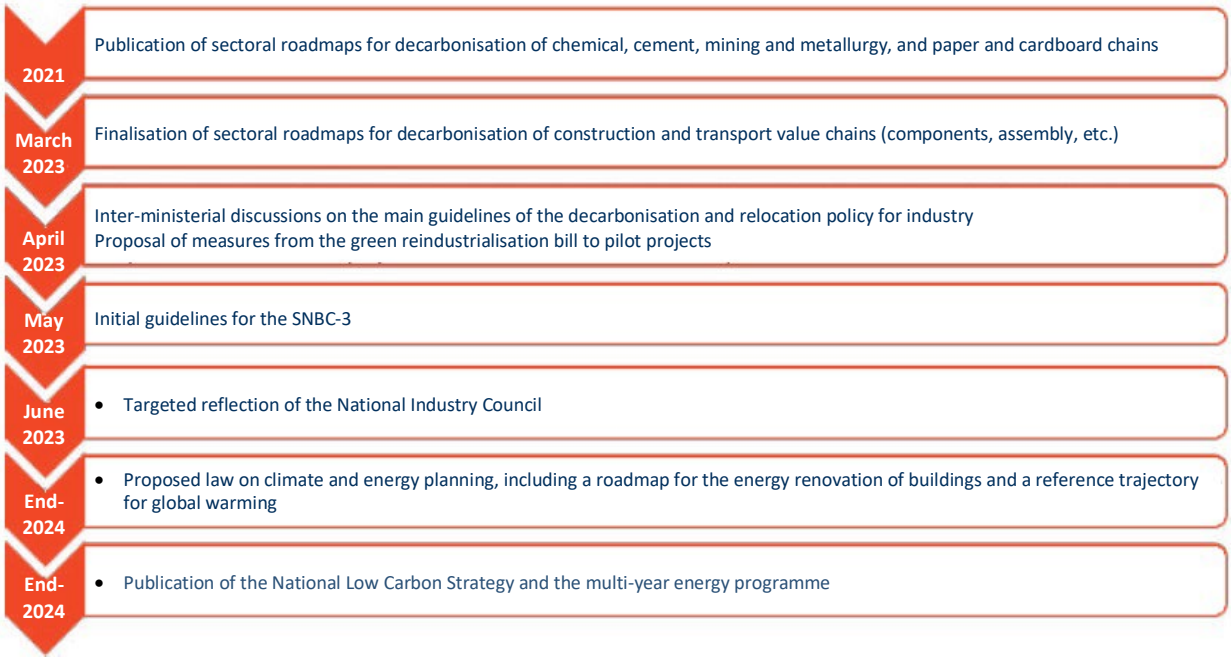
2021 (-1.2% per year). In addition, the recent deterioration in the performance of the national forest carbon sink further increases the decarbonisation target of all sectors, including construction. Lastly, green reindustrialisation policies could drive up national emissions, while reducing the sector's carbon footprint, thanks to industrial processes being less carbon-intensive in France than abroad, reduced transport between production and consumption locations and the lower carbon content of French electricity.

Emission items: The vast majority of emissions concern CO_2 (more than 92%). Three quarters of the sector's emissions are due to metallurgy, chemicals and the manufacture of non-metallic minerals (cement, lime, glass, etc.). These products are highly carbon-intensive due to the energy consumption required for their production or the associated process emissions. For example, chemical emissions decreased by 68% in France between 1990 and 2020, thanks to a drastic reduction in N_2O emissions (-97%) linked to the production of adipic and nitric acids.

Main drivers of decarbonisation: The current national low-carbon strategy (SNBC-2) and the multi-annual energy plan identify the main decarbonisation levers, which are still relevant:

1. Transformation of the energy mix in industry (stop using coal as an energy source, integration of thermal renewable energies, electrification of heat production and increase in energy efficiency)
2. Process change (process electrification, replacement of methane by hydrogen, new innovative processes[103])
3. Development of carbon capture and storage (for the decarbonisation of final emissions from concentrated emission sites)

Timetable: the timetable is provided for illustrative purposes, to present the key milestones of the ecological planning steps for the construction sector.



[103] For example, use of clinker-free cement.

f. Investment needs

France Relance measures to decarbonise industry

Calls for projects included in the France Relance Industrial Decarbonisation Fund helped finance the decarbonisation of industry for €1.3 billion (for 241 successful applicants), for a total investment of €4.3 billion. These investments are expected to reduce emissions by approximately a further 5 $MtCO_2eq$/year, corresponding to a decrease of -6% in 2030 versus 2015, compared to the SNBC-2's target of -35%[104].

The average socio-economic abatement cost of 121 projects chosen in the process and utility decarbonisation component was €26/tCO_2eq. Considering that calls for projects were subsidised in order of profitability and efficiency, the abatement cost of future projects is expected to increase as decarbonisation becomes more complex.

France 2030

The France 2030 plan aims to reduce the sector's emissions by 8% between 2015 and 2030 by devoting €5.6 billion to decarbonising industry. Of this €5.6 billion, €4 billion would be allocated to major deep decarbonisation projects and €1 billion to the deployment of low-carbon technologies targeted at smaller or emerging players. As announced by the President of the Republic, this €5 billion could be doubled if industrialists double their decarbonisation efforts (from -10 to -20 $MtCO_{2eq}$ by 2030) within 18 months.

The main estimates put the need for additional gross investment in the decarbonisation of industry at between +€2 billion and +€3 billion/year by 2030 to meet SNBC-2 targets (Rexecode 2022, Institut Rousseau 2022), compared with a business-as-usual trend including certain investments under the France Relance and France 2030. Decarbonisation drivers include increasing energy efficiency, using biomass in boilers or industrial furnaces, electrifying processes (for example for low-temperature industrial heat), replacing coal with (bio)gas, capturing and sequestering CO_2 or producing low-carbon hydrogen and developing the use of H_2. On a scope limited to the cement production sector, which accounted for 14% of industry emissions in 2020, gross investment needs could reach €0.3 billion/year until 2050 (ADEME 2022). As an indication, the sector's current gross tangible investments were in the region of €0.2 billion/year between 2013 and 2017 (source: INSEE national accounts). These estimates for the cement sector are dependent on sales outlets, and in particular on trends in new construction and the use of alternative building materials (e.g. wood panels or clinker-free cement), which varies greatly between transition scenarios (see focus on Construction). These gross needs should be seen in light of the potential for redirecting investments within the sector, away from brown assets toward those favouring decarbonisation.

Carbon capture and storage (CCS)

The full abatement costs of CCS (purchase and operation) are between €80 and €150/tCO_2 avoided over 20 years; the first projects may be more costly because they require substantial infrastructure. Based on a development potential of 1 $MtCO_2eq$/year in 2030 estimated in the SNBC-2, the total development costs would reach between +€1.5 billion and +€3 billion. A national CCS development strategy is currently being developed, which could raise the capture and storage trajectories and associated investments (capture, transport, storage) over the next few years.

[104] Directorate-General for Companies, March 2023, DGE Themes – No. 8. Government action to decarbonise industry.

These estimates do not take into account the risks of technological obstacles (effect of substituting investments in CCS for low-carbon investments, such as in clinker-free cement, for example) and tension on electricity production (these technologies are highly energy-intensive). Nor do they take into account the effects of dependence on fossil fuel prices on operating costs (maintaining fossil gas imports for energy use, for example).

The hydrogen strategy

As part of its national strategy for the development of low-carbon hydrogen,[105] the government will deploy €7 billion and €1.9 billion respectively in favour of the production and use of low-carbon hydrogen in industry, particularly heavy industry (part of which via France 2030 and France Relance). The strategy is expected to be updated in 2023.

g. Main uncertainties

The estimated amounts are particularly sensitive to assumptions regarding changes in abatement costs. These are expected to gradually increase as the most efficient decarbonisation projects in the industrial sector are completed (through an increase in the marginal cost of energy efficiency gains, for example). The uncertainty concerns both future technology costs and the cost of their deployment, taking into account, for example, network effects for CCS. Furthermore, pressure on biomass production capacities for energy - also mobilised for the decarbonisation of uses that are difficult to electrify - could prove high and increase the need for technological disruptions (new processes to avoid the use of biogas, for example).

More broadly, the reindustrialisation roadmap will have a strong impact on the sector's total investment needs. A green reindustrialisation policy could lower the sector's carbon footprint, given the low average carbon content of French electricity, the resulting reduction in transport between places of production and consumption, and thanks to processes being on average less carbon intensive (although this varies depending on the sector), while at the same time increasing the sector's national emissions.

h. Parties involved

More than 55% of emissions from industry are generated by 50 high emission sites, meaning that the management of decarbonisation policies can be concentrated. These sites account for more than 10% of French emissions, providing an opportunity to carefully manage the trajectories of emission reductions and the associated investments, in particular via ecological transition contracts and decarbonisation roadmaps for each major site.

[105] Accelerating the deployment of hydrogen, the cornerstone of the decarbonisation of industry, Press kit, February 2023.

Study	*Reference point*	*Scenario*	**TOTAL**	Comments
Average additional requirements over the period 2022-2030 (€ bn/year)				
Cement				
Insee (national accounts)			**Gross fixed capital formation of the sector: +€0.2bn/year over 2013-2017**	NAF code gross tangible investments 23.5
Sector transition plans - ADEME (2022)	2013-2017	SNBC-2 - Technological variant	**+€0.1bn/year**	Assuming that all current investments in the sector (see line above) are devoted to low-carbon assets in the future
		SNBC-2 – Low-carbon variant	**-€0.2bn/year**	
All sectors				
Rexecode	*BAU scenario*	*SNBC-2*	**+€3bn/year** (+5 to 2050)	
Institut Rousseau	*BAU scenario**	*SNBC-2*	**+€2bn/year to 2050**	

** Excluding France Relance and France 2030 investments*

Rexecode (2022) estimates the additional investments needed in industry by estimating the investments needed in certain technological levers for decarbonisation (decarbonisation of hydrogen for current uses, production and use of hydrogen for new industrial energy or non-energy uses, CO_2 capture and sequestration, electrification of low temperature heat production (< 200°C) for certain industrial uses). Decarbonisation costs are based on reports from the International Energy Agency (for CCS, low-carbon hydrogen and new uses of hydrogen) and others identified in academic literature (process electrification).

Institut Rousseau (2022) estimates the additional investments to be made compared to a business-as-usual scenario to: (i) decarbonise the nine most energy-intensive activities in industry[106] (generating 52% of industrial emissions); (ii) decarbonise the rest of industry (48% of the remaining emissions); and (iii) develop strategic national sectors of excellence (batteries, electrolysers, renewable energy production technologies, heat pumps, etc.). The investments to be made in biogas producers, which cover the sector's biomethane consumption, are included in the Energy sector, as are hydrogen production facilities in the industrial sector. Institut Rousseau estimates additional requirements at +€16 billion by 2050.

ADEME (2022) analyses decarbonisation challenges in its sectoral transition plans and puts forward two associated transition scenarios, one focused on efficiency ("low-tech") and the other on technological development ("techno-push"). Each scenario is established in line with a different trajectory for cement demand for new construction and renovation. The first and only sectoral plan published to date deals with cement and establishes two scenarios in line with SNBC-2 objectives. In particular, the scenario based on efficiency is driven by a drop in production reaching -46% in 2050, while the pro-technology scenario focuses on the renovation and extension of sites as well as the deployment of carbon capture and storage and mineralisation technologies. The investments associated with the scenarios are calculated for 2050.

[106] Production of steel, cement, alkenes (hydrocarbons), glass, paper/cardboard, ammonia, sugar, aluminium and chlorine.

5. Agriculture and forestry

Few recent studies address the need for additional gross investment in agriculture and the forestry and land sector. Current figures identify a minimum additional need of around +€1.5 billion/year for agriculture, driven by the acquisition of new low-carbon vehicles, and around +€1 billion/year on average for forestry by 2030 compared to current levels to achieve SNBC-2 objectives, on a limited scope of investments considered. These figures will need to be more detailed, as they are mostly partial, focused on the sector's energy transition. They also do not include all the costs of the environmental transition for the sector: costs related to changes in agricultural practices and training, research and development, investments necessary to meet non-CO_2 objectives (in particular non-energy emissions, for example those related to methane). These amounts will rise with the increase in the target in 2030 as well as by 2050.

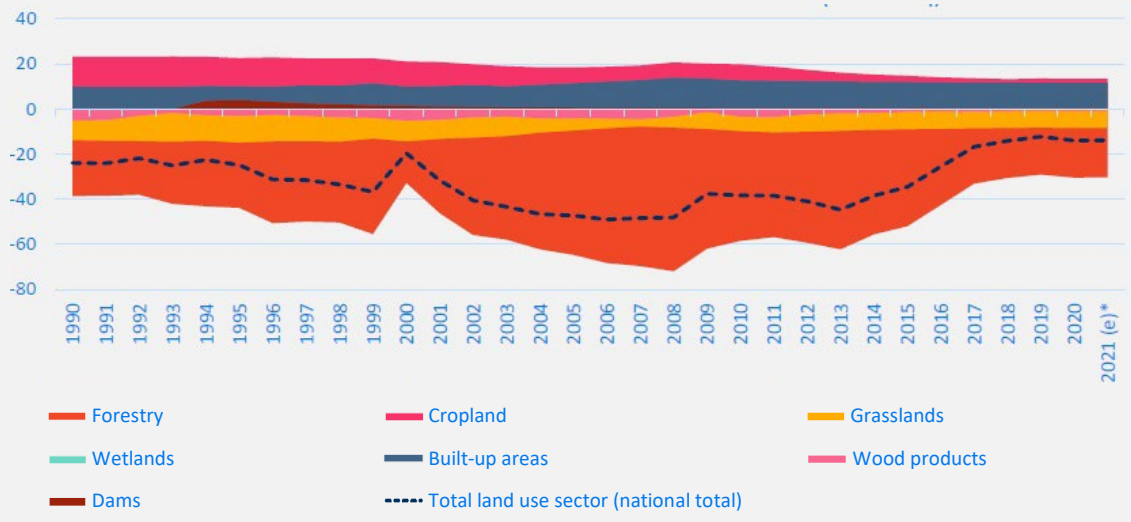
a. Emission reduction targets and main drivers

Current situation: In 2021, after an 11% drop in emissions since 1990, agriculture accounted for 19% of gross national greenhouse gas (GHG) emissions in France. In Secten accounting, used to report emissions at national level, the emissions attributed to agriculture include those from livestock, crops, including forestry, and motor vehicles and heating systems used by farms (for example greenhouses). The "land use" sector, referred to here as "Forestry" acts as a net carbon sink by capturing more greenhouse gases than it emits. It offset 3% of gross emissions in 2021, compared with 9% in 2005 (see box below).

The sharp drop in storage capacity in the land use sector

The emissions footprint of the "land" sector improved sharply between 1990 and 2005 (from -24 to -47 $MtCO_2eq$), almost entirely due to an increase in the forest carbon sink linked to the decline in agriculture in favour of wooded areas. It then deteriorated from around -45 $MtCO_2eq$ in the mid-2000s to -35 $MtCO_2eq$ in 2015. The deterioration then accelerated sharply. It only accounted for -14 $MtCO_2eq$ in 2021, mainly due to the collapse of the forest carbon sink.

Chart: Land use sector emissions in 1990 and 2021 (MTCO2eq)



* 2021 emissions are a provisional estimate. *Source: Citepa 2022, Secten scope.*

Note: The sharp variations in 1999 and 2009 were due to storm damage in those years.

The recent trend is explained by the decline in tree growth and the rise in mortality, due to the increase in the frequency and intensity of droughts and diseases since 2015 (decline of trees linked to parasites and fungi, particularly beetles and ash dieback), but also by an increase in extraction (Secten report, Citepa 2022).

The resilience of stands and the adaptation of forests to climate change is a key variable in limiting the additional effort required of the rest of the economy: faced with the additional effort to reduce gross emissions between 1990 and 2030 linked to the transition from SNBC-2 to SNBC-3 (+10 pts), offsetting the deterioration of the carbon sink between 2005 and 2021 requires an additional effort on emission reductions of 6.2 pts in 2030 compared to 1990. In particular, the loss of efficiency of natural storage will require additional reductions in final emissions, which will be all the more difficult to abate as sectors are decarbonised.

Target for 2030: The SNBC-2 sets a target for reducing emissions from agriculture to 71.2 $MtCO_2eq$ in 2030 (-22% compared to 1990), requiring a reduction of -1.5% per year between 2021 and 2030. By factoring in France's new 2030 target of a 50% reduction in GHG emissions compared to 1990 (versus -40% in the SNBC-2), and assuming an additional national effort of 10 pts per sector (the SNBC-3 will break down this effort in more detail), the sector's target would increase to 62.1 $MtCO_2eq$ in 2030, requiring a reduction in emissions of -2.9% per year between 2021 and 2030, or a rate of reduction more than 2.5 times higher than that achieved by the sector between 2015 and 2021 (-1.1% per year). The land use sector has an SNBC-2 target of -40.0 $MtCO_2eq$ in 2030, an improvement of more than 185% in the net performance of the carbon sink compared with 2021. This average effort of +12.3%/year requires a significant break with the average rate of deterioration since 2015, which was -14.2%/year on average. The SNBC-3 will therefore have to establish a realistic target for the sector, which could be less ambitious, but would require a relative increase in the effort for the other sectors. The tension in these two sectors will be all the greater as they offer levers for decarbonisation for many uses, in particular via the use of biomass (biogas and biofuels for agriculture and wood products for forests).

Emission items: Agriculture differs from other sectors by the low share of energy-related emissions (13%). The main sources of emissions are methane (CH_4), accounting for 46% of emissions, primarily produced by animals via enteric fermentation, and nitrous oxide (N_2O), accounting for 40%, linked to the transformation of nitrogen products via crop fertilisation (spreading fertilizer, manure, slurry, etc. on fields). The land use sector includes both emissions and storage items. Emissions in the sector are dominated by CO_2, in particular emitted by harvesting and the mortality of biomass as well as deforestation for agricultural use. Storage is driven in particular by the growth of biomass, changes in carbon in the soil and reforestation.

Main decarbonisation levers: the current national low-carbon strategy (SNBC-2) identifies the following main decarbonisation levers:

- Agriculture:
    1. Reduction in CH_4 emissions via changes in livestock uses: reduction in food waste and increase in the production of vegetable proteins as a substitute for animal proteins; modification of the diet of cattle herds and downward underlying trend; influence of demand and consumption in the agri-food sectors in line with nutritional recommendations, limiting excess consumption of cured meats and meat (excluding poultry) and increasing that of legumes and fruit and vegetables;
    2. Reduction in N_2O emissions, in particular through changes in practices for field crops: increase in the production area for organic crops and legumes, promotion of nitrogen recycling;
    3. Reduction in CO_2 emissions through the transformation of energy uses: reduction in energy consumption, conversion of agricultural machinery to biofuels, biogas and electricity over the longer term;

- Forests:
    1. Strengthening of carbon storage in long-life wood products;
    2. Reduction of soil sealing;
    3. Strengthening of carbon storage in agricultural land;
    4. Adaptation of forests to climate change.

Timetable: the timetable is provided for illustrative purposes, to present the main milestones of the ecological planning steps for the agriculture and forestry sectors.

b. Available estimates

Decarbonising the agricultural and forestry sectors will require additional investment in fixed capital formation, to be more broadly associated with changes in practices. Fixed capital investment items include, for example, changing agricultural and forestry vehicles to low-carbon alternatives, the use of agricultural anaerobic digestion (acquisition of biogas producers, pit covers), the electrification of livestock buildings and the switch to renewable energies for heated greenhouses (waste heat and biomass). For some farms, the sector's transition may also involve the development of energy production (agrivoltaism, biogas, etc.).

To date, few studies consider current investments in the environmental transition of the agricultural and land sector (natural carbon capture sink), with estimates of additional needs even rarer still. This is explained by the vast differences in the types of needs, which must be considered through various GHG reduction levers depending on the GHG in question (CO_2, methane, nitrogen) and the sub-sector: reduction in the use of high-emission inputs, methane emissions from livestock, changes in agricultural machinery, actions on natural sinks (grasslands, forests, etc.). Another difficulty stems from the fact that in this sector the ecological transition requires significant changes in practices that are not limited to making investments as defined in this work by gross fixed capital formation (support for the adoption of greener agricultural practices, research and development, etc.).

For agriculture, current studies estimate the gross investment requirement in the transition at a minimum of +€1.5 billion/year by 2030 to meet SNBC-2 objectives. I4CE (2021) provides a partial estimate of historical investments in decarbonisation, focusing on the energy segment of the agricultural sector (€0.3 billion recorded in 2019, covering solar installations, energy efficiency, biogas and biomass recovery). Rexecode (2022) estimates an additional requirement of +€0.3 billion/year for the agricultural sector to achieve SNBC-2 objectives, by extrapolating the abatement costs resulting from changes in farming practices from a 2013 INRA study (€75/tCO_2eq) and including the savings linked to reductions in fossil inputs. By considering this estimate, and those of IDDRI (2021) for certain segments only (cereals, oilseeds, milk) and the General Council for Food, Agriculture and Rural Areas (CGAAER, 2022) on the transition to low-carbon vehicles (gross investments on purchase, and not the additional cost compared to an ICE vehicle), we can estimate the lower end of the range for the need for additional gross investments in decarbonisation at +€1.5 billion/year.

Some studies include, in addition to investments, other costs associated with decarbonisation, which are expected to be proportionally significant for the agricultural and forestry sectors. In a very ambitious transition scenario (almost full conversion to agroecology and organic farming), including changes in practices and training, Institut Rousseau (2022) estimates that decarbonisation of the agricultural sector requires financial needs of around +€5 billion/year by 2050. Research and development needs are not estimated.

The studies do not include the investments already made via France Relance and France 2030 in their reference point, which could reduce additional needs.

Furthermore, the gains arising from the development of energy production by the sector in transition scenarios could reduce the total additional cost over the life of the investment. In a scenario involving high energy production by farms, the CGAAER estimates that the income gain generated by the production of photovoltaic electricity could reach €1 billion/year by 2050 (CGAAER, 2022).

For the carbon sink sector, additional investment needs for the transition can be estimated at around +€1 billion/year by 2030. Investment items cover the increase in forest area and the improvement of forest management (diversification of species, planting of trees and hedgerows in fields). Institut Rousseau (2022) and Rexecode (2022) both provide an estimate of investment needs of around +€1 billion/year by 2030. Here, Institut Rousseau includes investments in technological carbon sinks (CCS) by 2050 but at much lower capacities than those foreseen in the SNBC-2 (3 $MtCO_2eq$/year versus 15 $MtCO_2eq$/year).

Forest renewal

Estimates of additional investment needs for forest renewal range between +€150m and +€300m/year by 2030[107]. These estimates were followed by the government's recent commitments at the Forest Conference in March 2022 to mobilise +€150 million/year from public and private sources to fund forest renewal from 2024 (in line with the France Relance plan).

These estimates do not address the alignment of forest renewal with the very ambitious objectives of increasing the forest carbon sink. In particular, they do not guarantee a return to the carbon sink's high storage capacity recorded in 2005. Furthermore, they call for clarification following the downward revision of the carbon sink's storage capacities between the transition scenarios of SNBC-2 (-70 $MtCO_2eq$ in 2050) and SNBC-3 (-44 $MtCO_2eq$ in 2050) induced in particular by the increase in forest mortality due to global warming and parasites.

c. Parties involved

The climate transition of the agricultural and forestry sectors will require significant capital investment by forest operators and owners, which are mainly very small businesses and SMEs. It also requires changes in practices and training. The transition to low-carbon non-road vehicles and on-site bioenergy production will require capital investments, which could be significant for smaller farmers and landowners. The effort will depend on the imposed pace of vehicle renewal (over the course of the underlying investment cycle or before the end of depreciation period) and the availability of alternative low-carbon equipment in the various sectors, with a varying additional cost. Support will be needed, in particular for the most vulnerable players and for training in new practices in the production sectors.

The sectors located downstream of forestry (wood processing) will also have to be structured to meet the strong demand for biosourced products. Foresters and sawmills will face an increase in demand for wood products,

[107] *Cattelot report, 2019; French Court of Auditors, 2020; IGF, 2020.*

particularly for construction and renovation purposes, to meet the constraint of reducing emissions linked to the production of materials.

d. Main limits and uncertainties

Estimates of current climate investments and additional needs are very little known in these two sectors, particularly those relating to non-energy measures. Estimates of needs for the energy transition of agriculture (conversion of engines and production of bioenergy) are currently the most studied. The cost of changes in agricultural practices, reforestation and the fight against soil sealing are still too poorly mapped and will need to be further developed. In particular, the most comprehensive study on the costs of changes in agricultural practices dates from 2013 (INRA).

The overall biomass production in the scenarios used remains uncertain and calls for a rapid structuring of the agricultural and forestry sectors. In particular, the production of biomass for energy use (biofuels, biogas) and of wood products will have to increase sharply to meet the demand of these sectors, for which electrification and the decarbonisation of materials is the most complex to achieve.

Given the constraints for agriculture, the changes in practices called for by the EET and the decarbonisation of the agricultural sector will be all the more effective if they are accompanied by adaptations of agricultural models. Discussions on developments in agricultural support policies (at local, national and European level, in particular with the Common Agricultural Policy) are part of this framework.

Finally, the ecological transition of the agricultural sector must not only be considered from a decarbonisation perspective, but must also include environmental impacts as a whole, at the risk of adopting guidelines that would potentially have an adverse effect on other environmental considerations.

Appendix 1 – Details of results

Agriculture				
Study	*Reference point*	*Scenario*	**TOTAL**	Comments
2019 climate investments (€ bn)				
I4CE 2021			**€0.3bn**	Partial scope: achievements related to energy efficiency in the ERDF/EAFRD programmes[108] and on-farm renewable energies (photovoltaic, thermal solar, biomass, biomass recovery, energy efficiency)
Average additional requirements over the period 2022-2030 (€ bn/year)				
Partial scope				
IDDRI (2021)	*2015*	*SNBC-2*	**+€0.2bn/year**	Only for cereal, oil and protein and milk production sectors Includes system transformation and decarbonisation
CGAAER (2022)	*2021*	*"The Energy Growers"*	**+€1bn/year public** *Note: +€2bn total in the case of a simple assumption of public-private co-financing of 50%*	Only for the switch to low-carbon tractors (NGV and electric motors, but also charging infrastructure for €15m/year)
Entire sector				
Rexeco (2022)	*Business-as-usual scenario*	*SNBC-2*	**+€0.3bn/year** (+€0.8bn/year to 2050)	All sectors, based on the abatement costs of crop growing practices and the use of biogas production only[109]
Institut Rousseau (2022)	*Business-as-usual scenario*	*SNBC-2*	**+€5bn/year to 2050**	Including transition support beyond investments (e.g. changes in practices)

Forestry				
Study	*Reference point*	*Scenario*	**TOTAL**	Comments
2019 climate investments (€ bn)				
I4CE 2021			**€0.2bn**	Partial scope: EAFRD programme and timber construction
Average additional requirements over the period 2022-2030 (€ bn/year)				
Institut Rousseau (2022)	*Business-as-usual scenario*	*SNBC-2*	**+€1bn/year to2050**	Land use, land use change and forestry) and technology
Rexecode (2022)	*Business-as-usual scenario*	*SNBC-2*	**+€1bn/year** (+€1bn/year to 2050)	

[108] The European Regional Development Fund (ERDF) and the European Agricultural Fund for Rural Development (EAFRD) contribute to the funding of the second pillar of the Common Agricultural Policy (CAP).
[109] Reduction of synthetic mineral fertilisers, intermediate crops, agroforestry, changes in livestock diets, biogas plants and new tillage techniques. The decarbonisation of vehicles is therefore not considered.

I4CE (2021) provides an overview of total climate investments in the energy segment by the agricultural sector and some of those by the forestry sector in 2019 (€0.6 billion[110]).

IDDRI (2021) calculates the need for additional investments in the agricultural sector for the cereals and oilseeds segment and the dairy segment (excluding the suckler beef segment). Meat production, which accounts for one third of the jobs and value of the agri-food sector, is not included. IDDRI therefore covers a partial scope, with these two sub-sectors accounting for half of the value creation of agricultural operations and the food industry respectively. Two transition scenarios inspired by the SNBC-2 are used. The first ("France duale") focuses on the climate issue, without changing the market framework or demand, and the second ("Recompositions") incorporates ambitious changes in production or consumption patterns[111], compared to 2015. For example, IDDRI models an increase in production efficiency (nitrogen fertilisers and animal feed) and an increase in the production of vegetable proteins, the use of biogas production and the storage potential of agricultural soils. The amounts therefore represent needs for decarbonisation and the transformation of the sector. Unlike most simulation models, this estimate takes into account changes in food preferences over the medium to long term.

Rexecode (2022) estimates the necessary additional investment needs in the agricultural sector based on abatement costs and sources in an INRA report (2013[112]), by mobilising an annual reduction of emissions, 20% of which resulting from changes in practice that do not require investment. The remaining levers are mobilised for an average abatement cost of 75 (€/year)/($MtCO_2eq$/year). They include nitrogen management (nitrogen fertilisation, legumes), underground carbon storage and biomass (non-ploughing, agroforestry, intermediate and intercropping, grassland management) and animal feed (feed that reduces nitrogen releases or methane production). For the land use sector, Rexecode uses a single abatement cost of 100 (€/year)/(tCO_2eq/year) and additional emissions to be avoided compared to the business-as-usual scenario in order to achieve the SNBC-2 emissions absorption targets.

The CGAAER (2022) establishes scenarios for reducing energy emissions in the agricultural sector based on reports and consultations with experts from EDF and ADEME. It only studies the needs arising for the replacement of tractors with alternative engines (switch to bioNGV and electric engines, and deployment of refuelling infrastructure). The transition to electric and hydrogen engines is considered in the longer term, as they are only prototypes for the time being.

Institut Rousseau (2022) uses a scenario of an abandonment of conventional agricultural practices and a widespread transition to agroecology and organic farming, requiring additional investments estimated at +€5 billion/year[113], based on SOLAGRO's "Afterres" scenario. The Institute also measures the additional investment required in agroecological and forestry management (planting of trees, hedgerows, etc.) as well as in CO_2 capture and storage technologies (CCS - technological carbon sink for 3 $MtCO_2$/year in 2050[114]), for a total average annual investment increase of +€0.9 billion/year by 2050. These needs for investments in CCS are therefore negligible given their low development assumptions compared to those in the first technical round of the SNBC-3 (19 $MtCO_2$/year in 2050). In addition, the estimate includes the financing needs for political measures aimed at achieving environmental objectives and subtracts the associated government revenues. This figure therefore goes beyond the scope of gross fixed capital formation.

[110] Expenditure on energy efficiency of the ERDF/EAFRD programmes, biogas plants and upstream forestry activities.
[111] For demand: promotion of less processed products and animal proteins. For production: de-specialisation and diversification of agricultural systems.
[112] INRA, 2013, How can French agriculture contribute to reducing greenhouse gas emissions.
[113] Assuming that the increase in the amounts of certain European aid is 100% borne by the French government, which is a conservative assumption since France is a net beneficiary of the CAP.
[114] Rexecode accounts for the necessary investments in CCS technologies within the industrial sector.

6. Waste

There are currently few estimates of the need for additional investment in the waste sector. Rexecode (2022) values this need at around +€1 billion/year by 2030.

e. Emission reduction targets and main drivers

Current situation: In 2021, after a 5% drop in its emissions since 1990, centralised waste treatment accounted for 3.5% of gross national greenhouse gas (GHG) emissions in France. In Secten accounting, used to report national emissions, emissions assigned to the waste sector concern activities relating to the storage, incineration and treatment of solid waste (construction waste, waste from economic activities and household waste) and the treatment and discharge of domestic and industrial wastewater. The main source of emissions in the sector is the storage of non-hazardous waste (degradation of organic matter in landfill sites in particular), which accounted for 81% of emissions in 2021. Thus, emissions from the sector depend directly on the quantity of waste generated in the country and the share exported, the associated emissions of which are not recorded in the inventory.

Target for 2030: The SNBC-2 sets a target for reducing emissions from the centralise waste treatment sector to 9.3 $MtCO_2eq$ in 2030 (-39% compared to 1990), requiring a reduction of -4.8% per year between 2021 and 2030. By factoring in France's new 2030 target of a 50% reduction in GHG emissions compared to 1990 (versus -40% in the SNBC-2), and assuming an additional national effort of 10 pts per sector (the SNBC-3 will break down this effort in more detail), the sector's target would increase to 7.8 $MtCO_2eq$ in 2030, requiring a reduction in emissions of -6.7% per year between 2021 and 2030, a rate of reduction more than 11 times higher than that achieved by the sector between 2015 and 2021 (-0.6% per year). The recent deterioration in the performance of the national forest carbon sink further increases the decarbonisation target of all sectors. In addition, the sector is also concerned by targets to reduce physical waste flows excluding emissions (see box below).

Emission items: Methane-related emissions (CH_4) are preponderant in the waste sector, accounting for 87% of the sector's emissions in 2021. They are derived in particular from the degradation of organic waste under anaerobic conditions. Emissions from industrial composting and biogas production account for only 6% but have increased in recent years (doubling since 2005). Incineration with energy recovery is accounted for in the energy sector. Sorting and recycling activities, which are crucial to waste reduction objectives, are not considered as high emission activities but contribute to the reduction of emissions by the subsequent reduction in volumes stored in landfill. They also enable the decarbonisation of upstream sectors by reducing demand for the production of high-emission products, for example through the use of recycled steel. Finally, the decarbonisation of waste treatment will also be affected by the mobilisation of levers in other economic sectors, particularly upstream of the value chain (e.g. eco-design in the industrial sector or the incorporation of wood products in new construction and renovation).

Main decarbonisation levers: the current national low-carbon strategy (SNBC-2) and the energy transition law for green growth identify the following main decarbonisation levers:

5. [*Scope of industrial sector investments] Prevention of the production of mineral waste: eco-design and increase in the life of products;*
6. Reduction of organic waste: reduction of food waste in particular;
7. Recovery of residual waste: reuse, sorting of bio-waste at source, reuse, repair, recycling, energy recovery.
8. Reduction and recovery of residual emissions: biogas capture, sludge treatment by anaerobic digestion.

European and national targets for the waste sector

Structural targets have been set for the waste sector at European and national level. At the European level, the Waste Framework Directive (2018) sets targets for reducing municipal waste sent to landfill by 10% by 2035 and for separate collection obligations for bio-waste by 2024 and for textiles by 2025. At the national level, the energy transition law for green growth (2015) sets targets for waste reduction and recovery (for example, halving the quantity of non-hazardous non-inert waste sent to landfill in 2025 compared to 2010). The French law on the fight against waste and the circular economy sets new objectives, such as reducing the consumption of resources (-30% in 2030 compared to 2010, relative to GDP), broken down into the elimination of disposable single-use plastic by 2040, raising consumer awareness, combating waste and fostering solidarity-based reuse, combating planned obsolescence and improving production quality (in particular identifying new polluter-pays sectors that should thus contribute to the eco-contribution for extended producer responsibility).

These principles, measures, objectives and legislative, regulatory and/or tax guidelines are summarised in the national waste management plan.

Timetable: the timetable is provided for illustrative purposes, to present the key milestones of the ecological planning steps for the waste treatment sector.

f. Available estimates

Few studies currently analyse investments in decarbonisation in the waste sector, with additional needs estimated at around +€1 billion/year on average until 2030. Institut Rousseau (2022) estimates the additional requirements at around +€60 million/year compared with an underlying emissions trend, but on a partial scope, essentially limited to bio-waste management. Rexecode (2022) estimates additional investment needs of around +€1 billion/year until 2030, also compared with a projected baseline emissions trend.

Segments subject to Extended Producer Responsibility (EPR)

Extended Producer Responsibility (EPR) strategies are systems for organising the management of waste from certain products. They are based on the principle of extended producer responsibility, according to which persons placing a product on the market may be held responsible for financing or organising waste prevention and management.

These producers can join forces to fulfil these obligations within the framework of non-profit eco-organisations. The model followed is either operational (eco-organisations collect eco-contributions in order to contract with service providers responsible for collecting and treating waste), or contributory (eco-organisations receive eco-contributions that will be paid to local authorities or other operators responsible for waste management).

The ADEME circular economy fund

With €400 million contributed in 2021, including €236 million under the recovery plan (source: ADEME 2022), the circular economy fund aims to help players - mainly local authorities and businesses - implement policies that promote waste management. It aims to support all operations that contribute to the implementation of the waste policy and the circular economy. It is partly financed by the general tax on polluting activities (TGAP) collected by the state. The circular economy fund is supplemented by certain grants from the Heat Fund (development of energy recovery from non-recyclable waste) and the Investment Programme for the Future (innovation in the development of sorting and recycling).

g. Parties involved

The additional needs concern local authorities and, in relation thereto, private companies operating under public service contracts. Responsibility for waste management lies with local authorities. They involve private companies under public service delegation agreements for the various stages of waste management (collection, sorting, recycling and treatment).

h. Main limits and uncertainties

Studies on investments that promote decarbonisation are sparse and few in number. Only two studies have been referenced detailing the investment needs for decarbonisation covering the entire sector (Rexecode and Institut Rousseau, 2022). They use average abatement costs that are not very detailed or come from other sectors. Moreover, the main indicators used today are related to tonnes of waste generated and not to the associated GHG emissions[115].

The objectives of reducing the economy's materials footprint could increase the additional investments to be mobilised in this sector for the ecological transition, not limited to decarbonisation. Significant additional requirements may be necessary to achieve the objectives of reducing the material footprint, excluding GHG emissions.

[115] ADEME, 2017, Public service report on the prevention and management of household and similar waste.

Appendix 1 – Details of results

Study	*Reference point*	*Scenario*	**TOTAL**	Comments
Average additional requirements over the period 2022-2030 (€ bn/year)				
Institut Rousseau	*Business-as-usual scenario*	*SNBC-2*	**+€60m/year to 2050**	Partial scope: waste management, mainly bio-waste
Rexecode	*Business-as-usual scenario*	*SNBC-2*	**+€1bn/year** (+€2bn/year to 2050)	Estimate based on simplified abatement costs taken from the industrial sector

Appendix 2 - Details of research studies

Rexecode estimates in a simplified manner the additional investment required in the waste treatment sector, based on the abatement costs of decarbonisation levers for the industrial sector (not specified). The associated levers for the waste sector are therefore not detailed.

Institut Rousseau only considers emissions related to the management of waste produced (landfill, incineration) in the scope of the Waste sector. Materials recycling, reuse and efficiency are taken into account in the industrial sector. The investment needs contributing to the reduction of the volume of bio-waste buried (disposed of in landfill) are therefore mainly estimated here, for the implementation of mandatory and widespread selective sorting of bio-waste from the end of 2023. An average abatement cost per tonne of CO_2eq avoided in the sector is used to quantify the investments needed to abate the sector's residual emissions and achieve the objectives of the SNBC.

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