

2% FOR 2 °C

HOW TO ACHIEVE AND FINANCE
FRANCE'S CARBON NEUTRALITY
BY 2050

2 % FOR 2 °C : **SUMMARY FOR POLICY MAKERS**

The unveiling conference of the report can be viewed on [our YouTube channel](#). The full report is available for download [here](#).

In recent years, ambitious climate targets were set and the number of international agreements, laws, and national strategies increased. However, the results are not forthcoming. Our national emissions are decreasing too slowly. One of the main reasons for this failure is that the ecological reconstruction of our societies is coming up against the wall of money. Achieving carbon neutrality implies - some will see this as a paradox in view of the need for sobriety - a lot of investment.

How much, exactly?

One might imagine that this figure already exists. Indeed, how can we think of country-wide low-carbon strategies or multi-year energy programmes without simultaneously addressing the question of the budgetary and financial resources needed? It may seem surprising, but this “aggregation” simply does not exist, despite scattered and incomplete attempts by public or private structures to provide some data. This situation inevitably leads to some form of double talk in environmental matters: promising a lot in terms of objectives, while mobilising little in terms of funding.

Our report sets out to tackle this major threat to the success of the low-carbon transition and challenge to the democratic and economic debate. The final objective of this study is to match the levers for decarbonising the economy with the financial resources needed to achieve them.

Our study estimates that a total investment of 182 billion euros per annum is needed to achieve the low-carbon transition of France by 2050. Within this amount, only fifty-seven billion per year are to be invested in addition to the investments already planned, which include both current «green» spending and spending that we can anticipate will be redirected. For example, current investments in internal combustion engine (ICE) vehicles will be transformed into investments in electric vehicles. These additional 57 bEUR represent 2.3 % of France COVID-impacted Gross National Product (GDP) in 2021. This figure gives our report its title: 2 % of GDP of additional public and private investment is needed each year to meet our commitment to carbon neutrality in 2050 and do our fair share to limit warming to 2 degrees!

It should be noted that these “investments” are not to be considered in the strict economic sense of the term. They actually cover both public and private expenditures necessary to achieve the objectives set. They can take the form of investments, but also subsidies, tax credits, tax breaks, incentives and aid for installation or reforestation, the acquisition of property by households, etc.

Thirty-six billion of the additional fifty-seven billion euros of investment should be covered by the national government. Thirty-six billion per



year of additional public money to achieve carbon neutrality: what does this mean for the governmental budget? This is roughly what France pays each year to banks and other investors in interest payments on its public debt (€38 billion for 2022, more than €40 billion in the 2010s). This is considerably less than what is spent each year on defence (€50 billion) or what private shareholders received in dividends in 2019 (€49.2 billion). And it is a little less than the first emergency budget plan put in place at the start of the pandemic in March 2020 (42 billion euros).

We need an emergency plan for climate as well, now and for the years to come.

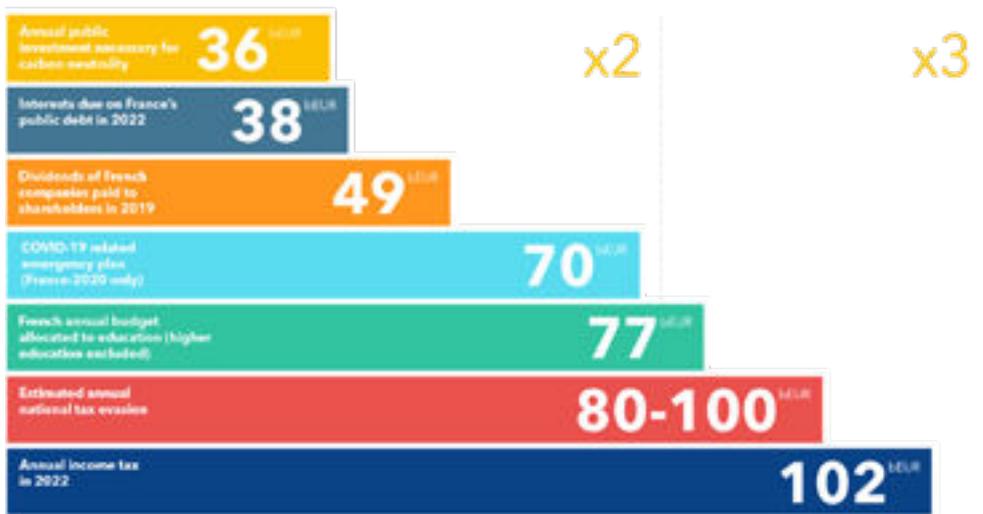


Figure 1: Benchmarking of the additional public costs of all proposed measures against France-only expenses

The needed level of public and private investments is therefore not out of reach. On the contrary, the investment would make it possible to trigger and set in motion a virtuous circle of impacts for the environment, employment, health and ultimately the prosperity of our fellow citizens. A few important clarifications are required to fully understand the framework of our study. First, the study focuses on public and private investments that will enable France to reduce its greenhouse gas emissions sufficiently to achieve carbon neutrality within thirty years. Consequently, our study does not consider all the investments that would be necessary for a complete policy of ecological reconstruction. Even though many investments we included also contribute to acting on

the preservation of biodiversity, the fight against the sixth mass extinction that we are experiencing, the reconstruction of water networks, the chemical depollution of soils and processes and other challenges, those are not the primary goal of our study. Our figures therefore constitute a lower threshold for achieving carbon neutrality but should be revised upwards significantly by integrating the other ecological issues. Further work will tackle those topics. Also, we have evaluated the cost of capital investment (“Capex”) and have therefore left out the operational costs (“Opex”), which are much more difficult to evaluate and anticipate.

Secondly, it is important to stress that our work is not regulatory in nature but budgetary. We did not

provide an exhaustive list of the legislative and regulatory measures that will necessarily accompany the implementation of investments. The most structuring regulatory measures, or those that constitute prerequisites for investments, are however described.

Finally, although we are fully aware of the importance of the issues linked to the most impactful operational deployment of such a transition, we do not outline all the conditions necessary for the proper implementation of the action plan we budgeted.

To implement the investment plan that we propose, we recommend, along with multiple stakeholders engaged in the transition, the drafting of a multiannual strategic and legal frameworks covering the financing of ecological reconstruction. Such plan exist for public-funded research and defence and would align the objectives set with the means of achieving them. The added value and originality of our report is also to propose a vision of what this multiannual framework for financing ecological reconstruction should contain, sector by sector. This vision is not only based on figures that are as proven and neutral as possible, but also linked to a political and social evaluation on how to conduct ecological reconstruction. This evaluation is based on two guiding principles. Firstly, a massive

investment effort in ecological transition is necessary today rather than tomorrow, each year lost increases the annual effort needed to reach the objective. Secondly, the ecological reconstruction cannot be achieved without social justice, without providing financial and operational support for the poorest citizens and the least funded companies. Our study allows us to conclude, for example, that without providing funding that is on a par with the tasks to be accomplished, it is extremely unlikely that we will be able to meet the target of a 55 % reduction in greenhouse gas emissions by 2030 relative to 1990 levels ("Fit for 55").

These factors explain why public authorities must bear a significant part of the additional investment of the transition (thirty-six billion euros (63 %) out of the fifty-seven billion euros of extra cost), a substantial amount. However, the third part of the report also shows how this public expenditure can be financed easily over time, not only if linked to more significant budgetary and monetary reforms but also if governments were to make these potential reforms without delay. We also show the many economic benefits that this plan is likely to generate, whether for public finances, for the purchasing power of households, for the benefit of social security and the healthcare system, or from the point of view of the national trade balance.

levers” proposed in this study would enable us to reduce greenhouse gas emissions by 87 % in 2050 compared to today. The development of a negative emission sector, the “carbon sinks” cover the remaining 13 %.

With the second phase, we calculate the overall investments, whether public or private, required to achieve decarbonisation in each of these sectors. The costs are calculated for each decarbonisation lever. The “additional cost” is defined as the difference between the investments needed to decarbonise the economy (transition scenario) and what France would continue to invest, on the same scope and according to the data available to us, if the current “reference scenario” is continued until 2050. In the reference scenario, the current structure and organisation are essentially preserved; the policies currently pursued are continued. Also, the changes currently made continue to be made at the current speed (or anticipated by the current policies), without accelerating the pace or undertaking the more profound changes that we propose in the transition scenario. The additional costs we compute therefore imply that the trend investments which are not already supporting the transition efforts should be redirected towards transition investments (see figure

A THREE-STAGE EVALUATION PROCESS

The process we used is simple and can be summarised in three phases. A detailed presentation is available in the Appendix (French only).

In the first phase, we leverage existing studies and national strategies to define the action levers that would enable France to reduce its emissions to almost zero. Domestic greenhouse gas emissions are generated from the six major sectors of activity of our economy (transport, industry, agriculture, buildings, energy production and waste). The impact of the sector-specific “decarbonisation

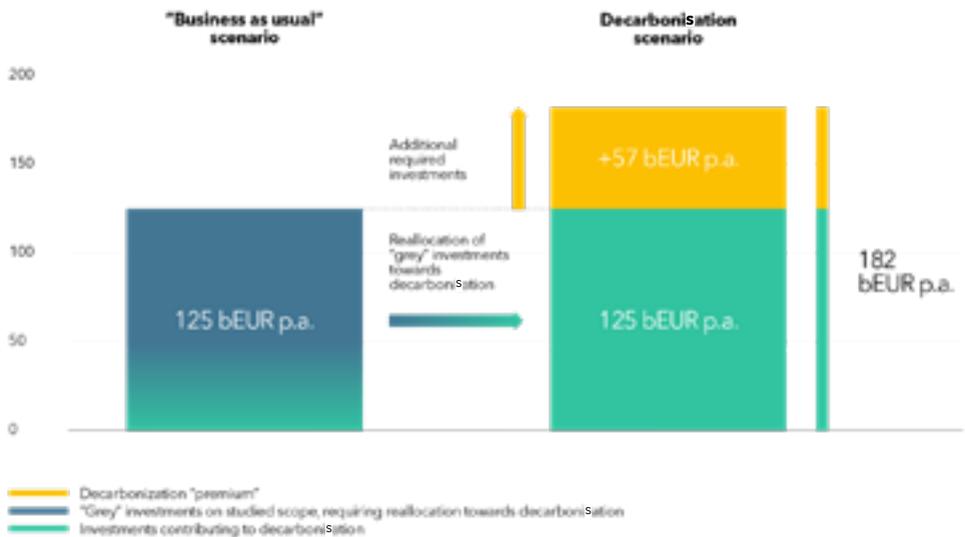


Figure 2: Calculation philosophy of the additional cost of transition compared to the investments already made that possibly require reallocation

below). As indicated above, such a redirection is what happens when individuals invest in an electric vehicle instead of an internal combustion engine vehicle, or when investors finance low-carbon energy production means instead of fossil fuels.

are essentially direct investment measures or aid for investment or consumption, whether in the form of subsidies, tax credits, or tax cuts (or increases).

Finally, in the third phase, we define and quantify the main public measures that will make it possible to effectively activate the decarbonisation levers. There are seventy-three such proposals. We listed only the measures that we consider the most important and which are, most often, the most expensive for public finances. As mentioned above, these



Figure 3: France's 2019 domestic emissions, by sector
(source: France's High Council for Climate, annual report 2021)

FRANCE'S EMISSIONS AND THE INVESTMENTS REQUIRED TO REDUCE THEM

About a third of France's domestic emissions are due to the transport of goods and people. In particular, the use of cars (private and professional) accrues to more than half of transport emissions, 17 % of the total. Then follow, in relatively equal proportions (just under 20% each), industry, agriculture and buildings (which require energy for heating, lighting, cooking, ventilation, etc.). Domestic energy production accounts for about 10% of the total, half of which is related to the production of electricity from

fossil resources (gas, oil, etc.). Finally, waste management is responsible for 3.4 % of our emissions, mainly due to methane leaks from the natural decomposition of organic waste in landfills.

All but few of the levers of action impactful to reduce the emissions are well known and referenced. Essentially, reaching the objectives requires decarbonising the production of the energy necessary for all everyday activities: moving around, eating, housing, lighting, or heating, obtaining various objects, etc. Also, all sectors must adapt, both to reduce their energy consumption and to be able to use these new,

decarbonised forms of energy (for example by switching from fossil run equipment to electrical equipment). Finally, some sources of emissions not directly linked to energy consumption require changes in practices or processes, such as in agriculture or industry. We have listed thirty-three action levers, twenty-six of which directly concern

emission sectors and seven of which concern cross-cutting means of action, beneficial to all sectors.



Figure 4: Our 33 levers to decarbonise France by 2050

We estimate the total public and private investments required to implement all the decarbonisation levers presented in the report at around 5,000 billion euros until 2050, or 182 billion euros on average per year. As previously mentioned, we compare these investments required to decarbonise the economy to what France will continue to invest, on the same perimeter, if the current trend continues until 2050, a scenario we refer to as “Business as usual (BAU)”. For example, the trend of investments includes the purchasing of the ICE cars that we would continue to buy if we did not convert to low-carbon vehicles, the cost of renovating buildings according to the patterns of renovation currently observed or, on the public side, costs relating to the continuation of current public expenditure budgets (Heat Fund, Circular Economy Fund, etc.). We calculated the sum of these trend costs comparable to our transition costs at around 3,400 billion euros by 2050, 125 billion euros on average per year. The “over-investment” or cost of the transition to carbon neutrality is then the difference between the total investment necessary for the transition and the trend of investment. Fifty-seven billion on average per year are needed for the transition, an increase of about 50% over the trend investment.

Among the total investment, two sectors stand out where most investments (almost 60 %) are concentrated: transport and construction. The large-scale nature of these two sectors explains their relative significance; the required investments apply to tens of millions of vehicles and buildings. Past those two sectors, the energy production (17 % of total investment, 30.8 billion per year), agriculture (11 %, 19.8 billion per year) and transverse measures (11 %, 20.8 billion per year) follow. The industry (€2.4 billion per year) and carbon sinks (€1.2 billion per year) are far behind expecting to require 2 % of the total investment together.

However, if we consider the “overinvestment” required for the transition, the picture changes completely. The building sector is, by far, the one that requires the greatest additional effort compared to the trend (36 % of the additional transition costs, i.e., twenty-one billion euros per year), followed by energy production (28 %, 15.9 billion euros per year). These two sectors together account for 64 % of the additional investment needs. The building sector is due to not only accelerate significantly the pace of renovations, but also shift from partial refurbishments to full

Total investissement : 182 billion euros/year

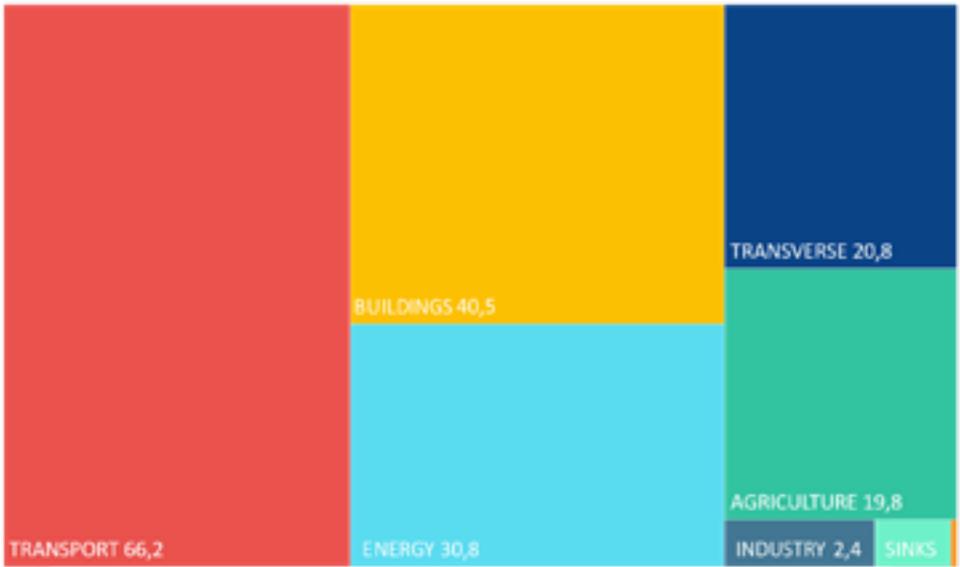


Figure 5: Annual investment required by sector (bEUR p.a.)

scale renovations, more costly on a per-unit basis. The energy sector is expected to transition to 60 % increase in electricity consumption, compatible with the assumption of a strong electrification of uses.

The relatively lower share of investments in transportation is mainly due to two reasons. On the supply side, the increased investment in the transport sector is tempered by the investment that would in any case be made in ICE vehicles. Such “Business-as-usual” investment is lower in the building sector, for example, where some of the necessary renovations would simply not be done. On the demand side, the

relatively low share is linked to a 20 % decrease in the total number of private cars in the transition scenario, made redundant by the strong development of rail and public transport (see next section on transport). Fewer cars will be purchased by 2050 than in the current trend, which generates a “negative” additional cost on this lever and balances out the other additional costs of the sector (development of public transport, revival of the railways, etc.).

Total additional investment : 57 billion euros/year

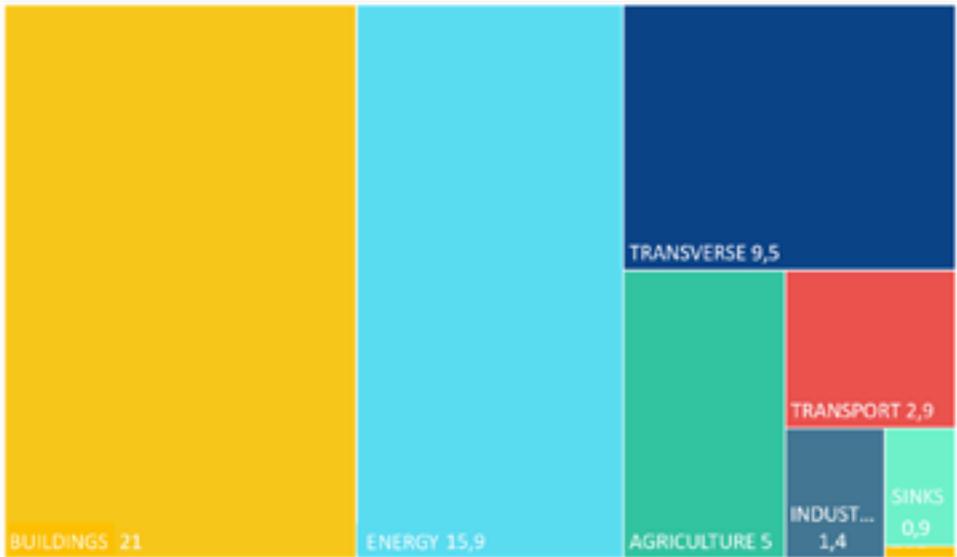


Figure 6: Required additional investment, by sector, in addition to redirecting existing schemes. Total overinvestment: 57 bEUR p.a

HOW CAN THESE INVESTMENTS BE FINANCED?

Among the available sources of funding, we consider that it is necessary to increase, in the short term, the public debt. This additional financing, in the order of approximately thirty billion per year (also accounting for the budgetary “savings” linked to the elimination of a certain number of tax expenditures that are unfavourable to the environment - see below), must take place over the long term, on an ongoing basis for each of the next three decades. Although impressive, these amounts do not represent a “significant” amount for the financial markets.

In comparison, France issued nearly twenty-four billion euros on the markets between 3 and 15 February of this year 2022 on maturities of up to 31 years at rates of less than 1 %. Also, it should be noted that government’s cash requirements are expected to reach 302.5 billion euros in 2022, compared to 321.1 billion for the year 2021 (excluding the rollover of short-term debts). Consequently, borrowing an additional EUR 30 to 40 billion would represent an addition of less than 10% of the country’s annual financing requirement.

Moreover, the fact that the offers received by the Treasury when debt is issued represent almost 3.5 times the amounts sought tends to show that France could easily raise more debt on the financial markets.

At the European level, the implementation of the investments necessary for the ecological transition require a complete overhaul of the current legal framework. At the very least, the public expenditure related to investment in the sectors detailed in this report which are beneficial to ecological reconstruction should be excluded from the computation of the European Union convergence criteria which constrain public deficit levels at a maximum of 3 % of GDP.

At the national level, the rules of public procurement will also have to be reassessed. Public procurement represents approximately two hundred billion each year, slightly less than 10 % of GDP. However, the Observatory of Public Procurement finds that only 13.6 % of public procurement contracts currently include an environmental clause, compared to a target set by the 2015 Energy Transition Law of 30% in 2020. Price remains the major factor in the weighting of the various criteria at the time of consultations. It is common for the price criterion

alone to exceed 70 % of the total score, compared to less than 10 % on average for environmental considerations. To engage in a real ecological reconstruction, it is necessary to introduce in the law an obligation to weight the environmental criteria at least in a range between 30 % and 50 % of all the criteria, depending on the categories of products and services concerned.

Across Europe, monetary levers should also be seriously considered. A share of the expenditure could and should be monetized to lower the bill for the member states. This option becomes even more necessary now that interest rates are rising again and it is not anymore certain that Central Banks will keep on

supporting the issuance of public debt. A long-term solution could then be the moderate and targeted introduction of debt-free money, in limited volumes and decided under democratic control. Several publications of the Institut Rousseau explore this proposal. For example, Central Banks could facilitate the financing of the transition creating money ex-nihilo to supply either the countries directly or through public ecological investment funds. The European Central Bank (ECB) could inject twenty billion euros per year (for France) to finance the planned ecological investments and support the other countries of the euro zone in proportion to their needs. This injection of liquidity would be similar in nature to that currently



used by the ECB for the benefit of the financial markets. In our case however, it would benefit the society and the general interest. The method, and the impact on the central bank's balance sheet, however, would be technically similar to the operations currently being implemented.

This suggestion to monetize public spending under democratic control, via the mechanism of debt-free money, leads to almost the same result as the conversion of public debt held by the ECB into ecological investments. In 2021, the Institut Rousseau has put forward an original proposal: against the commitment of governments to develop investments in ecological and social reconstruction, the same amount of public debt held by the European System of Central Banks (ESCB) would be written-off. As of the beginning of 2022, nearly 4,000 billion euros of public debt was on the ESCB's balance sheet. Writing-off 750 billion euros of French public debt held by the ECB, through the national central bank, against a commitment to reinvest thirty-six billion euros per year in carbon neutrality, would allow the government to finance 20 years of the transition plan proposed in the report, without any increase in public debt.

Finally, an ecological tax can mitigate the cost to public finances. Such a scheme requires the elimination of tax expenditures that are harmful to the environment. According to "Réseau Action Climat" (Climate Action Network), a French cluster of climate associations, the tax expenditures most significantly harmful to the environment costed almost 12.5 billion euros to the national budget in 2021. Also, polluting activities and products can be taxed, the amounts collected being redirected to encourage the adoption of more environmentally friendly practices. This type of taxation has been existing for some 30 years. However, France makes little use of it and does not even appear in the top 10 European countries in terms of the proportion of environmental tax revenues to GDP.

COSTS BUT ALSO BENEFITS FOR THE COUNTRY, BUSINESSES, AND HOUSEHOLDS

The measures we suggest for the ecological reconstruction also have many direct and indirect positive economic and social consequences. Among these, we calculate that France's balance of trade would improve by about fifty-four billion euros annually, most of it due to the decrease in hydrocarbon imports (approximately 46.5 billion euros per year). However, an additional one billion a year worth of biofuels (calculated in the Transport section) must be imported. Also, savings will be generated from the country's agriculture-related imports. 1.84 billion euros worth of nitrogen and phosphorus intrants were bought from abroad in 2019. This amount would be reduced by more than 50% by the measures we present in this report. Consequently, we compute an agriculture-related saving of nearly one billion euros a year on the country's trade balance.

On the job front, the net creation of at least 300,000 jobs according to the figures computed by the Shift Project would also have a positive impact on public finances. In September 2020, the average monthly unemployment

benefit was €1266 per person, in comparison to an average gross salary of €3183 per month in France in 2019. Therefore, an order-of-magnitude calculation shows that a decrease of 300,000 unemployed persons yields nearly €4.56 billion in unemployment benefits either saved or contributed. Moreover, if we consider the average employee contribution rate of 22% and the employer contributions rate of 30% (actual figures vary between 25% and 42%), the net increase in employment triggered by the transition would lead to an increase of €2.52 billion in employee contributions and €3.44 billion in employer contributions per year. In total, the net increase in employment would free around ten billion euros annually, resulting from savings in unemployment subsidies and increase in additional contributions.

The Social Security would save an additional three billion euros a year thanks to a reduction in the number of air pollution related diseases. Specific costs related to sickness caused by humidity and insufficient heating in housing could also be avoided. A recent parliamentary report mentions a specific annual cost of 666 million euros for social security related to these poorly insulated houses referred to as "thermic colanders".



Finally, for households, the first pool of savings is related to privately-owned vehicles. According to studies, in 2020, an electric car in operations costs on average one and a half to two euros per one hundred kilometres, whereas ICE cars cost eight to nine euros for the same distance. On average, French drive 12,200 km each year. Over this distance, an ICE car user transitioning to an electric car would save more than eight hundred euros a year on average if fuel prices were to remain stable over time, an assumption proven unreliable recently. According to several concurring studies, annual savings of €100 on maintenance can also be expected (see section on Transport).

Also, thermic renovations will generate significant savings. A study estimates that household may save up to 67.5% on the heating bill after significant improvement of both insulation and heating systems. Considering an average annual

energy bill of 1602 € in France, including 1058 € for heating, a household can expect an average saving of 714 euros a year after renovations aligned with the climate ambitions our report reflects.

When added together, these measures result in average cumulative savings of about 1700 euros per year per household. Considering that our calculations account for these changes to be largely subsidized by the government for modest and middle-class households, these savings would often be net of the necessary initial expenses.

IN SUMMARY

- Decarbonizing our economy has a significant cost: 182 billion euros of public and private investment, including fifty-seven billion euros of additional investment compared to the “business-as-usual” scenarios, of which at least thirty-six billion euros will have to be covered by public expenditures. This cost, however, should be regarded as an investment and can easily be financed, particularly if leveraging innovative sources of funding.
- To make these investments over the long term and to allow for an informed democratic discussion on this issue, France must put in place, as soon as possible, a multi-year programming law specific to the financing of the ecological reconstruction. It also requires strategies and planification actions from the local and national governments. The «invisible hand» of the markets should not be expected to drive the transition.
- All sectors of our economy must start the transition right away. Any further delay will lead to an investment overload in future years. Delaying the investment in any sector will only make the ecological transition more difficult and more expensive. The «Fit for 55» goal is already at risk.
- The low carbon transition generates substantial economic benefits, not only in terms of health, business performance, jobs, and economic gains for households, but also in quality-of-life. Each household could expect to save an average of 1,700€ annually, mostly from their housing and transportation expenses.

- The ecological reconstruction of our country should be supported socially so that the most disadvantaged households do not have to bear the burden of the transition without adequate support. We expect some investments to be paid for 100% by the public authorities. Ecological transition and social justice must go hand in hand.

- In conclusion, achieving carbon neutrality in France requires a sum of proactive and immediate actions and the mobilization of the intellectual and budgetary means. Under these conditions, the goal is within reach. It is a matter of political will. So, what are we waiting for?



This work is the result of the efforts of a group of about twenty people who worked on a volunteer basis for close to eight months. It was reviewed by several experts whose comments were invaluable in refining the results and better explaining the process.

We warmly thank them all!

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CONTACT US

Oriane Wegner

oriane.wegner@institut-rousseau.fr

+33 6 59 57 32 89

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It brings together intellectuals, researchers, senior civil servants and workers from the private and public sectors. Its objective is to produce innovative, ambitious and operational public policy proposals.



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