INSTITUT ROUSSEAU

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France factsheet

ROAD TO NET ZERO

BRIDGING THE GREEN INVESTMENT GAP

January 2024

This document is an appendix of the Road to Net Zero report. For more details and EU-scale results, please refer to the full report. For more information about the methodology used, please refer to the Methodological Appendix.

Key takeaways

- **An additional €70 billion investment is needed by 2050 to decarbonise the French economy, averaging around 2.7% of current GDP** yearly. This is more than the European average, mainly due to **France lagging behind in the transport sector**.
- This extra-investment plan can be **partially financed by redirecting fossil fuel subsidies**, will be **offset by a sharp decrease in energy costs**, is **~50% less expensive than the EU Com plan** (thanks to more efficiency & sufficiency) and **~6 times less than the cost of inaction**.
- **France's public expenditure should more than double** from €40 to €90 billion per year. **This additional public investment of €50 billion per year amounts to around 1.8% of the current GDP**. Biggest needs for additional public support are in the **buildings and transport sectors**.

TRANSPORT

Current public support needs to nearly triple. 65% of this extra public investment is required to enhance public transportations (notably by extending railway networks).

BUILDINGS

Current public support is still too low and too concentrated on heating replacement. It has to be both strongly complemented and reoriented toward efficient renovation.

AGRICULTURE

Additional public support needed in agriculture is the highest in France given its relatively lower current 'agro-environmental' public support and the current stagnation of organic conversion.

ENERGY PRODUCTION AND INFRASTRUCTURE

Relative to its GDP, France's investments in decarbonizing its energy system are on a par with those of other European countries. Power sector concentrates most investments. High electrification rate leads to lower needs for investments in hydrogen and e-fuels. The share of nuclear has a limited impact on the overall cost.

CARBON SINKS (LULUCF)

- Regeneration costs aside, **urgent human intervention is vital to ensure tree species adaptation** in a context of potent habitat shift by 2050.
- France's hedgerow deployment stands out. **Efforts must focus on preserving existing agroforestry infrastructures**.
- Even in a context of dominantly private forest ownership, the massive investments must be funnelled in public expenses to support long term-low profit measures.

CROSS-SECTOR/R&D

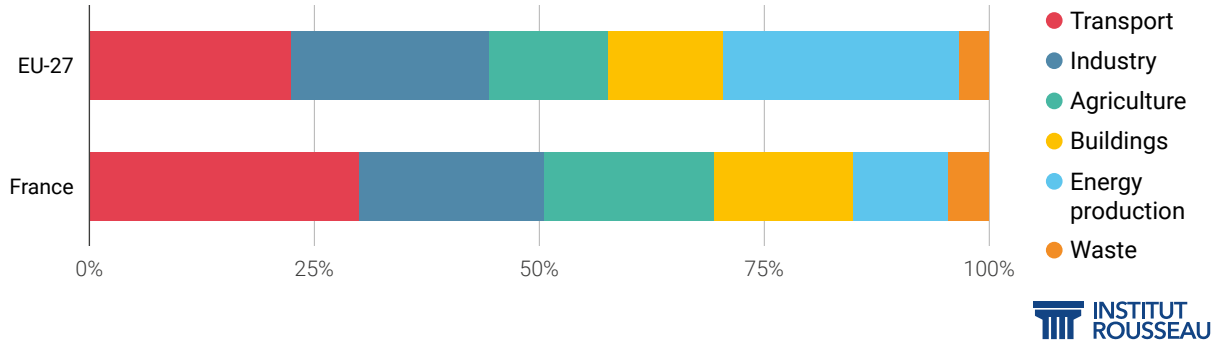
France current public R&D for energy and agriculture is already high, but **energy research remains weak outside of nuclear energy and a strong reorientation towards agroecological systems is needed in the agricultural R&D field**.

1 Current GHG emissions, decarbonisation potential and action levers available

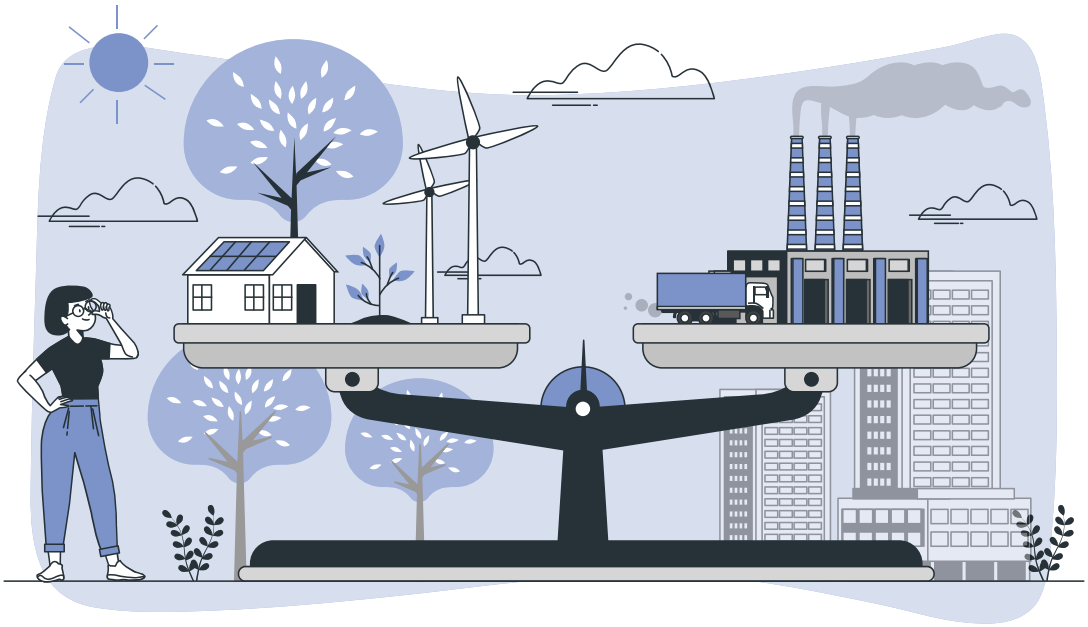
1.1 Current GHG emissions profile

France's territorial emissions are primarily due to transport (30%) and industry (21%). Agriculture and buildings (which consume energy for heating, lighting, cooking, ventilation, etc.) follow with 19% and 15% respectively, before energy production (11%). Waste management constitutes the remaining 4%, primarily attributed to methane emissions resulting from the natural decomposition of organic waste in landfills.

Fig. 1 **Sectoral breakdown of France and EU-27 current domestic emissions (2021), in %**



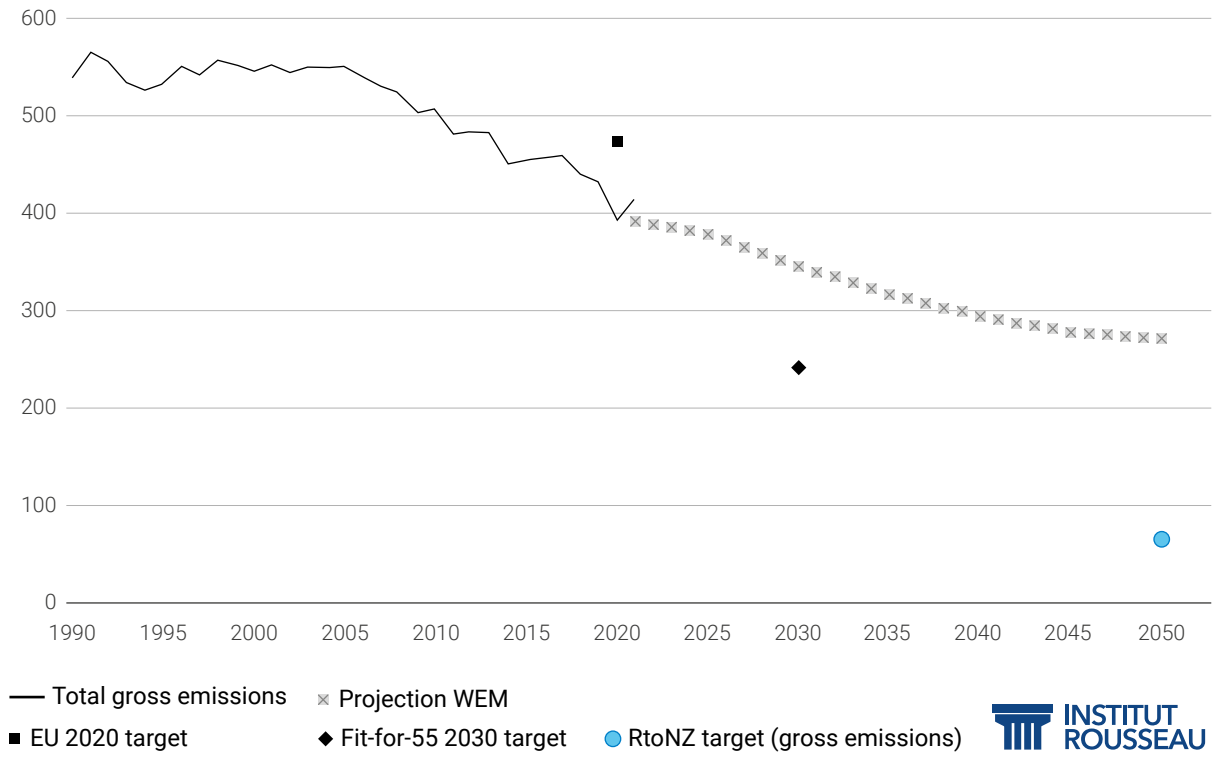
Compared to the rest of the EU, France stands out with a proportionally larger agriculture sector and a much less carbon-intensive energy mix (due to the use of nuclear energy for electricity production). As a result, the transport sector carries proportionally more weight in France than the EU average.



1.2 GHG emissions trend

France is the third greenhouse gas emitter in Europe, behind Germany and Italy. It contributed 415 million tons of CO_2-eq in 2021, approximately 12% of the European Union's emissions. Since 1990, the country's emissions have decreased by 23% or 4 million tons per year on average (compared to -29% for EU-27), as shown on Figure 2.

Fig. 2 **France's past domestic emissions and progress towards achieving 2030 and 2050 targets, in million tons of CO_2 equivalent ($MtCO_2e$).**



WEM: With Existing Measures. European Environment Agency, 'Total net greenhouse gas emission trends and projections in Europe', 2023.

1.3 Decarbonisation levers

To meet these targets, it is necessary to activate multiple levers. There are 37 decarbonisation levers in total, outlined in Figure 3. Key decarbonisation levers with significant emission reduction potential involve energy (power production), transport (cars, trucks) and building renovations. But there is no single solution for instantly decarbonising the French economy. All listed levers, regardless of their scale or economical efficiency, must be engaged to reach the goal of carbon neutrality.

Fig. 3 **Decarbonisation levers proposed and modelled in this study, by sector**

TRANSPORT

1. Reduce the number of vehicles and convert them to low-carbon technologies
2. Develop public transportation
3. Develop soft mobility
4. Reduce air traffic and switch to Sustainable Aviation Fuels
5. Transition to zero carbon navigation

INDUSTRY

1. Reduce industrial production through end-use sufficiency
2. Increase material efficiency
3. Increase energy efficiency
4. Decarbonize industrial energy mix
5. Develop low-carbon innovative processes
6. On-site Carbon Capture, Utilisation and Storage
7. Develop EU strategic industrial sectors for the transition

AGRICULTURE

1. Reduce herd size and adapt breeding practices
2. Convert crop systems to agroecology
3. Convert tractors to low-carbon technologies

BUILDINGS

1. Efficient renovation of housing
2. Efficient renovation of public tertiary buildings
3. Efficient renovation of private tertiary buildings

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ENERGY PRODUCTION AND INFRASTRUCTURE

1. Decarbonize and adapt the power system
2. Switch from fossil gas to biogas and other 'green' gases
3. Phase coal and oil out, end conventional refining activities
4. Decarbonize heat production for district heating

WASTE MANAGEMENT

1. Separately collect and recover biowaste
2. Reduce plastic use, increase plastic recycling and substitution with other materials
3. Reduce wastewater treatment emissions through process adaptation
4. Produce biogas from waste and sludge

CARBON SINKS (LULUCF)

1. Improve forest management
2. Revitalise degraded ecosystems
3. Support wood industry adaptation
4. Increase forest area
5. Turn grasslands back to net sinks
6. Plant hedgerows and field trees
7. Protect wetlands and peatlands
8. Reach net zero artificialisation

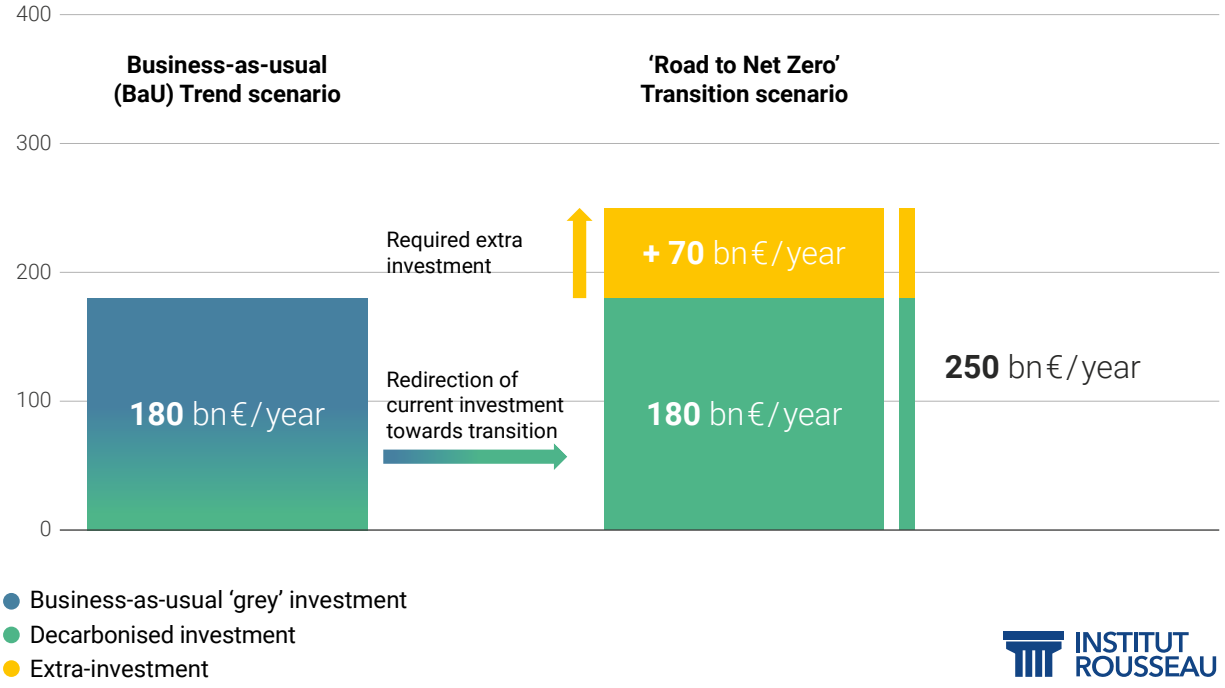
CROSS-SECTOR LEVERS

1. Enhance Research & Development in transition solutions
2. Foster public awareness of environmental issues
3. Boost the Fair Transition Fund to support professional transitions

2 Global investment required

The collective investment required to activate all decarbonisation measures is estimated at €6.9 trillion by 2050, averaging €250 billion yearly (Figure X). This equals almost 9.5% of current GDP. This contrasts with the ongoing business-as-usual (BaU) scenario, estimated at around €4.9 trillion between now and 2050, averaging €180 billion per year (6.8% of current GDP). The difference, about €2 trillion or an average of €70 billion per year, represents the 'extra investment' needed for carbon neutrality. This extra investment represents a 40% increase compared to the baseline scenario and around 2.7% of current GDP.

Fig. 4 **Concepts and amounts of total EU-27 investment required for the transition and extra investment compared with a business-as-usual scenario (in billions of euros per year)**

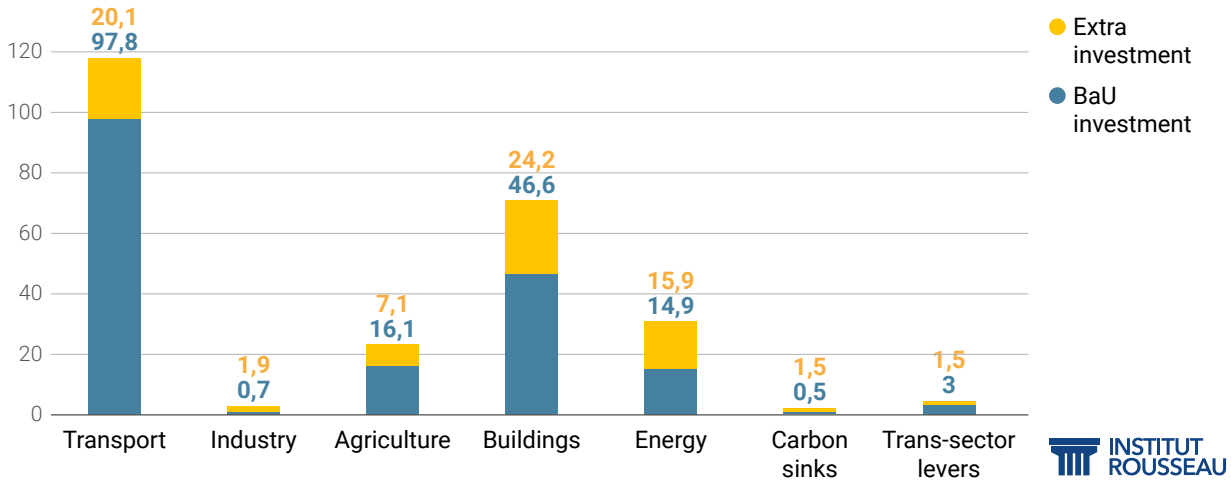


These estimates are correct only under the express condition that all BaU investments are actively redirected towards the transition by 2050. This implies a massive divestment from sectors that have become partially to completely obsolete. Without this active shift, not only will carbon neutrality not be achieved, the above-mentioned extra cost will also be higher.

In terms of total investment (Figure 5), approximately 75% is focused on two sectors: transport (**47%** of overall investment, €118 billion annually) **and buildings** (**28%**, €71 billion annually). This is due to the large-scale nature of these sectors, which invest in tens of millions of vehicles and buildings. These sectors are followed by energy production and infrastructure (12%, €31 billion annually) and agriculture (9%, €23 billion annually). Industry (€2.6 billion annually), cross-sector measures (€4.5 billion annually), carbon sinks (€1.9 billion annually) and waste management require only 4% of total investment.

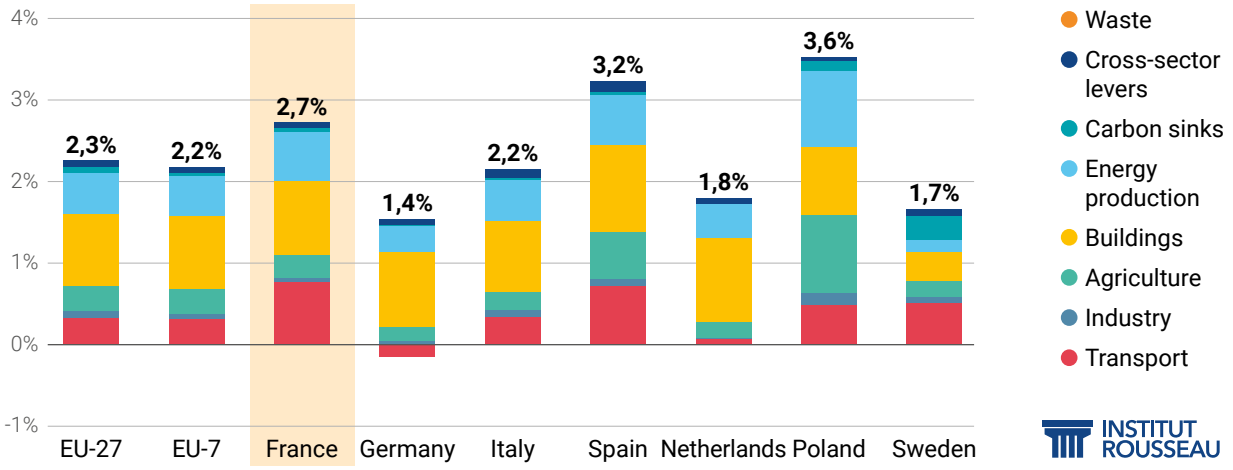
When considering extra investment compared to the business-as-usual trend, the top three sectors remain the same, but **the buildings and energy production sectors require the most substantial extra effort, with respectively 39%** (€142 billion per year) **and 22%** (€79 billion per year) of the total extra investment required. In the building sector, this is attributed to the need for an accelerated renovation pace and a shift towards comprehensive renovations, which are individually more expensive. On the energy side, the assumption of strong electrification in the transition scenario leads to a doubling in electricity consumption compared to the trend scenario. The transport sector's decrease in extra investment ranking is mainly due to reducing the private car fleet.

Fig. 5 **French trend investment, extra-investment and total investment per sector, in billion euros per year, on average, by 2050.**



In comparison to most of the countries examined, France necessitates a higher level of additional investment across all sectors, as illustrated in Figure 6. This is **mainly attributed to the substantial investment requirements in public transportation, particularly in the modernisation, enhancement, and expansion of the railway network**. Additionally, significant investments are necessary for agriculture, owing to its extensive agricultural land use and comparatively lower current level of 'agro-environmental' public support.

Fig. 6 **Yearly extra investment needed by sector per country (in % of GDP 2022)**

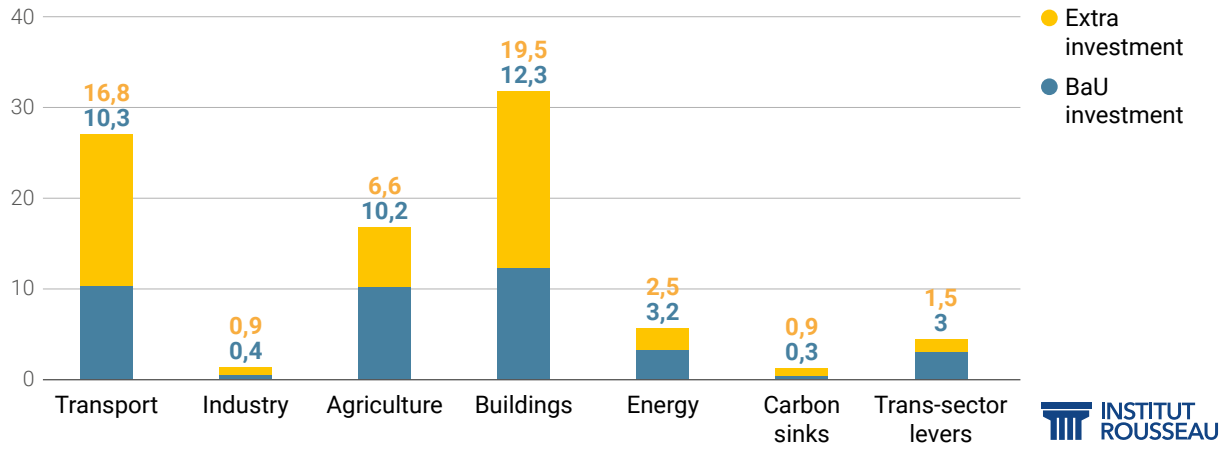


3 Public investment required

This study also outlines 73 public policy proposals to catalyse these investments, categorised for each of the 37 decarbonisation levers.

The total public cost of these measures for France is estimated at €90 billion annually, with €50 billion exceeding the trend scenario. This is equivalent to more than doubling average annual public investment.

Fig. 7 **French public trend investment, extra-investment and total investment per sector, in billion euros per year, on average, by 2050.**

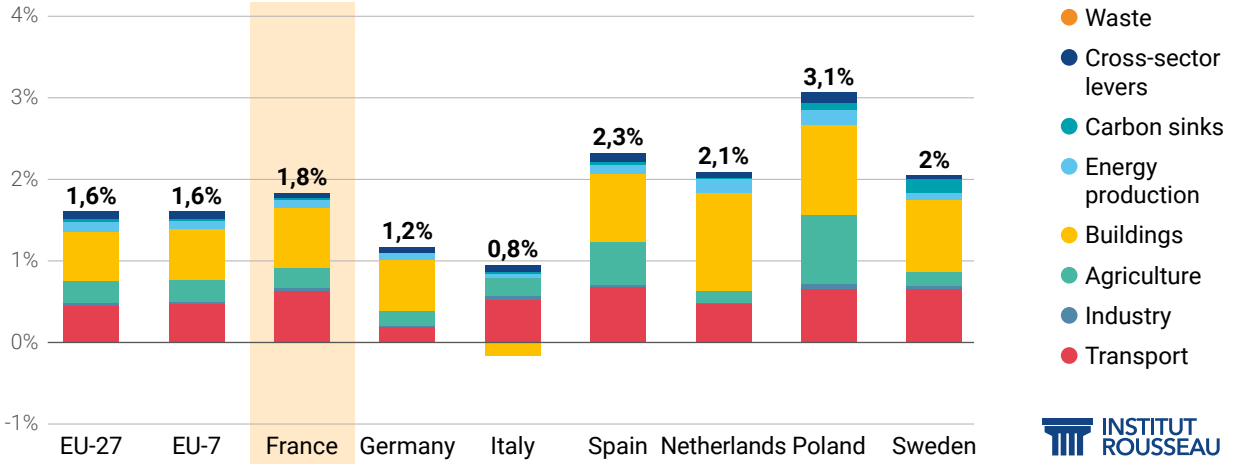


The sectoral breakdown of the €90 billion investments shows that the buildings sector (36%) and the transport sector (31%), together account for two-thirds of the required public investment. Agriculture stands for 19%, which brings these three sectors to a total of 83% of the essential public investments.

When considering extra public investments, the same two sectors alone account for three-quarters of the extra public investment needs: construction (40%) and transport (35%). Agriculture (14%), energy production and infrastructure (5%) and cross-sector measures (3%) come next. The ranking remains consistent with total public investment needs, since public support allocations are generally calculated within the same scope between the transition and reference scenarios.

These €50 billion per year of extra public investment equal approximately 1,8% of current French GDP. This is slightly more than most of the other countries studied and the EU average, as shown on Figure 8, and primarily due to its low current public expenditure on public transport infrastructure.

Fig. 8 **Yearly public extra investment needed by sector per country (in % of GDP 2022)**



Despite this need for additional public investment close to the average, the absolute public funding requirement remains significant, necessitating a substantial realignment of public support:

- **France's building renovation sector requires a considerable increase in public funding, with a notable shift towards more efficient renovation practices from simple heating replacements**. While the proportion of housing stock eligible for efficient renovation is moderate (71% compared to 70% on average), the prevalence of individual houses in the targeted stocks entails substantial investments.

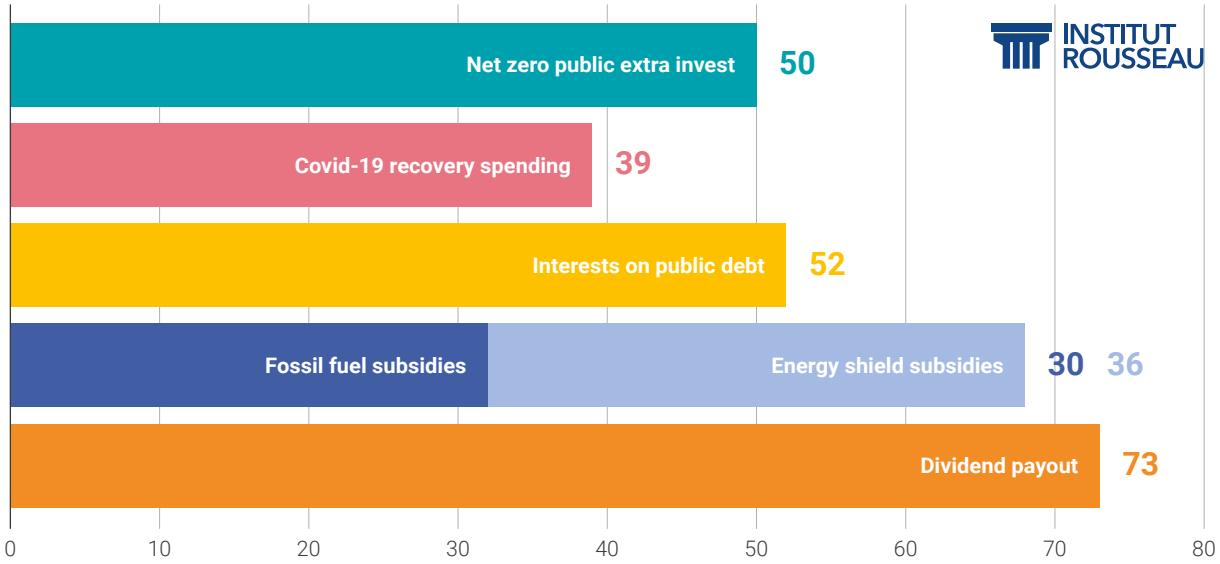
- **Extra public investment needs are particularly pronounced in the public transportation sector due to high requirements for infrastructure modernisation and development**, compounded by limited current public support compared to most neighbouring countries.

- As France boasts larger agricultural areas and currently low public support for agroecological systems, there is a **pressing need for a significant long-term increase in public support for such alternative agricultural practices**.

- Regarding Research & Development, while current investments are already substantial in energy and agriculture, France requires a substantial reorientation of its relatively high public agricultural R&D towards agroecological systems.

Contextualising the proposed €50 billion per year is crucial. This amount, allocated to empower public authorities in stimulating, encouraging, and overseeing all stakeholders while setting the necessary pace to meet the European Union's climate objectives, must be viewed in perspective (cf. Figure 9). **€50 billion per year is comparable to the country's interests on public debt in 2022 and much less than currently distributed fossil fuel subsidies (including price caps) or dividend payout.** Also, funding the ecological transition remains cheaper than other investments in the EU's collective future, such as education, which stands at €77 billion per year (excluding higher education).

Fig. 9 **Contrasting extra public investment with known yearly budget (2022 values)**



This additional investment plan :

- Can be partially financed by redirecting existing fossil fuel subsidies.
- Will be offset in the short term by a significant decrease in energy costs for households, businesses, and public authorities.
- Is approximately six times less expensive than the potential cost of inaction[1,2].
- Will generate numerous local jobs, amounting to several million net positions at the European scale. All conventional sectors affected by the transition to net zero will require social support through a dedicated Just Transition Fund, included in the investment plan.
- Will yield returns by reducing the need for future public expenditure, such as unemployment insurance, energy bills, and costs related to climate change adaptation.
- Is nearly 50% less expensive than the investment plan proposed by the European Commission[3] (on a similar scope of sectors), thanks to a reduction in final energy consumption achieved through both efficiency and sufficiency measures.

If sufficiency and local production options are prioritized, it will also enhance the EU's energy security, economic sovereignty, competitiveness, and trade balance.

Images: Storyset.com/Freepik.com, Unsplash.com

Notes

1. Kotz & al., The economic commitment of climate change, published in the journal Nature in April 2024.

2. Additionally, ADEME estimates adaptation costs for France alone at €260 billion per year; 'Climate risks and their costs for France: to preserve the economy, the urgency to act now', December 2023. To be compared to a + €70 billion per year of global (public + private) net zero extra investment in our scenario, i.e. a × 4 ratio.

3. European Commission 2040 climate target, feb 2024.