

2 Steering the recovery towards an ecological transition

Priscilla Fialho

The green transition has become one of France's main priorities. Even though it is one of the countries with the lowest greenhouse gas emissions, the pace of emissions cuts has to accelerate to comply with its European commitments, namely carbon neutrality by 2050. Land take continues to increase and waste volumes remain above the OECD average. Intensive farming and the use of chemical inputs have had a highly detrimental impact on biodiversity and ecosystems.

Green private investments must increase, and households and businesses need further incentives to adapt their behaviour. Public acceptance for environmental taxes is low. They are nevertheless effective in reducing emissions and pollution. To avoid exacerbating inequalities and to promote social acceptance for environmental taxes, the most vulnerable households and businesses need additional support.

The design and implementation of some policy instruments can still be improved to increase their cost-effectiveness in reducing emissions and pollution. The development of renewable energies must accelerate to diversify the energy mix without jeopardising efforts towards a more sustainable economy, nor affecting electricity supply security and affordability. Land-use policies must also take better into account the many benefits of biodiversity and internalise the negative externalities of land take.

2.1. France has set itself ambitious environmental targets

Climate change is accelerating and its consequences are being felt throughout the world. In France, 2019 was one of the hottest years since the beginning of the 20th century (CGDD, 2021b). More than 60% of the French population is currently strongly or very strongly exposed to climate risks, such as avalanches, storms, forest fires, floods, droughts, heatwaves or land movements (ONERC, 2018; Météo France, 2020). Climate change is mostly driven by the increase in greenhouse gas emissions worldwide. Concentrations of carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O) into the atmosphere have increased substantially since 1800 as a result of human activity (CEDD, 2015). France is nevertheless one of the OECD countries with the lowest greenhouse gas emissions, both per unit of GDP and per capita (Figure 2.1, part A).

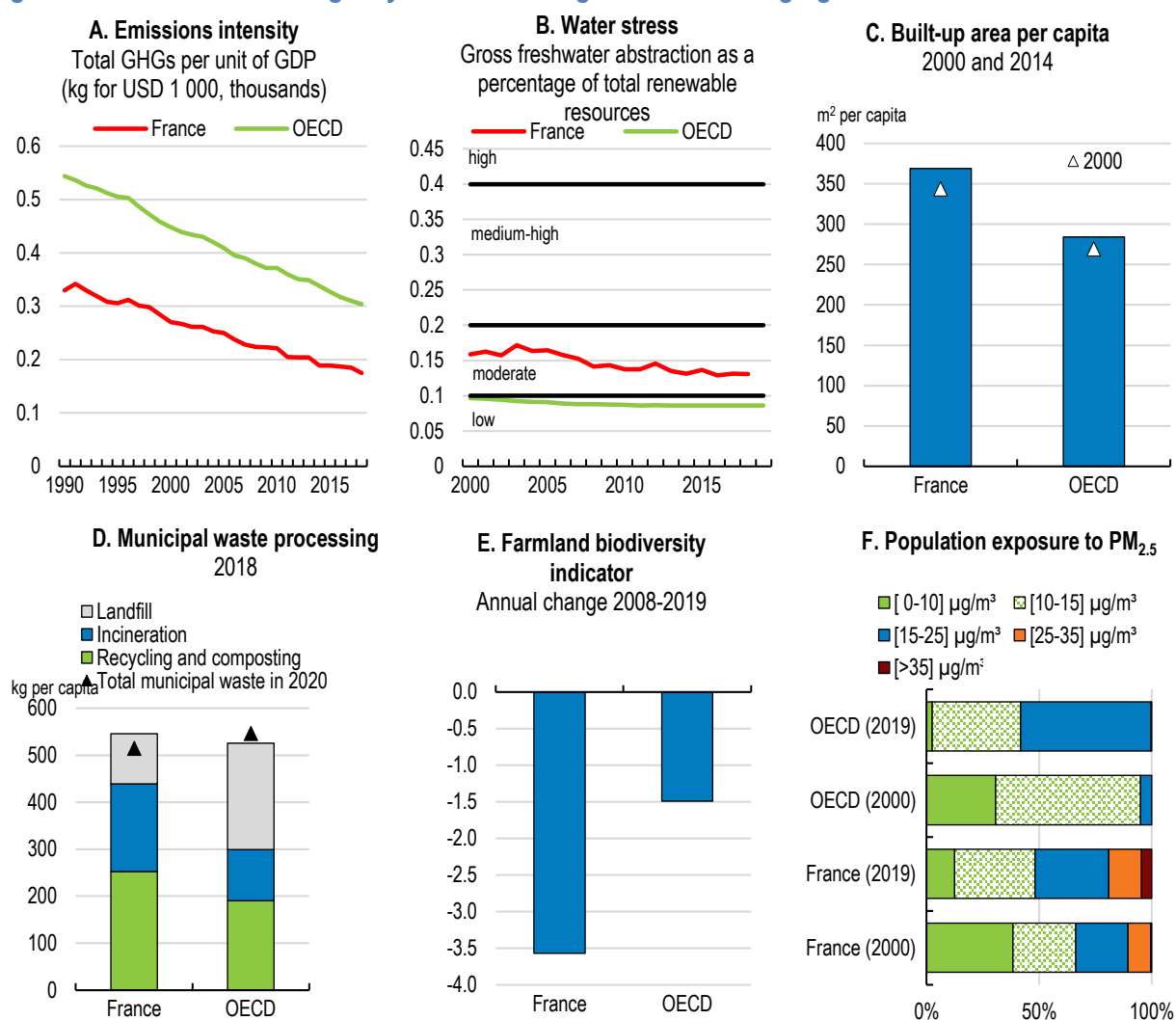
Some human activities contribute directly to the exhaustion and contamination of natural resources. The extraction of surface water or groundwater in excessive quantities reduces the quantity of water available. In France, water stress remains moderate so far (Figure 2.1, part B), but urbanisation continues to increase, reducing natural spaces and eroding landscapes, natural resources and habitats (Figure 2.1, part C). The volume of waste has increased slightly since 2000 and landfilling also contributes to soil and water contamination, even though a higher proportion is recycled than the OECD average (Figure 2.1, part D). Biodiversity in France is heavily impacted by urban sprawl, intensive farming, soil and water contamination (Figure 2.1, part E). Human activity can also adversely affect air quality through emissions of air pollutants. Annual mean concentrations of pollutants have fallen overall in France and are below the OECD average (Figure 2.1, part F). However, this is partly because France has a relatively low density, some towns and cities being very exposed. Between 2016 and 2019, 7% of total mortality among the French population, around 40 000 deaths each year, could be attributed to excessive exposure to fine particulate matter (Santé Publique France, 2021). Therefore, policy action must go beyond the transition to other sources of energy and energy efficiency. More initiatives are needed in the industrial sector, with low-carbon and less polluting mobility solutions, more energy-efficient constructions, more sustainable urban development, further reuse, repair and recycling, and in the agri-food industry, gradually replacing industrial agriculture with more sustainable farming practices.

The economy and political stability are endangered by climate change, pollution and the increasing scarcity of resources. The erosion of ecosystems, for example, has an impact on agricultural and viticulture outputs (Hardelin and Lankoski, 2018). Other sectors are also affected, such as tourism, construction and energy production and distribution, as coastal infrastructures and installations are at risk. The financial system is also subject to increasing risks. Some assets could suffer a sharp depreciation due to climate change, but also if the green transition occurs abruptly. The increased frequency of extreme climate events could also cause significant losses for insurance companies, with consequences for public finances (OECD and World Bank, 2019). The health consequences of global warming will put additional pressure on the health system. Overall, it is difficult to predict and quantify all the economic repercussions, but the impact on GDP would be negative and significant (Figure 2.2; Direction Générale du Trésor, 2020; DeFries et al., 2019). All-hazards risk analyses and the ensuing adaptation policies should take these potential costs related to climate change into account (chapter 1).

The governance of environmental policies has been strengthened in recent years

The fight against climate change, human pollution and biodiversity loss are major priorities in France. The country has set itself ambitious, legally binding, targets in a number of key areas (Table 2.1). Many of these targets have been set at the European Union level and transposed into national law. Others, for example those relating to biodiversity protection, are even more ambitious than the European targets. The list of sectoral, interim and non-binding targets is even longer. For instance, France has set specific targets for the transport and buildings sectors to achieve its broader emissions reduction and energy savings objectives. France is among the most ambitious countries as far as climate policy goals are concerned (CCPI, 2019). As regards its foreign policy, the country participates in all multilateral climate discussions. France recently hosted the Paris Climate Change Conference (COP21), where it championed and ratified the Paris Agreement.

Figure 2.1. The climate emergency calls for stronger and wide-ranging action



Note: The farmland biodiversity indicator is an aggregate index which tracks the population of a selected group of breeding bird species that is dependent on agricultural land for nesting and breeding (OECD, 2017b).

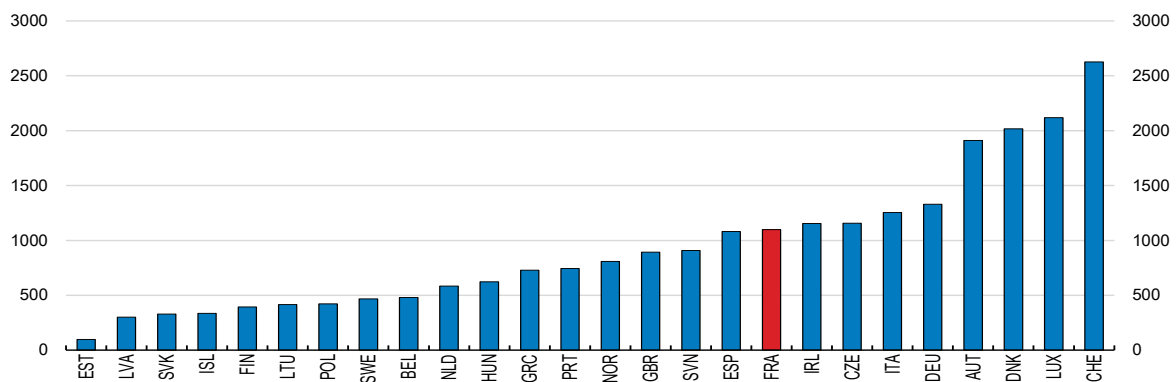
Source: Parts A-D and F: OECD Green Growth Indicators; part E: OECD (2021), *Measuring the Environmental Performance of Agriculture Across OECD Countries*, OECD Publishing, Paris.

StatLink  <https://doi.org/10.1787/888934285704>

France has strengthened the governance of its environmental policy. The 2015 Law on Energy Transition for Green Growth defines long-term targets, clarifies roles and divides responsibilities among relevant stakeholders (Figure 2.3). It also requires the development of a “National Low Carbon Strategy” (“*Stratégie Nationale Bas Carbone*”), which defines the main priorities to decarbonise the economy and sets maximum emission ceilings every five years, by sector and by greenhouse gas, known as “carbon budgets” (“*budgets carbone*”). The budgets establish a roadmap and a long-term target trajectory. Regarding energy policy, the “Multiannual Energy Programme” (“*Programmation Pluriannuelle de l’Énergie*”) defines, for five-year periods, priorities concerning energy supply security, energy efficiency improvements, fossil fuels consumption, and the development of renewable energies. The first programme was adopted in 2016 and the second in 2020. All the strategic and planning documents must remain coherent, something which is often difficult given the different drafting and revision calendars.

Figure 2.2. Economic losses due to extreme climate-related events are high

Estimated cumulative losses per capita between 1980 and 2019, EUR at 2019 prices



Note: The figures vary according to the proportion of damage that is insured and do not therefore reflect the real cost of damage.

Source: NatCatService database provided by Munich Re and Eurostat structural indicators.

StatLink  <https://doi.org/10.1787/888934285723>

Local policies are key to reach environmental objectives and should be better coordinated with national policies. Local authorities are responsible for waste management, the development of public transport, management of public capital and urban planning, among other things. Through these policies, they can directly act on 15% of greenhouse gas emissions and indirectly on 50% of such emissions (France Stratégie, 2020b). Each region must therefore draw a plan to take climate, air and energy concerns into account (“*Schéma Régional d’Aménagement, de Développement Durable et d’Égalité des Territoires*”), namely when it comes to urban planning. However, regional plans are not always coherent with national objectives. Cooperation between different levels of government must improve, in particular the coordination of local planning documents and the National Low Carbon Strategy (HCC, 2021).

Tools for monitoring the implementation of public environmental policies, which requires coherent data and well-defined quantitative indicators, are still being developed. To monitor the implementation of the National Low Carbon Strategy and the Multiannual Energy Programme, the Ministry of the Ecological Transition introduced a dashboard consisting of 184 indicators and 42 indicators, respectively. The first dashboard for the National Low Carbon Strategy was published in January 2018, but only 103 indicators had been compiled (Rüdinger, 2018c). For the Multiannual Energy Programme, no dashboard has been published yet. In addition, subnational results are not always reported in a harmonised and comparable manner. Data collection does not take place regularly enough (Dive and Duvergé, 2019). To improve data collection, a number of observatories have been set up. The Energy and Climate Observatory, for example, established in 2018, monitors some indicators at the regional level. The National Land Use Observatory, established in 2019, is responsible for surveying land use, while the National Building Energy Renovation Observatory, established in 2020, should improve knowledge on the dynamics of building renovation. However, their resources are still limited. Efforts to improve data collection must continue.

The evaluation of environmental policies must improve. *Ex post* evaluation studies are not conducted as often as *ex ante* evaluation studies. *Ex ante* evaluations assess whether strategies are properly aligned with France's national, European and international objectives. *Ex post* evaluations, on the other hand, assess the effectiveness of the measures so as to inform the revision process of each strategy. The Law on Energy Transition requires that the two types of evaluation must be conducted. However, when the first revision process for the National Low Carbon Strategy and the Multiannual Energy Programme were launched in 2017, there had not been an in-depth *ex post* evaluation yet (Rüdinger, 2018b). *Ex post* evaluations must be conducted before the next revisions are launched. Impact assessment studies, to evaluate the efficiency of specific public expenses and identify the most effective public programmes and policies should be encouraged. For that purpose, data collection to make these impact assessment studies feasible needs to be planned ahead. The creation of the High Council on Climate (HCC) in 2018, an independent experts committee that publishes regular reports on environmental progress, is a step in the right direction. The government must still ensure that the HCC has adequate resources to exercise its functions.

Table 2.1. Major legally binding environmental targets for France

Target	Legal constraint	National/ European
Reducing global warming		
Reduce greenhouse gas emissions by 40% between 1990 and 2030 and carbon neutrality in 2050 (1)	Law of 8 November 2019 on Energy and Climate	European (2)
Increasing energy efficiency		
Reduce final energy consumption by 50% in 2050 compared with 2012, with an interim target of 20% in 2030	Law on Energy Transition for Green Growth	European
Reduce primary energy consumption by 30% in 2030 compared with 2012	Law on Energy Transition for Green Growth	European
Diversifying the energy mix		
Increase the share of renewable energy to 23% of gross final energy consumption in 2020 and at least 33% in 2030	Law on Energy Transition for Green Growth	European
Increase the share of renewable electricity to 40% of total electricity production in 2030	Law on Energy Transition for Green Growth	National
Increase the share of nuclear energy in electricity production to 50% by 2035 (3)	Law on Energy Transition for Green Growth	National
Reducing air pollution		
Reduce, by 2020, pollutant emissions, expressed as a % compared with 2005: -55% for SO ₂ ; -50% for NO _x ; -43% for NMVOCs; -4% for NH ₃ ; -27% for PM _{2.5}	Directive (EU) 2016/2284 of 16 December 2016	European
Reduce, by 2030, pollutant emissions, expressed as a % compared with 2005: -77% for SO ₂ ; -69% for NO _x ; -52% for NMVOCs; -13% for NH ₃ ; -57% for PM _{2.5}	Directive (EU) 2016/2284 of 16 December 2016	European
Conserving biodiversity		
Reduce the net loss of biodiversity to zero	Law on Restoration of Biodiversity, Nature and Landscapes of 9 August 2016	National
Reduce landfill waste by 50% by 2025	Law on Energy Transition for Green Growth	National
Aim for 100% of plastic recycled by 1 January 2025	Law of 10 February 2020 on the Fight against Wastage and the Circular Economy	National

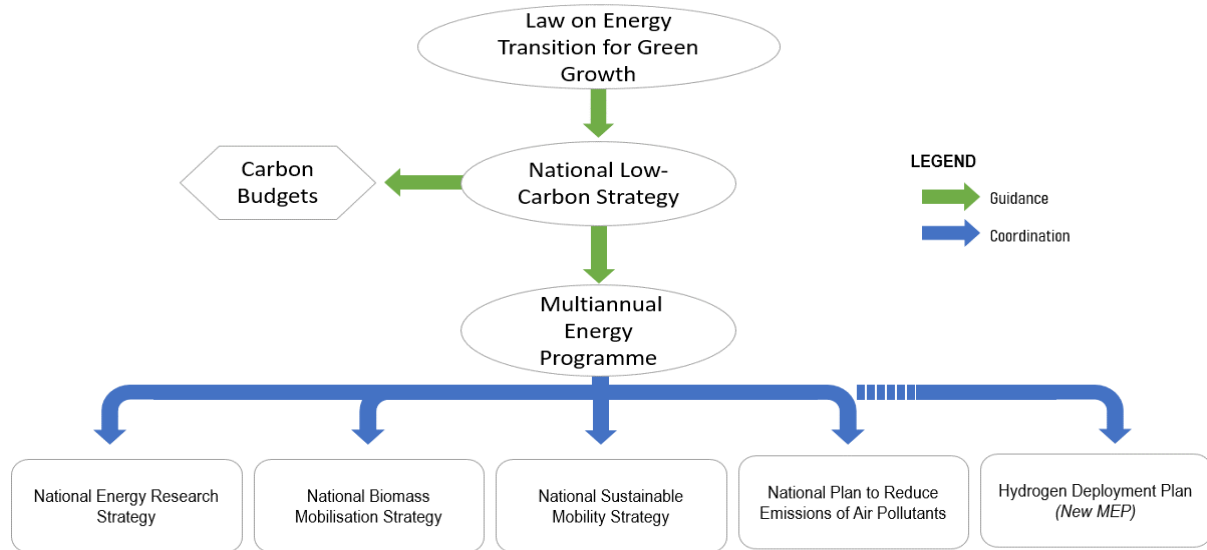
Note: Non-exhaustive list. (1) Concerns only French domestic emissions and does not include emissions from international transport or imported emissions. (2) In December 2020, the European Union increased its target for 2030 to -55%. A set of proposals was published in July 2021 to revise and update the European legislation and introduce new initiatives. The European Effort Sharing Regulation is thus currently under revision. A new target of -47.7% by 2030 has been proposed for France. There has not yet been a vote on this proposal. (3) Target revised downward in 2018. Initially, the target had been fixed for 2025.

Source: Legal texts; Ministry of the Ecological Transition.

The gap between the results and the objectives is widening

Despite all the efforts made over a number of years, France is still falling short of its targets for reducing greenhouse gas and air pollutant emissions, increasing energy efficiency, diversifying its electricity mix and improving biodiversity conservation. The gap regarding greenhouse gas emissions cuts is particularly concerning as, with the new European objective for 2030, the European Commission has proposed an even more ambitious target for France, still under discussion, of -47,7% compared with 1990 (European Commission, 2021).

Figure 2.3. The Law on Energy Transition establishes the framework for environmental policies



Note: The figure is not exhaustive. Other strategies and plans have been developed.

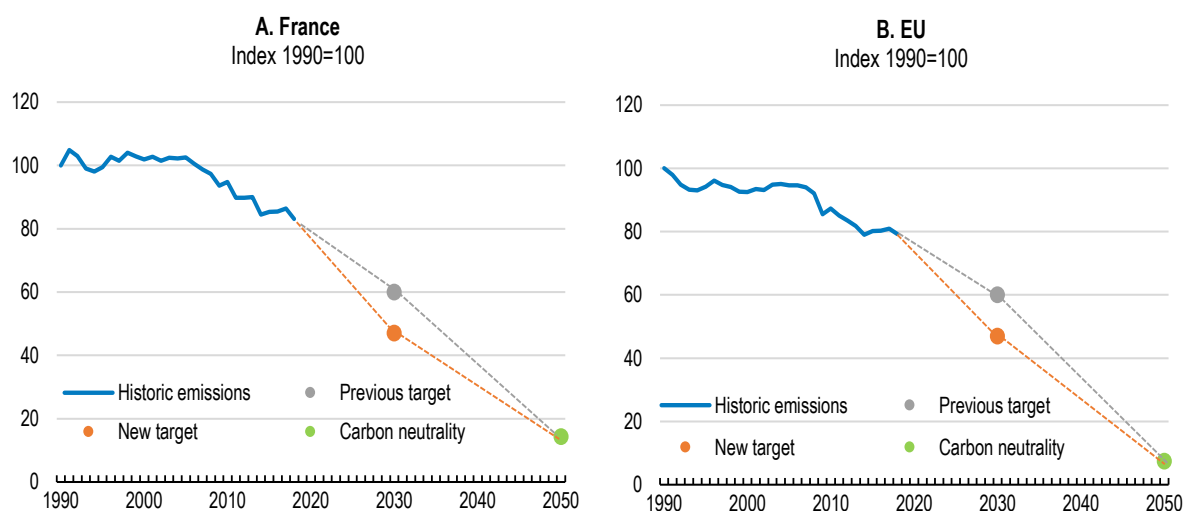
Source: Legal texts; Ministry of the Ecological Transition.

The pace of domestic greenhouse gas emissions reductions must increase. France failed to meet its first carbon budget between 2015 and 2018 (CITEPA, 2019). Consequently, for the second National Low Carbon Strategy, ambitions had to be revised downwards and the carbon budget for 2019-2023 was increased. Preliminary estimates show a 1,9% fall in 2019 and 9,2% fall in 2020, a faster pace than targeted in the second National Low Carbon Strategy (HCC, 2021a). However, the 2020 fall is primarily explained by measures taken in the wake of COVID-19. This pace should be maintained even as the economy recovers. From 2024, emissions will have to fall by 3,2% each year to meet the third carbon budget (CITEPA, 2020; HCC, 2020b). The proposed new target of -47,7% in 2030 within the effort sharing regulation and excluding emissions under the EU ETS system, would require emissions to fall by 5% each year, up to 2030 (European Commission, 2021; Figure 2.4, part A). The pace in the European Union as a whole is also insufficient for achieving the targets in 2030 and 2050, suggesting that collective efforts should be further intensified in the coming years, especially since the European ambitions have been raised (Figure 2.4, part B; EEA, 2020d).

France's carbon footprint, which includes "imported" emissions, has increased. Emissions from foreign economic activities, whose output is intended for French imports, increased by 72% between 1995 and 2019. Emissions from international maritime and air transport represent less than 5% of France's carbon footprint, but these have also increased by almost 50% since 1990 (CGDD, 2020d; HCC, 2020b). Imported greenhouse gas emissions are not included in the legally binding targets, nor covered by a specific strategy. To avoid reducing domestic emissions by increasing imported ones, the 2019 Law on Energy and Climate stipulates that, from 2022 onwards, indicative emissions ceilings should also be set for imported emissions and emissions connected with international transport.

Decoupling of primary energy consumption and economic growth in France is below the European average. France needs more primary energy to produce the same quantity of goods and services. Although primary energy consumption fell by 0,8% each year, on average, between 2012 and 2017, an annual reduction of 2% would have been needed to stay on track (Rüdinger et al., 2018). Final energy consumption, which refers to the energy actually consumed by end users, excluding the needs of the energy sector itself and transformation and distribution losses, fell by 1,7% between 2012 and 2017, while a target of -7% compared with 2012 had been fixed for 2018 (Figure 2.5, part A). Preliminary estimates for 2020 show that primary energy consumption fell by 10% and final energy consumption by 8% compared to 2019. However, this is mostly explained by favourable weather conditions and reduced economic activity. France is not the only country where the pace of energy savings remains insufficient. The European Union as a whole is not expected to meet its common target for 2020 (Figure 2.5, part B). Even though France is one of the countries that has contributed most to reducing final energy consumption in the European Union, in absolute terms, the gap regarding its indicative targets is still significant (Figure 2.5, parts C and D).

Figure 2.4. The pace of emissions reductions should be stepped up in order to achieve the targets
Greenhouse gas emissions



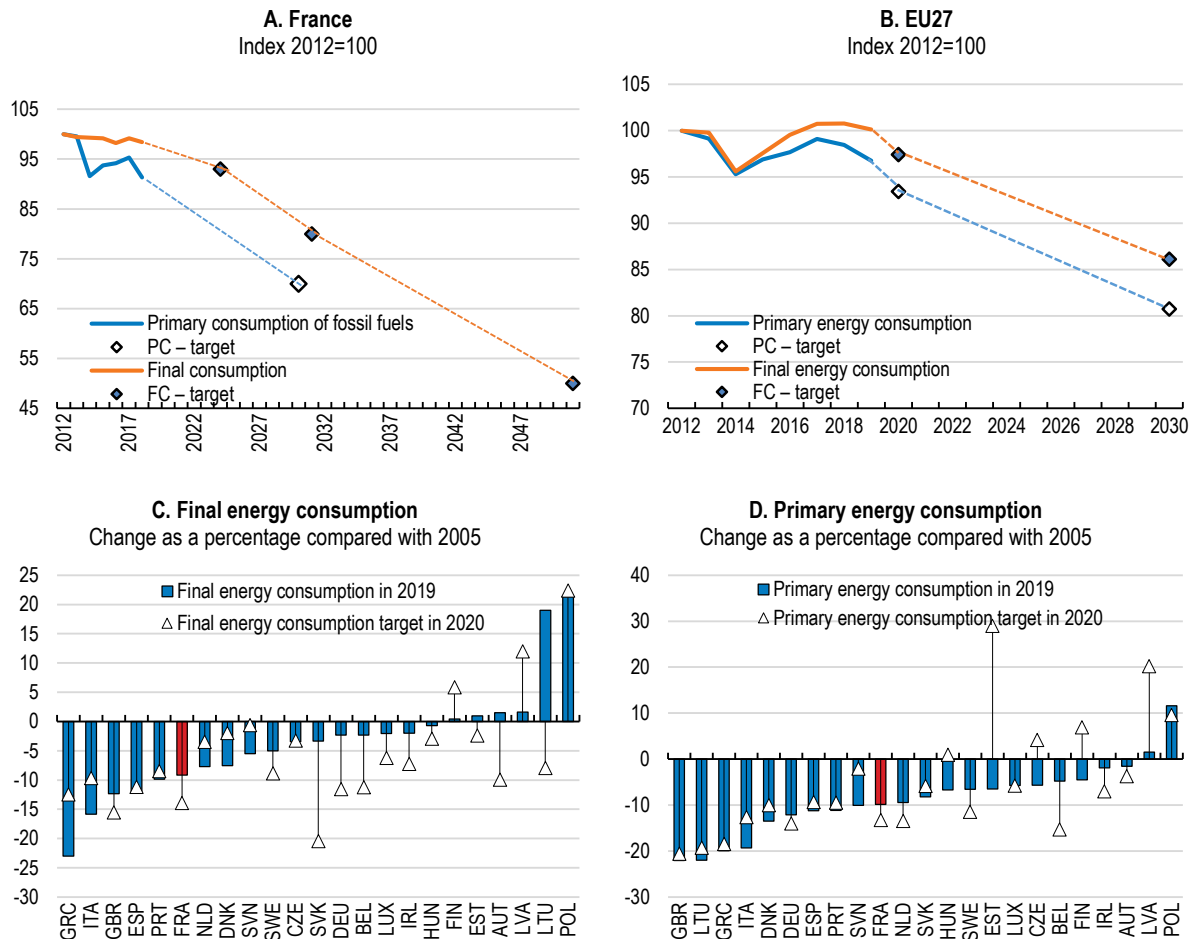
Note: The objectives represented in the figure are OECD estimates. The historical series excludes the LULUCF sector (gross emissions). The previous target for 2030 was to reduce GHG emissions by 40% compared with 1990, excluding the LULUCF sector (gross emissions). The new European target, set at the end of 2020, is to reduce emissions by 55% compared with 1990, including the LULUCF sector (net emissions). The figure considers an equivalent gross emissions objective of -53% approximately. The carbon neutrality objective for 2050 includes the LULUCF sector (net emissions). To approximate that objective, the figure considers that the ratio between net and gross emissions in 2050 will remain identical to the last historical value observed. The European target of -55% has not yet been transposed into French legislation. The new target for France shown here is therefore not definitive, but proposed by the European Commission in July 2021 as part of the “Fit for 55” package.
Source: European Commission, Energy Data (database).

StatLink  <https://doi.org/10.1787/888934285742>

The country is unlikely to meet its renewable energies' targets (Figure 2.6, part A). In 2020, renewables represented 19,1% of gross final energy consumption and 22,5% in electricity production, while those shares are expected to reach 33% and 40% in 2030. The share of renewables in heat consumption was only 23,3% in 2020, against a target of 38% for 2030. Production of renewable heat has even felt by 4,2% in 2020. The share of renewables in final fuel consumption was only 9,2% in 2020, while a target of 15% has been set for 2030 (CGDD, 2021b, 2021e). As for renewable natural gas, biogas represented only around 1,6% of total natural gas consumption in 2016, against a target of 10% in 2030 (Rüdinger et al., 2018). Biogas production increased by 14,2% in 2020 compared to 2019, but this was not enough to increase overall renewable heat production (CGDD, 2021e). For the European Union as a whole, the share

of renewables was 19,5% of final energy consumption in 2019, while a target of 20% was established for 2020 (Figure 2.6, part B). France is one of the countries with the lowest consumption of fossil fuels, thanks to the key role played by nuclear power in its electricity mix. Nevertheless, the gap compared to its indicative targets for renewables by 2020 is the largest in the European Union (Figure 2.6, part C).

Figure 2.5. More energy savings are needed to reach the targets

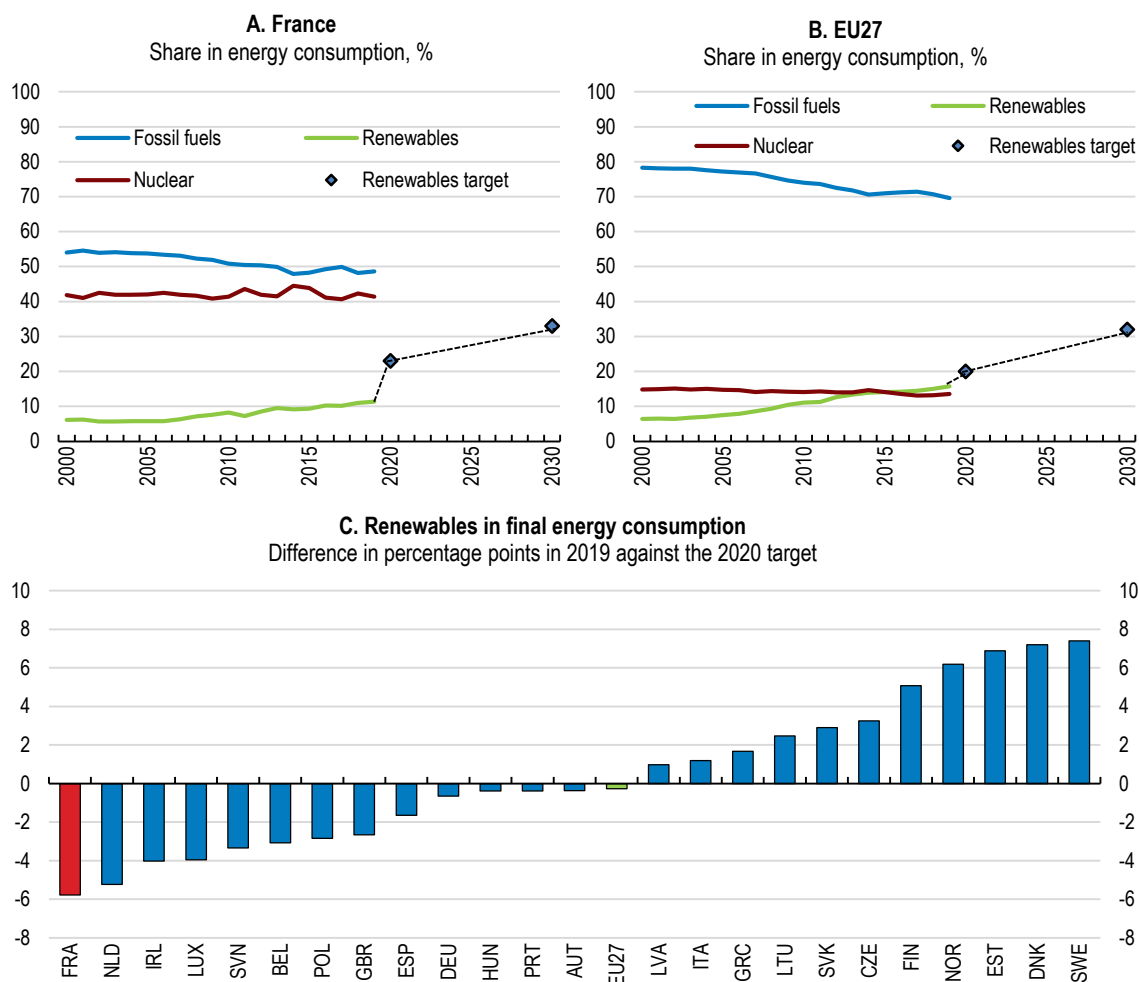


Source: Bilan Énergétique pour la France 2018; Eurostat, Complete energy balances; and European Union targets.

StatLink  <https://doi.org/10.1787/888934285761>

Progress made regarding air pollution is still insufficient. Between 2000–2019, the majority of gas and particulate matter emissions connected with human activities fell, with the exception of ammonia (NH₃), which has barely gone down since 2000 (CGDD, 2020a). The situation is not as good in some towns and cities. The regulatory ceilings for air quality, which have been imposed to protect public health, continue to be exceeded in several urban areas: Lyon, Marseille - Aix-en-Provence, Paris and Strasbourg. France is currently in a litigation procedure with the Courts of the European Union concerning nitrogen dioxide (NO₂) and in pre-litigation procedure concerning fine particulate matter with a diameter of less than 10 micrometres (PM₁₀), for failure to comply with the European directives. In fact, the impact of these air pollutants is non-negligible. A higher concentration of air pollutants increases the number of emergency admissions and the mortality rate on the same day, related to cardiovascular or respiratory causes (INSEE, 2021). Falls in pollution levels during spring 2020, as a result of lockdown measures, were associated with significant health benefits, with around 2 300 deaths per annum being prevented thanks to a temporary lower public exposure to fine particulate matter (Santé Publique France, 2021).

Figure 2.6. France consumes less fossil fuel but is lagging behind its targets for renewables



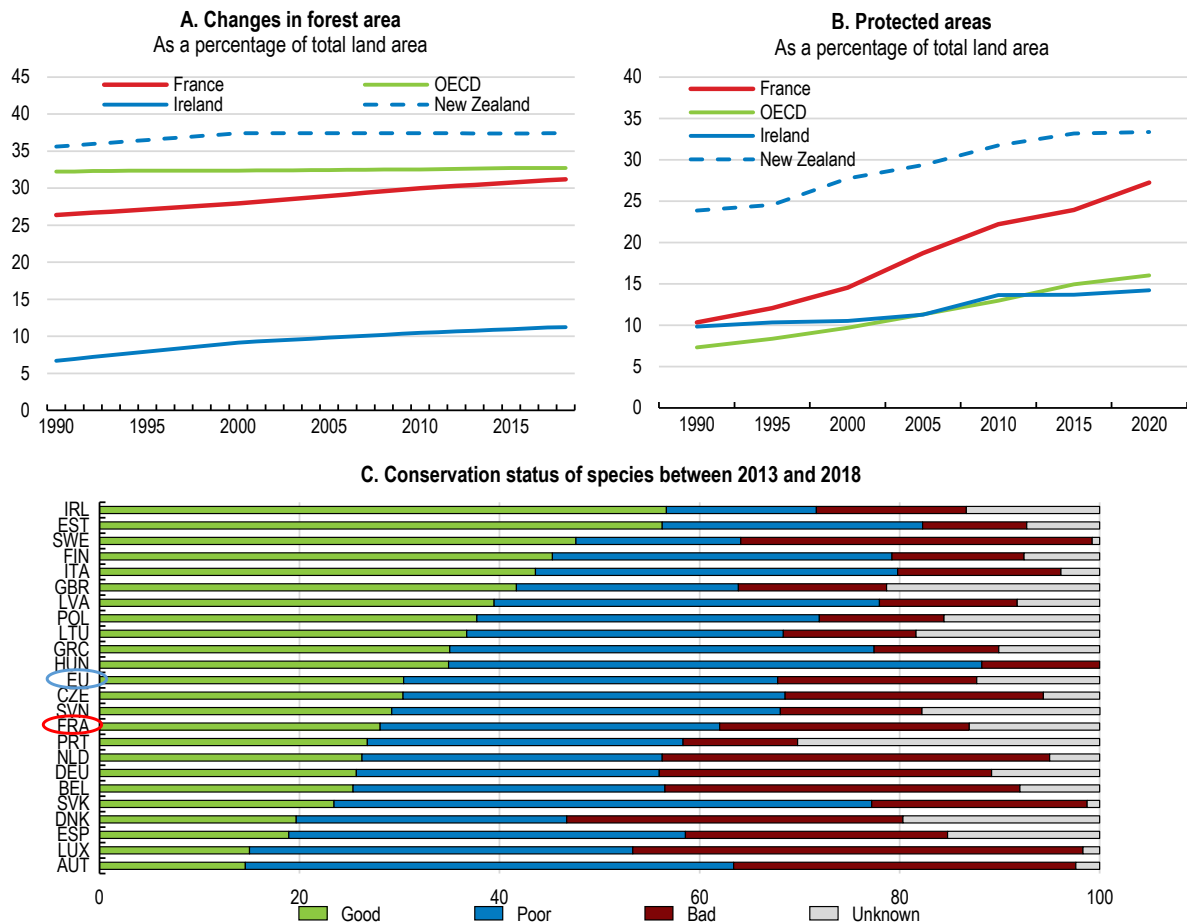
Note: In 2020, the targets varied from one country to the other but were intended to reflect the different starting points of the countries in renewable energy production and their capacity to increase production. These ranged from 10% for Malta to 49% for Sweden. The target for France was 23% (Table 1).

Source: Eurostat, Complete Energy Balances.

StatLink  <https://doi.org/10.1787/888934285780>

Similarly, biodiversity conservation measures have not been sufficient to slow down the decline of plant and animal populations. Forest and protected areas have expanded considerably since the 1990s, particularly compared with the OECD average (Figure 2.7). However, between 2006 and 2015, land take in France grew by 1.4% per year on average, the same trend as in the period 1992-2003. The increase in land take has been faster than population growth and equivalent to the disappearance of one “*département*” every 10 years (CGDD, 2018). The risk of extinction for certain species (amphibians, nesting birds, mammals and reptiles) rose by 15% between 2008 and 2017. Overall, 26% of species under review were subject to a risk of disappearance or had already disappeared. Just one fifth of habitats and one quarter of species of Community interest have a favourable conservation status, a lower percentage than the European average, and not much has changed since 2001 (OFB, 2020; Figure 2.7).

Figure 2.7. Few species have a favourable conservation status, despite the growth of forest and protected areas



Note: Ireland and New Zealand are included by way of comparison because of the significance of the agricultural sector in exports from those countries.

Source: OECD statistics on land use and OECD statistics on protected areas; and European Environment Agency, Article 17, Habitats Directive 92/43/EEC.

StatLink  <https://doi.org/10.1787/888934285799>

Several factors explain France's deviation from its objectives

The factors that explain the country's deviation from its objectives for reducing greenhouse gas emissions are also closely linked to the emissions of pollutant and biodiversity loss. Therefore, policies to reduce greenhouse gas emissions can also bring benefits for air, soil and water quality, as well as biodiversity conservation. This section begins by identifying the factors responsible for most greenhouse gas emissions and then explains how these also contribute significantly to pollution and ecosystem degradation.

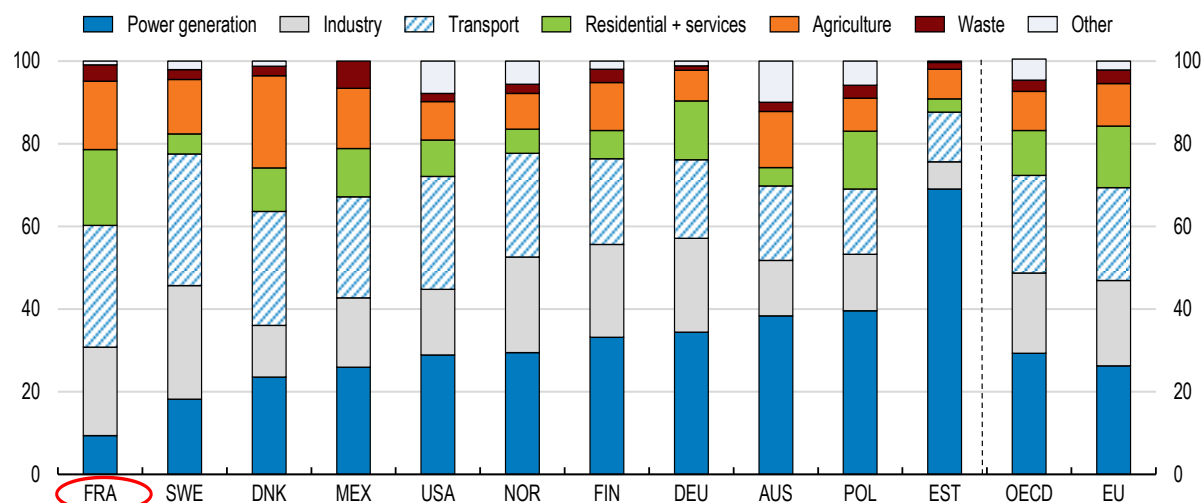
Factors that explain greenhouse gas emissions

Three sectors are primarily responsible for the deviation from the targets for reducing greenhouse gas emissions. In 2018, transport, agriculture and the residential-tertiary sectors accounted for more than 67% of greenhouse gas emissions, with 30,8%, 19,4% and 18,4% of emissions respectively (Figure 2.8). These three sectors can entirely explain the overrun on the first carbon budget: emissions were above the indicative values in the first budget by 22% for the residential-tertiary sector, by 11% for transport and by 3% for agriculture (CETE, 2018). Three sources alone account for half of the emissions: diesel road

transport, buildings (residential and tertiary) and cattle breeding (CITEPA, 2020). Since 1990, French emissions have increased by 10% in the transport sector and have fallen only slightly in the residential-tertiary sector and in agriculture (Rexecode, 2021). The manufacturing sector, on the other hand, has met its carbon budget and is responsible for more than 90% of French efforts to reduce greenhouse gas emissions since 1990.

Figure 2.8. Three sectors account for the majority of emissions in France

Greenhouse gas emissions by sector, as a percentage, 2018



Source: OECD Environment Statistics.

StatLink  <https://doi.org/10.1787/888934285818>

Road passenger transport explains a significant share of transport emissions. The road sector represents 94% of those emissions and passenger vehicles account for 51% (HCC, 2020c). Demand for mobility has increased substantially since 2012. Between 2012 and 2017, the number of passenger-kilometres travelled rose by 6.2%. Urban sprawl could explain some of the increase in the number of kilometres travelled per passenger. In fact, several studies show that the number of daily journeys has fallen slightly, but this has been offset by an increase in the average distance travelled (Rüdinger et al., 2018). The deployment of low-emission vehicles has not progressed sufficiently to compensate for this increase. Average emissions from the automobile fleet per kilometre travelled fell slightly by 0.6% per year between 2000 and 2016. However, the increasing popularity of heavier vehicles, particularly SUVs, has slowed that progress (CETE, 2018). Taxes on diesel fuel have not yet been fully aligned with taxes on petrol, and the planned gradual alignment was interrupted in 2018, which also slowed down the fall in emissions from motor vehicles.

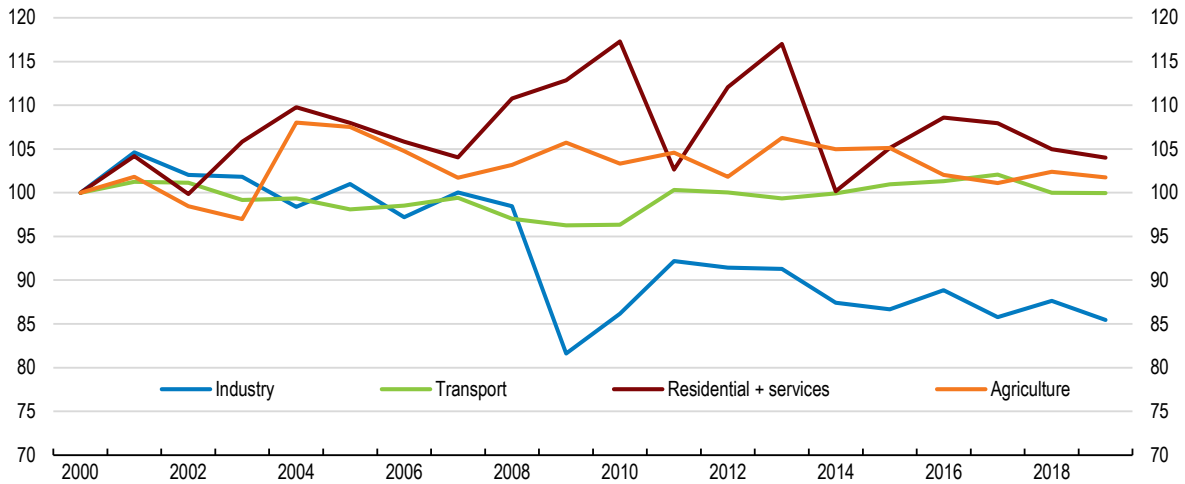
Freight transport remained stable over the same period, but the share of road freight transport increased significantly to the detriment of rail (Rüdinger et al., 2018). The lack of investment in the maintenance of existing rail transport infrastructures over many years has been detrimental to the quality of rail freight services (OECD, 2019a). Across the rail network, the risk of breakdown and delay is still too high and puts freight at a disadvantage.

The residential-tertiary sector accounts for more than 40% of final energy consumption. Energy efficiency in the residential sector has improved since 2000: the ratio of final energy consumption over the total surface of occupied housing fell by 24% (CGDD, 2021b). However, total final energy consumption in the sector has not changed much since 2000 (Figure 2.9). In particular, few energy savings have been realised in tertiary buildings (OECD/IEA, 2021). Consumption of fossil fuels by boilers for heating (domestic heating oil and natural gas) continues to be the main source of energy consumption and the main cause of emissions in the residential-tertiary sector (CGDD, 2021a). In 2018, heating represented 66% of residential energy consumption and 77% of CO₂ emissions in the sector (CGDD, 2020b).

The residential-tertiary sector is also characterised by high emissions of hydrofluorocarbons (HFCs), a potent greenhouse gas. HFC emissions are linked to air conditioning systems in buildings and domestic and commercial cooling equipment (OECD/IEA and UNEP, 2020). Energy efficiency in buildings must be improved to increase energy savings and reduce emissions from the residential-tertiary sector. The thermal rehabilitation of old buildings, in particular, appears to be a major challenge for sustainable urban development.

Figure 2.9. The final energy consumption of buildings has not changed much

Final energy consumption, index 2000=100



Source: European Commission, Energy Data (database).

StatLink  <https://doi.org/10.1787/888934285837>

The agricultural sector overran its first carbon budgets only marginally, but it is not structurally on track for its 2030 targets (HCC, 2020c). Agriculture differs from other sectors in the small proportion of emissions linked to energy combustion (CGDD, 2021a). The main sources of emissions from agriculture are methane (CH₄) and nitrous oxide (N₂O), which have a warming potential around 28 times and 265 times higher than carbon dioxide (IPCC, 2014). Methane emissions stem mainly from cattle bearing. Nitrous oxide emissions can be explained primarily by the use of nitrogen fertilisers for crop fertilisation (ADEME, 2013b). There are known methods for reducing emissions from the use of chemical inputs and, to a lesser extent, emissions from cattle bearing. Some of these methods may even improve the economic situation of farmers (OECD, 2016). However, these methods have struggled to spread. The fear of taking risks and lack of knowledge are often identified as the main obstacles.

Energy production has much lower greenhouse gas emissions than other OECD countries, especially because of the energy mix and the key role played by nuclear power (Figure 2.8). In fact, nuclear power is the main source of primary energy and electricity in France (Figure 2.6, part A). For more than 30 years, France has made investments to devise and implement sustainable solutions for radioactive waste management. Like most OECD countries, France has opted to store waste in adapted industrial centres while it poses potential risks (OECD/NEA, 2020a). Some waste is already held in those storage centres. For high-level and long-lived waste, the Cigéo project, led by ANDRA, should start being constructed in 2022, and the industrial pilot phase should be launched in 2025.

The target of reducing the share of nuclear power in the energy mix to 50%, initially planned for 2025, was ultimately deferred to 2035, so as not to jeopardise CO₂ emissions reduction efforts. In fact, to reach that target while guaranteeing the security of energy supply, and with relatively stable electricity consumption, the decommissioning of nuclear power plants would have had to be compensated with the reopening of coal-fired power plants (RTE, 2017). The development of renewables has not been fast enough to

compensate for the closure of coal power plants and must accelerate so that greenhouse gas emissions and air pollutants reduction objectives, energy supply security and affordable electricity prices are not called into question (OECD/NEA, 2019).

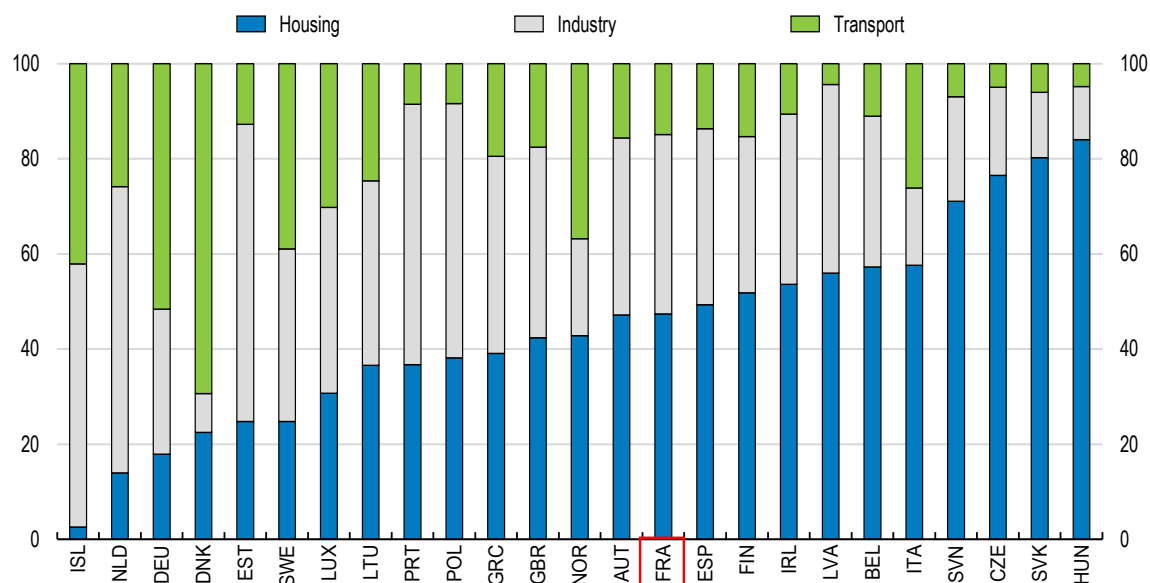
Factors that explain pollution and biodiversity loss

Intensive farming is one of the main causes of biodiversity loss (CGDD, 2018). Fragmentation and partitioning of land destroy natural habitats and adversely affect many species. Improper use of crop protection products (herbicides, fungicides, insecticides, etc.) gives rise to concentrations in the air, in the soil and in the water of chemicals that affect the behaviour of a number of living organisms. Fertiliser use and cattle faeces are also linked to pollutant concentrations in rivers, water surfaces, lakes and coastal waters, disrupting the ecological status of those habitats (OECD, 2012; European Commission, 2020). It is therefore important to spread examples of good farming practices, which are compatible with the sustainable use of land and natural resources.

Transport, buildings and agriculture are responsible for a high proportion of emissions of air pollutants, which increase risks of respiratory illnesses and cancer in humans, but also affects animal and plant communities (OECD, 2019d). Transport account for more than 60% of nitrogen oxide (NO_x) emissions, agriculture accounts for more than 90% of ammonia (NH₃) emissions, and the residential-tertiary sector is the main responsible for the emissions of fine particulate matter with a diameter of less than 2.5 µm and 10 µm (PM_{2.5} and PM₁₀) (Figure 2.10). Nitrogen oxide emissions impair air quality and, combined with ammonia, give rise to particulate matter. Emissions from transport originate primarily from road transport. Emissions from agriculture are mostly explained by cattle bearing and fertiliser use. Emissions from the residential-tertiary sector are principally linked to combustion of fuelwood and, to a lesser extent, combustion of fuel oil (CITEPA, 2020). Consequently, measures to reduce the use of polluting vehicles, limit urban sprawl, promote sustainable farming practices and thermal renovation of buildings will also have an impact on emissions of air pollutants.

Figure 2.10. Buildings account for a large proportion of particulate matter emissions

% of emissions of PM_{2.5} by sector, 2017



Source: OECD (2021), *Brick by Brick: Building Better Housing Policies*, OECD Publishing, Paris.

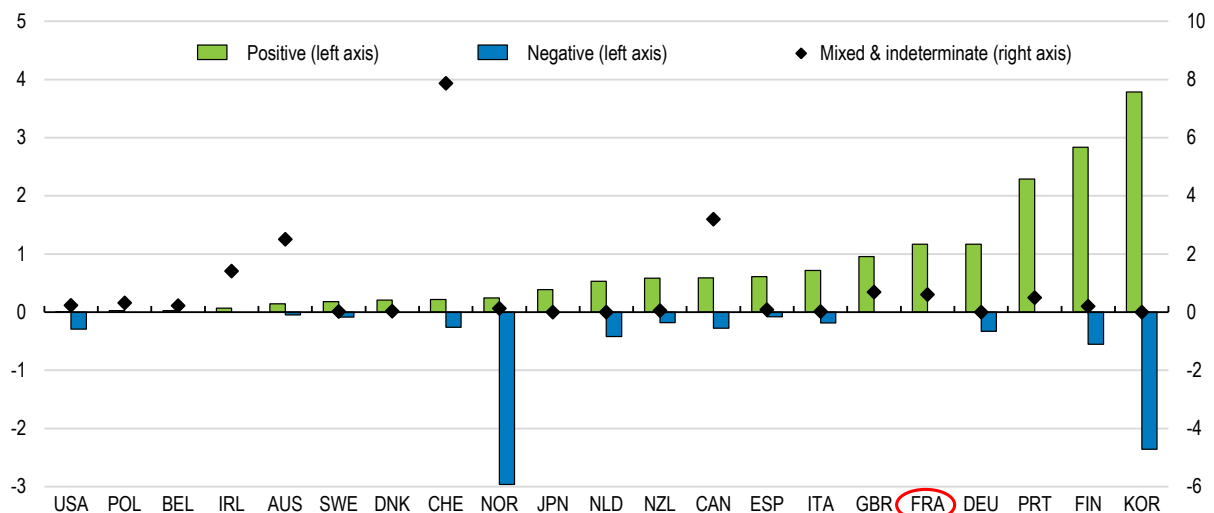
StatLink  <https://doi.org/10.1787/888934285856>

The pace of transition must accelerate and reallocation costs minimised

Planned investments to revitalise economic activity and employment following the coronavirus crisis may help to accelerate the pace of emissions cuts. Substantial public investment is planned in the next few years under the “France Relance” recovery plan, the “Investments for the Future” (“*Programme d’investissements d’avenir*”) programme, the “Next Generation EU” programme, and the recently announced “France 2030” investment plan. A considerable share of that investment is earmarked specifically for the “green transition” (Figure 2.11; Box 2.1). According to HCC estimates, the “France Relance” plan provides EUR 28 billion for the mitigation of greenhouse gas emissions between 2021 and 2022 (HCC, 2020a). The “France 2030” investment plan, announced in October 2021, earmarks EUR 15 billion to the green transition. The investments made under the “France Relance” plan also concern adaptation to climate change, biodiversity conservation and measures to combat land take. This is particularly timely, as financing costs are historically low, which makes it possible to finance very long-term projects. The health crisis also seems to have boosted the social acceptability of environmental measures. The “Citizens’ Convention on Climate” (“*Convention Citoyenne pour le Climat*” or CCC), which was held in October 2019, attracted significant media attention and generated much discussion. There was also a lively response to the examination of the “Climate and Resilience Bill” (“*Loi Climat et Résilience*”) in early 2021, which seeks to implement many of the measures proposed by the CCC and to enhance existing environmental policies (Box 2.1).

Figure 2.11. A large share of the recovery plan goes towards the green transition

Impact of recovery plan measures on the environment, as a percentage of GDP in 2019



Note: The database covers a range of environmental dimensions, beyond the focus on energy and climate. These are measures with impacts on pollution (air, plastics), water, biodiversity, waste management and climate change adaptation. The categorisation used draws on existing and emerging classification systems, such as the EU Taxonomy for Environmentally Sustainable Activities, and OECD assessments of those methods. Support for the nuclear industry is included among the measures regarded as positive.

Source: OECD (2021), The OECD Green Recovery Database: Examining the environmental implications of COVID-19 recovery policies.

StatLink  <https://doi.org/10.1787/888934285875>

Increasing public “green” spending through the recovery plan will not be enough to ensure that environmental objectives are met. The mechanisms introduced are not always cost-effective in reducing emissions of greenhouse gases and pollutants or conserving natural resources. In addition, private investment is still insufficient given the needs. These investment needs have been estimated at EUR 13 to 17 billion each year over 2021-2022 in the residential-tertiary, transport and renewable energies sectors, but the required investment for carbon neutrality will continue to grow after 2023 and investment needs in other sectors, such as agriculture, have never been estimated (I4CE, 2021b).

Policies to reduce emissions are not incompatible with economic recovery and good economic performance (OECD, 2021a). In fact, sectors that are lagging behind – transport, agriculture, building renovation and development of low-carbon energy – are also sectors with high job creation potential. The construction sector, for example, concerned with public transport infrastructures, infrastructures for production of low-carbon energy or energy renovation of buildings, is labour-intensive (OECD, 2017a). Greater investment in those sectors could therefore help to revitalise employment and short-term economic activity. In the long term, a number of transnational studies suggest that job creation in “green” sectors will be sufficient to compensate for job losses in the fossil-based energy production sector (OECD/IEA, 2020). According to a study based on input-output tables, the energy transition scenario proposed by the association négaWatt in 2011, which suggested a number of concrete measures to cut French CO₂ emissions by three-quarters by 2050, could have generated about 630 000 additional jobs in 2030 (Quirion, 2013).

Moving towards a greener economic model will nonetheless create winners and losers. Opportunities will arise for firms operating and workers employed in “green” activities. However, carbon-intensive capital will progressively be removed, potentially before having fully depreciated and generating financial losses for capital owners. Workers in carbon-intensive firms and sectors will need to be reallocated to less carbon-intensive jobs. Low-skilled workers or workers with limited access to reskilling opportunities could be left behind, which would exacerbate inequalities in the labour market. Jobs created in “green” sectors will not always be based in the same regions as the jobs lost in carbon-intensive firms and sectors, which could affect local employment dynamics and increase regional disparities. Higher energy costs will expose the most vulnerable households and firms to a greater extent than those who have the capacity to invest in less polluting equipment and technologies, potentially rising income and wealth inequality. If higher production costs are reflected into higher prices, this could also damage the international competitiveness of some French firms.

A comprehensive strategy to mitigate reallocation costs should be developed. Pro-active labour market policies must give comprehensive support to affected companies and workers, ensuring mobility between jobs and access to lifelong training opportunities so that no worker is left behind. Policies that improve the business environment, foster private investment, facilitate innovation, reduce entry-barriers for new low-carbon-technology firms and smooth the exit of carbon-intensive or polluting firms will be crucial (chapter 1).

Box 2.1. Recent measures to accelerate the green transition

Law of 8 November 2019 on Energy and Climate

This law sets the goal of carbon neutrality by 2050. Carbon neutrality is defined as a balance between emissions by sources and absorptions by greenhouse gas sinks. The law also formalises the establishment of the High Council on Climate (“*Haut Conseil pour le Climat*” or HCC).

Framework Law on Mobility (LOM) of 26 December 2019

The LOM sets the target of achieving carbon neutrality for transport from 2050 and reducing transport-related CO₂ emissions by 37,5% by 2030. It also fixes the objective of banning the sale of vehicles using carbon-based fossil fuels by 2040. The LOM strengthens the provisions laid down in the Law on Energy Transition for Green Growth concerning the obligation for public actors (government, public institutions, local authorities, State-owned companies) and private actors that manage a large vehicle fleet, when renewing the fleet, to include a proportion of low-emission or ultra-low-emission vehicles. The LOM also introduces an obligation to implement low-emission zones from 2021 in the most polluted areas.

Law of 10 February 2020 on the Fight against Waste and the Circular Economy

Under this legislation, reduction, reuse and recycling targets are laid down by decree for the period 2021-2025, then for each subsequent five-year period up until 2040. The law has already made progress with the introduction of bans in 2020 and 2021: ban on single-use plastic cups, plates and cotton buds, ban on the sale of straws, cutlery and stirrers. The law also sets the goal of going towards 100% recycled plastic by 1 January 2025 and sets the target of ending the marketing of single-use plastic packaging by 2040. Lastly, it requires telecommunications operators to inform their subscribers of the volume of data used and the associated greenhouse gases. In May 2021, 21 decrees implementing the Law on the Fight against Waste and the Circular Economy had already been published. France is the first OECD country to introduce a law to eliminate plastic packaging by 2040.

“France Relance” plan 2021-2022

In September 2020, the government announced a recovery plan amounting to EUR 100 billion, EUR 30 billion of which is dedicated to the environment. A number of measures are envisaged: thermal renovation of public buildings; support for thermal renovation of public and private housing and VSBs/SMEs; investment in cycling and public transport infrastructures; greening of the State-owned automobile fleet; help-to-buy schemes for clean vehicles; modernisation of waste sorting, recycling and recovery centres; investment in waterway and rail infrastructures; financing of prototypes and models to improve the energy and environmental performance of the fishing fleet; aid for replacement of agricultural equipment; launch of a “brownfield fund” to finance the decontamination, redevelopment and rehabilitation of industrial or commercial urban brownfield sites; financial support for research projects to develop hydrogen energy solutions; and support for the nuclear industry to enhance skills and develop innovative technologies. The environmental impact of the “France Relance” plan has been analysed as part of the OECD environmental budgeting initiative (“Paris Collaborative on Green Budgeting”).

Climate and Resilience Law of 22 August 2021

The law to tackle climate disruption and boost resilience against its effects was passed in July 2021. It includes a number of measures, stemming from proposals made by the Citizens’ Convention on Climate, around five themes: consuming, producing and working, moving around, housing and eating. The key measures are: making compulsory the establishment of low-emission zones, with lower volumes of traffic of the most polluting vehicles, for urban centres with a population in excess of 150 000 by the end of 2024; banning the sale of new vehicles with high emissions in 2030; ending air traffic for internal flights where there is a low-carbon alternative of less than two and half hours; establishing an obligation to offset carbon emissions linked to internal flights within Metropolitan France for all air operators; progressively banning the rental of poorly insulated buildings and housing from 2025; establishing a minimum energy performance level to define adequate housing; defining legal targets for protected areas; taxing nitrogen fertilisers; increasing penalties for environmental offences; and creating a general water and air pollution crime known as “ecocide”.

Having identified the main challenges to accelerate the pace of emissions reduction, the key messages in the following sections of this chapter are:

- Market-based incentives to reduce emissions must be reinforced. Exemptions and reduced rates weaken the incentive effect of environmental taxes and their capacity to modify individual behaviour and redirect investment towards green projects.
- Environmental taxation is not the only available instrument, and a comprehensive approach combining several mechanisms must be employed. Regulation could sometimes be used when economic incentives are ineffective at addressing market failures or not socially accepted.
- Policies to accelerate the transition to a low-carbon economy cannot succeed without public support. The social acceptability and distributive effects of reforms must be taken into account. Support mechanisms to compensate the most vulnerable and promote the social acceptability of environmental measures must be simplified and given more visibility.
- The design of some instruments can be improved to increase effectiveness without necessarily increasing public spending. Environmental criteria and conditions to benefit from public support must be more stringent. Monitoring must be strengthened.

2.2. Economic incentives must be reinforced to accelerate the pace of emissions reduction

Public investments need to be more cost-effective and policies to steer economic incentives, to secure more private-sector investment and to encourage all actors, particularly households and businesses, to adapt their behaviour, must be reinforced. France must continue efforts to review its spending and can draw on its green budget to carry out budget reallocations if needed (Cour des comptes, 2021). The OECD Economic Survey for France in 2019 makes a number of recommendations to improve the efficiency of public investment, particularly in the transport and energy sectors (OECD, 2019a). This section focuses on mobilising investors, households and firms towards a cost-effective green transition.

Private investment must increase

Investors and creditors need more information on the environmental impact of projects so that they can better assess the associated opportunities and risks and internalise environmental concerns in their decision-process. Businesses need to provide more information on the steps taken to integrate social and environmental concerns in their development strategies. Firms are strongly encouraged to incorporate climate issues into corporate social responsibility (CSR) reporting. Since 2010, this is even mandatory for listed companies and large corporations. In practice, this reporting obligation also applies to SMEs and VSBs that supply larger companies and form part of their production chains. However, smaller firms do not always have the necessary resources or know-how for an effective CSR reporting. The French Agency for the Ecological Transition (ADEME), which provides a range of training courses for companies, associations and public authorities, could offer specific modules designed to help smaller firms meet CSR reporting requirements.

The methodologies employed for analysing CSR reports remain very heterogeneous and, in some cases, not very transparent. For listed companies, analysing this information has led to the development of non-financial performance ratings, often called ESG ratings (based on environmental, social and governance indicators). The rating of companies by the Banque de France, which is currently based on the analysis of financial ratios, could also integrate non-financial criteria (I4CE, 2021a). However, without a harmonised regulatory framework, which, among other things, would allow for greater transparency of rating methodologies, the common practice of displaying environmental concerns that are not actually taken into account (“greenwashing”) could damage the credibility of CSR reporting and ESG ratings (Boffo and Patalano, 2020).

Several options could be explored to harmonise and improve the transparency of non-financial performance assessments. The creation of a single, freely accessible database of non-financial performance indicators would be one possibility. A regulatory framework laying down requirements for the way in which potential conflicts of interest are managed and internal controls carried out could be developed (Banque de France et al., 2020). External audits or certifications could be introduced for ESG rating agencies. The development of a taxonomy of sustainable activities should also help to harmonise methodologies for analysing non-financial information. Recent efforts by the European Commission - the publication of a first taxonomy on “environmentally sustainable” (or “green”) activities in June 2021, the revision of the European Corporate Sustainable Reporting Directive and the establishment of a single access point for companies’ information - represent big steps forward.

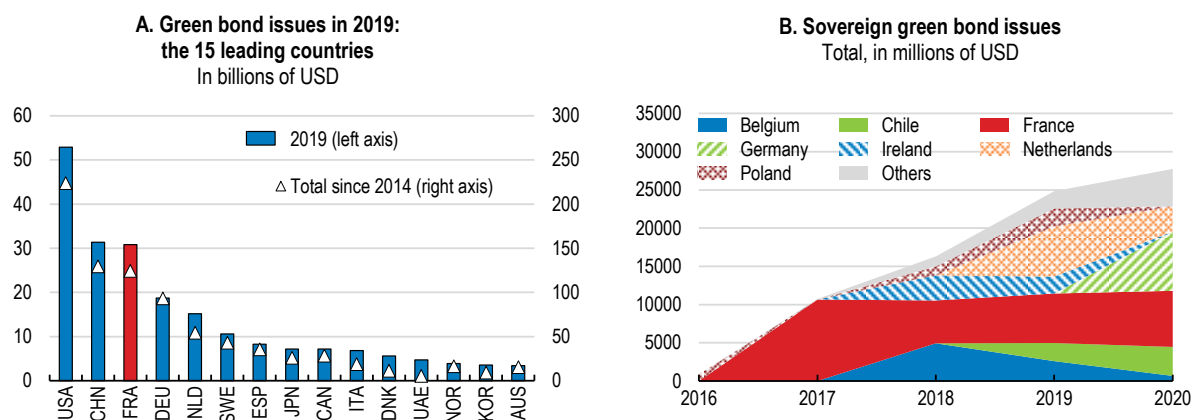
Final investors, including households, must also have access to appropriate information when they choose to invest through asset managers or institutional investors. The Ministry of the Economy and Finance has introduced a Socially Responsible Investment (SRI) label to distinguish funds whose strategy includes non-financial criteria. Funds that are SRI labelled must provide information about their investment strategy and how they monitor companies in which they invest. According to information published in the ministry’s website, the almost 700 funds that held SRI labels in March 2021 already had a total of almost EUR 470 billion in outstanding. In 2015, the Ministry of the Ecological Transition also created a “*GreenFin France Finance Verte*” label, highly demanding and focused exclusively on environmental issues. This guarantees the environmental quality of the labelled financial product and, in particular, excludes funds that invest in companies operating in the fossil fuel sector. However, it does not yet permit the large-scale development of a product offering for private individuals’ investment. In July 2021, 62 funds had been labelled, with a total of EUR 17 billion in outstanding. The differences between the *GreenFin* label and the SRI label should be clarified to avoid an excessive volume of information and prevent greenwashing practices. The regulators should also ensure that the existing labels remain consistent with the sustainable taxonomy developed by the European Commission.

The short-term orientation of investors is also an obstacle to the financing of the green transition. The majority of investors are under considerable pressure to obtain quick financial results. Many investment fund managers are remunerated according to the performance of their funds, which encourages them to seek a short-term return. Financial actors therefore find it difficult to commit beyond a horizon of three to five years (Carney, 2015). Index management practices, where selection of products, securities or sectors to be included in the portfolio is partially automated to track or surpass the performance of a reference market, discourage investors in engaging with the companies in which they invest and discussing green transition issues directly with them (ESMA, 2019). The development of a harmonised and transparent framework for analysing non-financial performance indicators, laid down in European law and whose progress is discussed above, and their integration in general indices could be a way of correcting the short-term bias. If this proves insufficient, the regulations governing remuneration practices could induce financial actors to defer drawing a proportion of the dividends until later, and beyond three years as it is the case currently. They could also encourage remuneration policies to be linked to portfolios’ non-financial performance indicators (I4CE, 2021a).

The green bonds market has expanded substantially in recent years, but remains less accessible to small and medium firms. These bonds are debt securities issued on the financial markets, where the issuer certifies that the funds will be used to finance projects with an expected environmental benefit. To that end, the supporting documents for each issuance must provide details of the projects concerned. However, it is up to investors to consult those documents in order to find out more about the nature of the investment. Therefore, the credibility of the issuer often plays a key role. The leading issuing countries are the United States, China and France (Figure 2.12, part A). After the issue of the second green bonds, with a maturity of 23 years, by Agence France Trésor in March 2021, France became the biggest sovereign borrower on that market (Bloomberg New Energy Finance, 31 March 2019; Figure 2.12, part B). The amount outstanding for this green bond was EUR 28,9 billion in March 2021. Aside from public administrations,

the main green issuers in France are large structures, with a limited risk profile and who already have access to financial markets, in particular, large energy and transport companies and large companies in the financial sector. Therefore, most of the projects financed by these bonds would have been financed in any case by conventional bonds (I4CE, 2018b). The development of the green bonds market requires that a precise and standardised definition of the objects financed by those bonds be recognised at the international level (Banque de France, 2019). The adoption of a European taxonomy for sustainable activities is a big step towards an official, standardised definition (OECD, 2020b). The European Commission also proposed a green bond standard in July 2021, which is intended to become an international benchmark.

Figure 2.12. France is one of the most active countries in the green bonds market



Source: Climate Bonds Initiative database and OECD (2020) "Business and Finance Outlook 2020".

StatLink  <https://doi.org/10.1787/888934285894>

Financial actors must be knowledgeable about the risks and opportunities associated with climate change, natural resources depletion and biodiversity loss. Some fields of knowledge, particularly those connected with the energy sector or innovative low-carbon and low-polluting technologies can be highly technical. Banking actors, in particular, are not always able to ask the right questions and therefore to finance the most relevant projects (I4CE, 2021a). However, they are often the only point of contact for SMEs, VSBs and households. Training in the banking sector must be adapted to include a minimum knowledge base on the financial implications of climate change and environmental policies.

Financial markets may take some time to adapt to increasing climate risks and the importance of resource efficiency. In the meantime, additional public action may be required. Green loans guaranteed by the State to small firms wishing to invest in cleaner technologies, infrastructures and processes (between EUR 50 000 and EUR 5 000 000 and up to 10 years), introduced in early 2021 and spread over the duration of the recovery plan, are welcome. Such publicly guaranteed loans will also encourage banking actors to acquire experience in assessing the quality of companies and local authorities' green transition projects. The authorities could consider extending these green loans guaranteed by the State beyond 2022.

The share of the sizeable amounts of household savings directed towards "green" investments is still low. These savings could represent a significant source of financing, since return is not the main motivation for households (Rüdinger, 2015). Increasing the credibility of "green" investment labels and their environmental benefits would create more incentives for households to invest in associated financial products. The "GreenFin" label, in particular, should be used more widely for products aimed at private individuals. If improving the credibility and transparency of these labels proves insufficient to attract higher volumes of households' savings, financial institutions should be encouraged to more systematically propose "green" investment opportunities to households. The 2019 PACTE Law obliges life assurance companies to offer at least one unit of account holding the SRI or "GreenFin" labels in any life assurance policy. This obligation could be extended to more financial institutions and financial products.

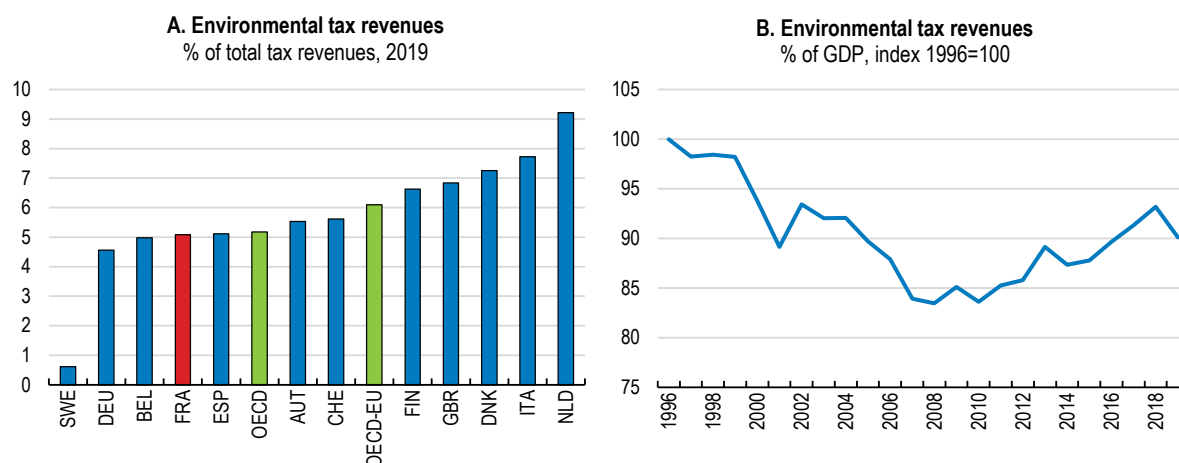
Climate change and ecosystem degradation pose a risk to the stability of the financial system. Going beyond raising financing to support the green transition, regulators must therefore also ensure the resilience of the financial sector as a whole in the face of growing threats from natural disasters and abrupt and disorderly green transitions (Allen et al., 2020). The first climate stress test was carried out in France by the Banque de France and the Prudential Supervision and Resolution Authority (ACPR). The results, published in May 2021, show that the exposure of the French financial sector is moderate (ACPR and Banque de France, 2021). However, the exercise highlighted a number of methodological limitations; financial institutions find it difficult to assess the market risk with such a distant time horizon, mechanisms for transmission of climate shocks to the real and financial economy are not yet well controlled, and the exercise is still sensitive to the selection of different scenarios (ACPR and Banque de France, 2021). It is therefore necessary to continue to improve the methodology of the climate stress test for the next exercise, which is planned for 2023.

Environmental taxation must be strengthened

Environmental taxation still has limited significance out of all tax revenues, with EUR 56 billion in 2018 (Figure 2.13, part A; Conseil des prélèvements obligatoires, 2019). The tax-to-GDP ratio is lower than in the mid-1990s despite a recent upswing (Figure 2.13, part B). The main reason for this downward trend, which can be observed in most European countries, is the absence of indexation for most of these taxes and the increased proportion of diesel vehicles in total car sales up to 2012, which are still subject to lower taxes (CGDD, 2017). The recent rise in revenues from environmental taxation, between 2014 and 2018, is mostly explained by the carbon component introduced in domestic taxes on consumption of *energy products* (TICPE), natural gas (TICGN) and coal (TICC), as well as by the alignment of diesel and petrol taxation (Conseil des prélèvements obligatoire, 2019). However, in the wake of the “yellow vests” movement, the carbon component of energy taxes, often called “carbon tax”, has been freeze at its 2018 level. The fiscal alignment between different types of fuels has been postponed to January 1st 2023 in the context of the economic crisis and tensions on the supply of raw materials.

Environmental taxes, and in particular energy taxes, are cost-effective in reducing energy consumption and associated emissions. A 10% increase in energy pricing can reduce energy consumption by French firms in the industrial sector by 6% without reducing the aggregate sectoral employment rate. In fact, the energy price increase encourages the reallocation of workers to the least energy-intensive and most efficient firms in the medium-term (Dussaux, 2020). There is actually no empirical evidence that the carbon tax has a meaningful impact on growth and the overall employment level (Metcalf and Stock, 2020; Dechezleprêtre and Kruse, 2018). Environmental taxation can even stimulate innovation in the design of less environmentally damaging products and processes and the development of new markets in the long-term (Kozluk and Zipperer, 2013). However, reallocation takes time, comes with costs and requires complementary policies (see above). In addition, environmental taxes can be regressive and, in some sectors, such as transport, the lack of alternative may significantly lower the price elasticity of energy demand, justifying compensation measures. Finally, the lack of social acceptability for higher carbon taxes may call for alternative or complementary policy instruments, such as standards, public bans or regulation, although research on the acceptability of environmental policies is still at an early stage (Box 2.4.).

Figure 2.13. Environmental taxation represents a low share of tax revenues



Note: The figures include environmentally related taxes, fees and charges, tradable permits, deposit-refund systems, environmentally motivated subsidies and voluntary approaches used for environmental policy. The data have been cross-validated and complemented with revenue statistics from the OECD Tax Statistics database and official national sources.

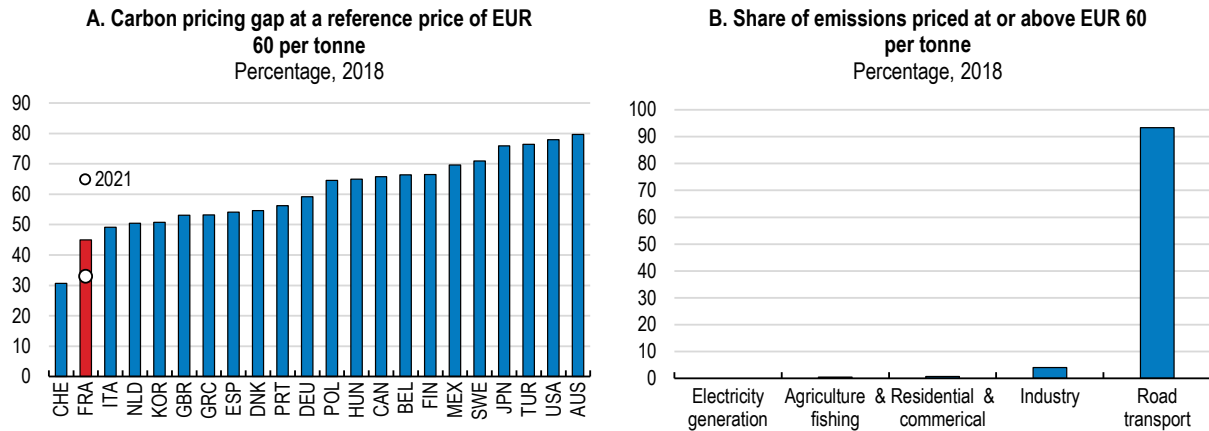
Source: OECD Green Growth Indicators.

StatLink  <https://doi.org/10.1787/888934285913>

Reforming energy taxes

Pricing of carbon emissions across sectors is uneven. Energy taxes, with the carbon component, and the average price of emission allowances under the EU Emissions Trading Scheme (EU ETS), determine the *effective* price of carbon emissions calculated by the OECD. Across all sectors, and in comparison with other OECD countries, the *effective* price of carbon in France is relatively close to the benchmark price of EUR 60 per tonne of CO₂, which is an estimate of the average cost to society from the emission of one tonne of carbon in 2020 (Figure 2.14, part A). In 2018, the proportion of CO₂ emissions covered by a price equal to or higher than EUR 60 per tonne was 55% in France, compared with 36% on average in the 44 countries covered by the survey (OECD, 2018). However, that proportion varies significantly between the different sectors under consideration, and in particular, between sectors covered and not covered by the EU ETS (Figure 2.14, part B).

Carbon prices applied in energy production and the industry, determined primarily by the EU Emissions Trading Scheme, have risen recently. In 2019, the price of an emission allowance in the EU ETS was still only EUR 24,7 per tonne (EEA, 2020). However, since the beginning of 2021 and the entry into force of a new European regulatory framework, the price of emission allowances has increased sharply and rose above EUR 50 per tonne of CO₂ equivalent in June 2021 (Box 2.2). With a price for emission allowances of EUR 50 per tonne of CO₂ equivalent applied to sectors and companies subject to the EU ETS, the difference between the effective price of a tonne of emissions and the benchmark price of EUR 60 would fall to 33% in France (Figure 2.14, part A).

Figure 2.14. CO₂ emissions are not all taxed at the same level

Note: The updated data point for France in 2021 is based on the higher price of emission allowances in the EU ETS at the beginning of the year. The calculation has only been updated for France, but the higher emission allowance price would also decrease the carbon pricing gap for other EU countries.

Source: OECD, Effective Carbon Rates (database).

StatLink  <https://doi.org/10.1787/888934285932>

Tax exemptions and reduced rates weaken the incentive effect of energy taxes for sectors and businesses which are not part of the EU ETS, namely buildings, agriculture and transports - sectors which are lagging behind their emissions cut objectives. For example, the use of non-road diesel fuel benefits from a reduced rate, in particular, in the construction sector. In 2018, this tax advantage costed almost EUR 2 billion in foregone fiscal revenues (I4CE, 2018a). The government had planned to abolish this tax advantage in 2019. However, after the “yellow vest movement” in 2018, the COVID-19 outbreak in 2020 and the still fragile economic situation in 2021, it backtracked three times and has been postponed to January 1st 2023. Fuel used by agricultural machinery also benefits from a tax credit. This tax credit represents 60% of tax expenditures for the agricultural sector and amounts to approximately EUR 200 million (OECD, 2020d; I4CE, 2018a). In the road transport sector, although the share of emissions that is taxed at the reference price of EUR 60 is much higher, there are also some tax advantages that reduce the incentive effect of energy taxes. The tax on road freight transport, for example, is partially reimbursed. In 2018, this represented more than EUR 1 billion of gross tax expenditure (I4CE, 2018a). The effective rate increased marginally in 2020 by two cents per litre, but this is not enough. The Climate and Resilience Law set the objective of abolishing that fiscal advantage by 2030, but the exact calendar and phasing out trajectory has not yet been defined.

Box 2.2. Revision of the EU ETS for phase 4 (2021-2030)

To increase the pace of emissions cuts, the overall number of emission allowances will decline at an annual rate of 2,2% from 2021 onwards, compared to 1,74% before.

The market stability reserve, a mechanism introduced in 2019 to reduce the surplus of emission allowances on the carbon market and prevent market imbalances, is being reinforced. The amount of allowances put in the reserve should increase to 24% of the allowances in circulation between 2019 and 2023, before returning to the regular feeding rate of 12% in 2024.

The system of free allocation will be prolonged for another decade and has been revised to focus on sectors at the highest risk of relocating their production outside of the EU. These sectors will receive 100% of their allocation for free. For other sectors, free allocation is foreseen to be phased out after 2026 from a maximum of 30% to 0% at the end of 2030.

Two new funds will be created to help energy-intensive industrial sectors and the power sector meet the innovation and investment challenges of reducing emissions: the Innovation Fund and the Modernisation Fund.

The European Commission proposal to revise the EU ETS in September 2020 included extending the scheme to cover the transport sector, including road transport and shipping. Including road transport in the ETS would increase the covered emissions by about 50%.

This type of fiscal advantages must be eliminated so that the price signal of energy taxes and the carbon component is maintained. In total, energy tax exemptions, tax credits and reduced tax rates amounted to EUR 6,9 billion in 2018 (I4CE, 2018a). Gradually withdrawing tax exemptions and reduced rates in energy taxes will help align the effective carbon price across different sectors of activity. Once these fiscal advantages have been removed and the carbon price is more balanced across all sectors, the gradual upward trend of the carbon component of energy taxes should resume so that these taxes do not lose their incentive effect over time and to avoid abrupt changes in the future.

Carbon dioxide emissions in the residential-tertiary sector are still barely taxed (Figure 2.14, part B). The price of CO₂ emissions in the residential and commercial sectors is determined primarily by the carbon component of the domestic tax on consumption of natural gas (TICGN). Consequently, it is above all a potential reduction of emissions in buildings that will be “missed” by freezing the rise in the carbon tax. If the carbon component cannot be increased immediately due to the lack of social acceptability, an increase in the excise duty on natural gas could be considered, which would not affect the already high *effective* price of carbon emissions in the transport sector. In fact, the TICGN has been stable at EUR 8,45/MWh since 2018, when it should have increased and reached EUR 14,13/MWh in 2021. The planned increase was supposed to contribute to finance the development of low-carbon energy production, such as biogas. The recent surge in gas prices and the government decision to smooth price increases over time make that policy particularly difficult to implement in the current context. However, this could be considered when gas supply tensions ease.

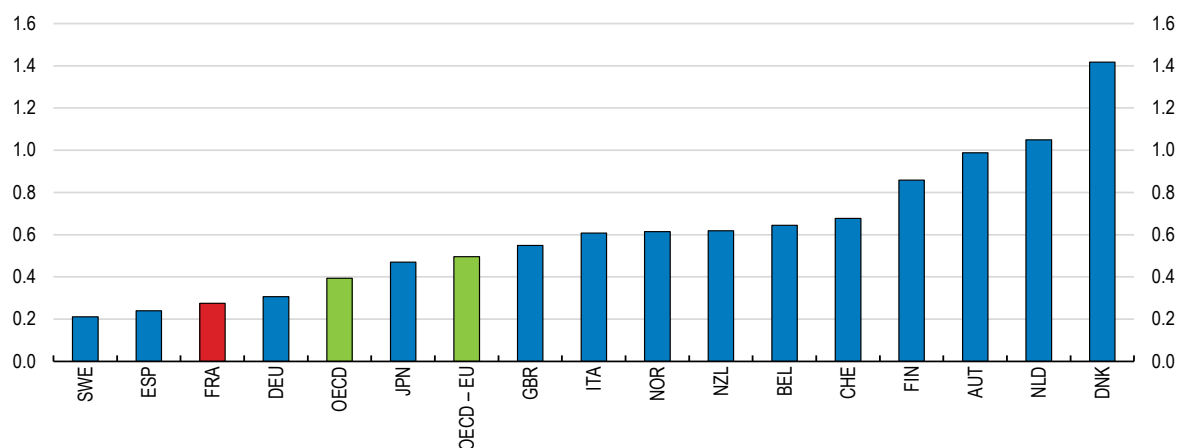
To avoid widening inequalities and the risk that households will not be able to meet their heating needs, while maintaining the incentive effect of energy taxes and the carbon component, compensation through more generous help-to-buy programmes should be given priority over exemptions, reduced rates or tax credits, or yet, direct financial redistribution. In the case of the tax on natural gas, the redistribution of one third of additional revenue to low-income households would be sufficient to attenuate the risk that they are unable to meet their heating needs (Flues and van Dender, 2017). Furthermore, the introduction of redistribution mechanisms increases the acceptability of environmental taxes like the carbon component of energy taxes (Box 2.4).

Strengthening other environmental taxes

Environmental taxation in France is mainly based on energy taxes, which account for three quarters of environmental tax revenues (CGDD, 2017). Taxes on transport excluding fuel, meant to reduce air pollution, congestion and noise, are particularly low compared with the OECD average (Figure 2.15). The tax on car registration certificates is also low in comparison with other European countries. Furthermore, there are many exemptions from the tax on company vehicles, and the performance criteria for the motor vehicle bonus/malus scheme could be strengthened, as discussed in the next section. The abolition of the “*vignette*” in 2000 reduced taxation on transport by one quarter, and since then, no other tax on vehicle ownership has been introduced (CGDD, 2017). The calculation method for the tax on registration certificates and the tax advantage for company cars should be reconsidered (Conseil des prélèvements obligatoire, 2019).

Figure 2.15. Taxes on transport excluding fuel are below the OECD average

As a % of GDP, 2019



Source: OECD, Environmental tax statistics.

StatLink  <https://doi.org/10.1787/888934285951>

France could consider introducing a tax on heavy goods vehicles, like its European neighbours. This “*ecotax*” would add to tolls on the main motorways. The idea of an “*ecotax*” in Île-de-France and Alsace is now gaining ground and the Climate and Resilience Bill opens up this possibility to any interested regions. The measure should be applied nationally. Switzerland was the first country on the continent to officially introduce an “*ecotax*” in 2001, applying to all domestic and foreign heavy goods vehicles weighing more than 3.5 tonnes. The value of the tax is based on vehicle weight, mileage and the level of polluting emissions. The rate varies between CHF 2,28 cents and CHF 3,10 cents per tonne-kilometer (approximately EUR 3 cents). This tax would have contributed to lower emissions of fine particules by 10% and emissions of nitrogen oxide by 14% (Office fédéral du développement territorial, 2015). Considering the annual volume of traffic of heavy vehicles in France, an equivalent tax could raise approximately EUR 10 billion (0,5% of GDP). Austria followed this example in 2004, as did Germany in 2005. Other countries like Denmark, Luxembourg, the Netherlands, Sweden and Belgium have opted for a Eurovignette system based on the actual time which vehicles spend on the road.

Greenhouse gas emissions other than CO₂, such as methane and nitrous oxide, coming mostly from the agricultural sector, and hydrofluorocarbons (HFCs), coming primarily from air conditioning and refrigeration systems in the residential-tertiary sector, are hardly taxed (Section 1; CGDD, 2017a). Industrial emissions of nitrous oxide have been included in the EU ETS system since the third revision of the legislative framework for the trading system, but emissions from other sectors are not always taxed (Box 2.2). A tax on HFCs was planned in 2021, but its introduction has been postponed to 2023. The introduction of this tax should no longer be postponed.

Fiscal instruments applying to soil and water pollution, as well as consumption of natural resources, remain weak. Taxes on air and water pollution account for only 6% of environmental taxes compared with almost 20% in the Netherlands, for example (CGDD, 2017a). The general tax on polluting activities is still lower than the decontamination costs and investment costs on cleaner technologies (Cour des comptes, 2020). Charges levied by water supply agencies do not cover the use of mineral fertilisers, which are very damaging to some ecosystems. Finally, taxes on the extraction of non-renewable resources are low and have barely evolved in recent years (CGDD, 2017a). The level of these taxes must be revised upwards if they are not to lose their incentive effect. A levy on nitrogen fertilisers could also be introduced to reduce soil and water contamination (Sud, 2020). The Climate and Resilience Bill establishes that a charge will be introduced if targets for the reduction of emissions connected with nitrogen-based agricultural fertilisers are not met, which is a step in the right direction. In Sweden, the introduction of a tax on nitrogen oxide (NO_x) emissions proved quite effective (Box 2.3).

Box 2.3. The Swedish tax on nitrogen oxide (NO_x) emissions

A strategy to reduce overall NO_x emissions by 30% was adopted in Sweden in 1985. Combustion plants were imposed different individual quantitative emission limits through a licence system. Nevertheless, it quickly became clear that those emission limits would not be sufficiently effective to achieve the emissions reduction objectives. The Swedish Parliament decided in 1990 to supplement the individual ceilings by a tax of SEK 40 per kilogramme of NO_x emitted by any stationary combustion plant producing at least 50 MW of useful energy per year. At the time, around 200 plants were concerned.

In three years, average emissions per unit of useful energy produced fell by 40%. The tax was then extended to all stationary combustion plants whose energy production was higher than 10 MW of useful energy per year, in the heat and electricity production sector, the chemical industry, waste incineration, metallurgy, pulp and paper, foodstuffs and the timber industries. In 2008, the tax was increased to SEK 50 (EUR 5,5) per kilogramme of NO_x so as to preserve a strong incentive to reduce emissions. Revenues from this tax reached about EUR 85 million in 2010.

Source: OECD (2014), *OECD Environmental Performance Reviews: Sweden 2014*, OECD Publishing, Paris.

Support for households and firms must increase to improve social acceptability

Environmental taxes, like other indirect taxes, are more onerous for low-income households. The poorest 20% households spend 7,2% of their income on energy, compared with 2,1% for the wealthiest households (Conseil des prélèvements obligatoire, 2019). The carbon tax also places a proportionally greater burden on households who live far from large urban and peri-urban centres, with limited access to public transport infrastructure. Environmental taxation can also have detrimental effects on the competitiveness of French firms. A rise in environmental taxes can cause “carbon leakage” and the relocation of polluting, high-emission activities, outside France or the European Union, to countries with less or little environmental regulation. Even if this is partly compensated by a reallocation of resources to “green” sectors and more environmental-friendly firms within France, transition costs can be significant and concentrated on a few individuals and stakeholders.

The lack of social acceptance for stricter environmental policies and, in particular, higher environmental taxes, makes their introduction quite difficult. In France, the carbon tax increase and the alignment of diesel and petrol taxation in 2018 faced strong public opposition. After the “yellow vests movement”, these measures were put on hold and the whole notion of increasing environmental taxation was called into question. Several factors could explain the strong public opposition: the scheduled tax increase was too steep at a time when oil prices were rising sharply, the social benefits were not well understood, the climate-related motivation was met with suspicion, and no compensation scheme for more vulnerable households and firms had been planned (CEDD, 2019c). The “red hats movement” in 2013, following the attempt to introduce a tax on heavy goods vehicles, is another example of strong public opposition to higher environmental taxes.

The socio-economic effects of environmental policies must be carefully studied. Impact assessments must not only identify the most cost-effective abatement measures, but also understand how those abatement measures will be distributed across the population and firms. Impact assessments must select appropriate quantitative or qualitative methods and be transparent as to the evaluation criteria used, assumptions made and methodology chosen. They must also be independent, and their findings must be widely disseminated (HCC, 2019). Based on these studies, the design of environmental policies or the development of an appropriate compensation mechanism should be considered if necessary. As previously discussed, France can still improve the assessment framework of its environmental policies. The socio-economic and regional impact of the Climate and Resilience Bill, for example, are only briefly mentioned in the bill’s prospective impact study (HCC, 2021b).

Improving communication and transparency regarding the use of environmental taxes would help to increase social acceptance (Box 2.4). Environmental taxes will only be accepted as legitimate if the objective of reducing emissions is clearly communicated and credible. The carbon tax, for example, has only been accepted in countries where institutional trust is high and communication on the measure was carefully considered, such as Sweden, Denmark and Norway. To improve communication efforts, the French government has started publishing annual reports on the environmental impact of the state budget, known as “Green Budgets”. However, pedagogy may not be enough. Switzerland, for example, has introduced an automatic adjustment mechanism for its carbon tax, based on the trajectory of its emissions, for environmental taxes not to be seen as yet another revenue-generating tax (Box 2.5).

Compensation mechanisms for the effects of environmental taxes on the most vulnerable households and firms can improve. Revenues from environmental taxes could be used to strengthen help-to-buy schemes for cleaner vehicles, more efficient boilers, cleaner productive technologies, or support the energy renovation of buildings, as in Switzerland (Box 2.5). Help-to-buy schemes should be preferred over tax exemptions or the complete financial redistribution of revenues so that the incentive effect of environmental taxes is preserved. Using revenues from environmental taxes to subsidise equipment changes also makes it possible to effectively target the losers from these reforms, that is to say, those who have polluting equipment and are subject to higher taxation. In France, since its introduction in 2014, less than a quarter of the carbon tax revenues have been used to invest in the green transition or to compensate vulnerable households. Revenues from the carbon tax have mostly been used to reduce the state budget deficit (ADEME, 2019; Conseil des prélèvements obligatoires, 2019). In 2018, compensation measures amounted to only EUR 180 million, while additional expenses for households stemming from the rise in the carbon tax had been estimated at EUR 3,7 billion (Husson, 2017).

An increase in environmental taxes could be compensated by a reduction in other taxes. Revenues from the carbon tax, which represented EUR 6,4 billion in 2017 (I4CE, 2018b), could be used to reduce income taxes or taxes on the relatively low-carbon electricity. In Sweden, the increase in the carbon tax in 2000 was accompanied by a reduction in other forms of taxation to limit its negative distributive effects (Box 2.6). In Denmark, the rise in fossil fuels taxes was accompanied by a reduction in taxes on electricity consumption, in particular during periods of low demand. The acceptability of the carbon tax could increase if revenues are used along these lines (Box 2.4).

To safeguard the competitiveness of French and European firms, solutions must be sought on the basis of international cooperation with trade partners. For example, the European Commission project to revise the Community framework for excise duties on energy and the exemptions allowed, paused in 2015, should be resumed (Conseil des prélèvements obligatoires, 2019). An European initiative to harmonise the taxation of heavy goods vehicles could also be envisaged to reduce emissions associated with road freight transport and give priority to rail freight without, however, undermining the competitiveness of French road transport and logistics companies compared to their European peers.

Finally, the introduction of a carbon border adjustment mechanism, whereby imports of products with a high carbon content require the purchase of CO₂ allowances, whose price would be aligned to those on the European market (EU ETS), advocated by France since 2009 and proposed by the European Commission in July 2021 with the “Fit for 55” package, could play a useful role in preventing carbon leakage. The mechanism would have the benefit of not weakening national incentives to reduce emissions (European Commission, 2021; OECD, 2021e). Such a measure must not be used for protectionist purposes. The mechanism would therefore have to be carefully designed, take into account countries’ commitments under the multilateral trading system and remain compatible with the principles of the World Trade Organization (OECD, 2020e; OECD, 2021e).

Moving to a more sustainable economic model will not be possible without a properly skilled workforce. Skills gaps and shortages are already a major bottleneck in a number of sectors linked with the transition, such as production of renewables, building energy renovation and sustainable farming (OECD, 2020c). Changes in skill needs must be anticipated and monitored. This is the role of the Observatory for Jobs and Occupations of the Green Economy (Onemev), who organised a series of consultations with representatives from each sector affected by the green transition between 2012 and 2015. However, in light of the rapid developments, those consultations should be held more regularly or other methods should be developed to follow progress in real time.

Support to regions and territories adversely affected by the transition should also improve. The green transition has heterogeneous effects on the local economy and labour markets. For example, the potential for renewables is not the same for all regions. The closure of fossil-fired power plants by 2022 will strongly impact the *départements* of Loire Atlantique, Seine-Maritime, Bouches-du-Rhône and Moselle. The closure of several nuclear reactors could also negatively affect the “*communes*” surrounding those nuclear centrals. In fact, beyond the highly-qualified direct jobs created by the centrals, there could be as many indirect jobs as 60% of the centrals’ employees (INSEE, 2014). However, tools to obtain a regional breakdown of labour market trends relating to the green transition have not yet been developed. For instance, data are not always available at the subnational level, as discussed previously. Labour market data collection could improve by conducting employers’ surveys that specifically take green transition issues into account and allow for the results to be disaggregated across territories. The use of high-frequency data, derived from “web-scraping” job websites, could also be envisaged. Results must be accessible to all relevant stakeholders, such as social partners involved in the development of vocational training programmes, and advisers of regional bodies and local career guidance organisations, who can point displaced workers towards relevant training programmes (OECD, 2017b).

Box 2.4. Social acceptance of environmental measures in France

Results from an ongoing OECD study on the social acceptability of environmental measures in France show that voters would be less opposed to carbon taxes if revenues were fully redistributed to households and firms, compared with the same tax without any compensation mechanism (Figure 2.16). Out of different possible uses for the carbon tax revenue, French voters seem to favour investment in “green” infrastructures, especially public transport, or else, a reduction in income taxes, as in Sweden (Figure 2.17; Box 2.6).

This study also shows that bans are sometimes perceived less negatively than taxes, at least initially (Figure 2.16). This suggests that non-market-based measures could be considered as alternatives in some instances, although they are less cost-efficient in reducing carbon emissions (Furceri et al., 2021).

Figure 2.16. Public support for carbon taxes remains low

Answers to the question “Do you support the following measures?”

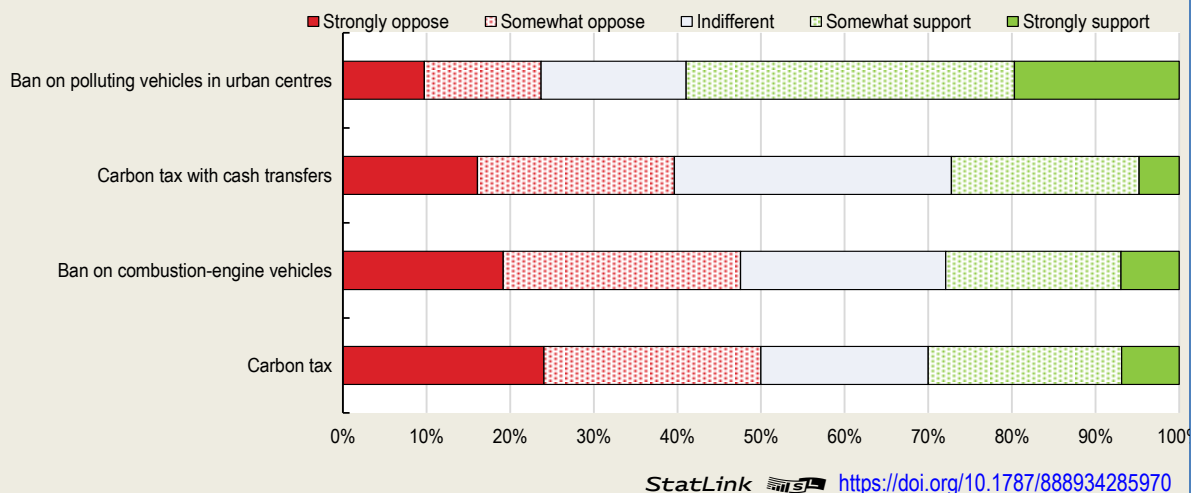
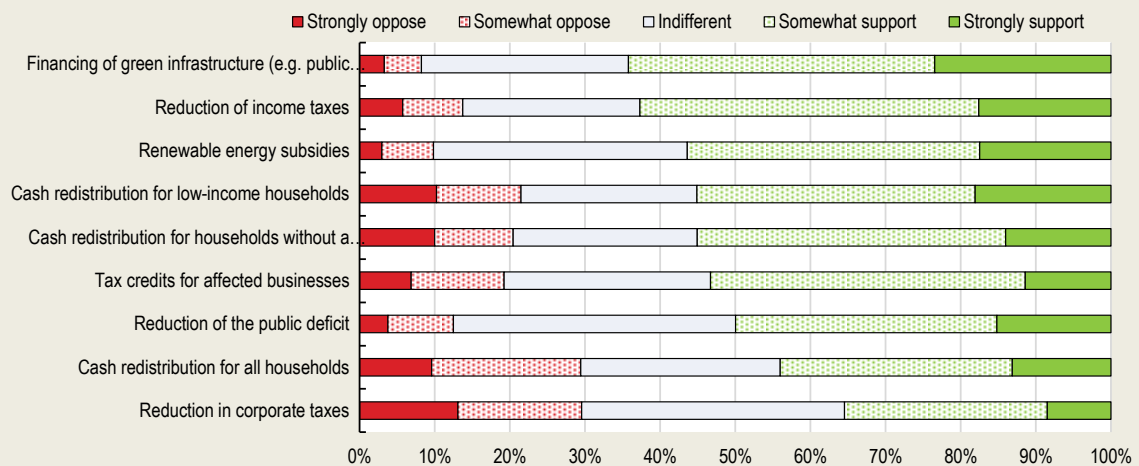


Figure 2.17. Using carbon tax revenues to finance green infrastructures would increase social acceptance

Answers to the question “Do you support a carbon tax if the revenues are used to...?”



Source: Dechezleprêtre et al. (forthcoming), *Preliminary results: Weighted, representative sample of 1 691 observations.*

StatLink <https://doi.org/10.1787/888934285989>

Box 2.5. Adjustments to the carbon tax based on the distance to targets in Switzerland

In 2011, Switzerland introduced an adjustment mechanism to its carbon tax, based on whether or not interim emissions reduction targets are met. If the targets for reducing CO₂ emissions fixed each year are not met, the planned increase in the carbon tax takes effect automatically. If the targets are met, or even exceeded, the carbon tax remains at the same level and the planned increase is deferred to the following year. Therefore, the State does not receive additional revenues when emissions reduction targets are met. In addition, efforts to reduce emissions are rewarded with lower tax increases.

Regarding compensation mechanisms, one third of the revenues from the carbon tax in Switzerland is earmarked for programmes to support building energy renovation to reduce energy consumption. The remainder is redistributed uniformly to all Swiss residents through lower health insurance premiums, regardless of their income.

Source: Bureau et al., 2019; World Bank, "Using carbon revenues", Technical Note No. 16, August 2019.

Box 2.6. How Sweden compensated for the increase in environmental taxes

The carbon tax rate in Sweden rose from EUR 40 to EUR 90 per tonne of CO₂ equivalent between 2000 and 2004. Other environmentally related taxes, including taxes on electricity, fuels, vehicles, landfilling, gravel and pesticides, also increased in the same period. These increases were accompanied by a rise in the minimum income tax threshold so that the purchasing power of the lowest-income households would not worsen. Sweden is thus one of the few countries that has managed to redistribute the tax burden from labour to environmentally damaging activities.

As a result of the "green" tax shift and the progressive increase in environmental taxes, final energy intensity (final energy consumption per unit of gross domestic product) has declined significantly, as has the carbon intensity of the economy (CO₂ emissions from combustion of energy sources per unit of GDP). According to Sweden's Ministry of Finance, the increase in energy taxation has had no negative impact on economic growth or employment. Several studies indicate that Sweden has nearly neutralised the potentially regressive effect of the tax reform. That reform resulted in increased disposable incomes for most income groups, although the highest and lowest income group experienced slight declines.

Source: OECD (2014), *OECD Environmental Performance Reviews: Sweden 2014*, OECD Publishing, Paris

2.3. The cost-effectiveness of some sectoral policies can still be improved

Sectoral policies to reduce emissions are sometimes poorly designed or insufficiently ambitious. Environmental policies directed at the transport sector and the residential and commercial buildings sector, in particular, must become more cost-effective. Development of renewables must also accelerate, to reduce emissions of greenhouse gases and air pollutants, and to diversify the electricity mix, while reducing the share of nuclear power to 50% by 2035.

Mobility-related measures can be better designed

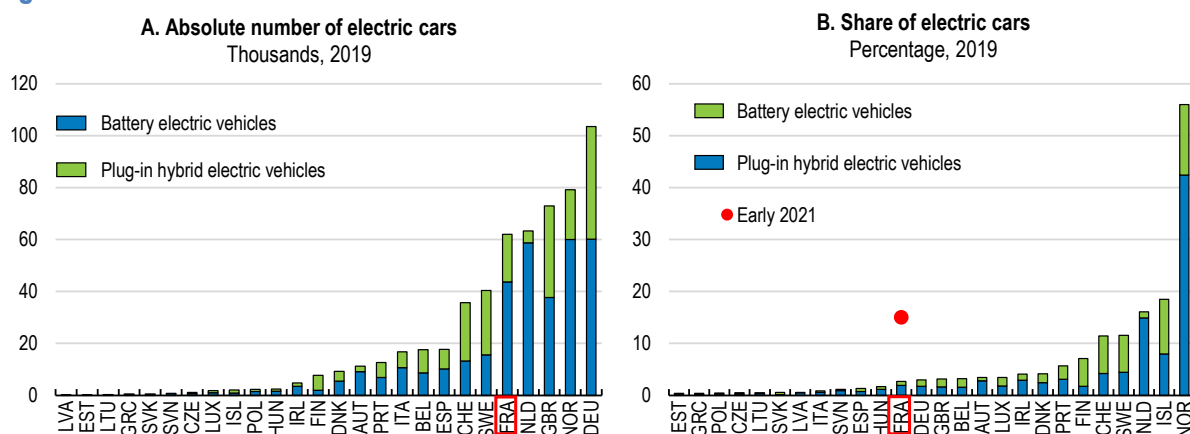
The demand for mobility has increased considerably in recent years, particularly for road transport. The rise in road transport compared to other means can be seen in both passenger transport and goods transport, including heavy and light-duty vehicles. Therefore, pending the extension of the EU ETS scheme to road transport, efforts to reduce the carbon intensity and pollution from motor-vehicle must continue. These efforts must be accompanied by measures to reduce demand for mobility and encourage the use of alternatives to road transport, such as rail.

Promoting the use of electric vehicles

The largely decarbonised electricity mix in France, particularly on account of nuclear power and renewables, means that the large-scale deployment of electric vehicles and plug-in hybrids can be particularly effective in reducing emissions linked with the transport sector (OECD/IEA and OECD/NEA, 2020). Electric and hybrid vehicles could be largely deployed for passenger transport, but also when it comes to deliveries using light-duty vehicles, whose emissions continue to increase. The price of electric vehicles and plug-in hybrids is one of the obstacles to their large-scale deployment. In fact, buying a fully electric vehicle still entails a considerable additional cost (Dive and Duvergé, 2019).

The “conversion premium” scheme and the “ecological bonus” have contributed to increase the sale of electric and hybrid vehicles, for individuals and professionals, while supporting innovation in the automobile sector. In fact, although these programmes can be quite costly, for the same volume of emission reductions, help-to-buy schemes for less polluting vehicles generate fewer losses and allow greater flexibility for businesses in the automobile sector, compared to regulatory instruments (Durrmeyer and Samano, 2017). Standards and prohibitions are also more likely to suffer from lobbying and administrative burden (Blanchard and Tirole, 2021). In 2020, the “conversion premium” was temporarily increased to support the automobile sector, severely hit by the crisis. Consequently, despite an overall fall in private passenger car sales, the sale of electric vehicles in 2020 increased by 259% compared to 2019 (ADEME, 2021b). In early 2021, 15% of new cars sold were either electric or plug-in hybrid (Figure 2.18). The amount of support for passenger private vehicles has already been readjusted and revised downwards in 2021. Nonetheless, in a welcome move, this has been compensated by an increase in the amount provided for the purchase of electric and plug-in hybrid light-duty vehicles in July 2021.

Figure 2.18. The sales of electric vehicles have accelerated



Note: Data for 2021 in panel B is preliminary and the data for other countries is likely to change too.

Source: European Environment Agency.

StatLink  <https://doi.org/10.1787/888934286008>

Eligibility criteria for help-to-buy schemes are not ambitious enough. The “conversion premium” can still finance vehicles emitting more CO₂ than the threshold imposed on motor vehicle constructors by European standards. Similarly, the “ecological malus” applies only from thresholds higher than those set by the European rules. The help-to-buy schemes for less polluting vehicles must be adapted to offer the right incentives and be better aligned with environmental ambitions in the transport sector. The “ecological malus” (“malus écologique”) has been strengthened in 2021 and should progressively become more binding up to 2023. The revision of the malus could, nonetheless, be carried out prospectively to ensure *ex ante* an alignment between the bonus-malus scale, targets under the national strategy and European goals.

There are other measures in the transport sector that are also not sufficiently aligned with European ambitions. The “Climate and Resilience law” bans selling vehicles emitting more than 95g CO₂/km starting from 2030, as a step towards banning thermal vehicles sales in 2040. However, this seems already outdated. The European Commission package “fit for 55” suggests banning thermal vehicles sales already in 2035. France is also the only EU country who does apply the European directive imposing a compulsory technical control for two-wheeled motor vehicles. Such controls can identify the most polluting vehicles so that they are equipped with filtration systems. Other measures though, deserve some recognition. The introduction of the weight criterion into the “ecological malus”, which is planned from January 2022, will help slow down sales heavy and polluting vehicles, such as SUVs. Taxing cars according to weight will also encourage the vehicle industry to develop lighter electric cars, which will reduce their energy consumption and the size of the batteries needed for their operation, and indirectly the emissions associated with batteries manufacture.

Autonomy is still a barrier to the large-scale deployment of electric vehicles and the installation of charging infrastructures has been slow (Dive and Duvergé, 2019). The recovery plan devotes EUR 100 million to the installation of fast charging stations across service areas in the motorway network. This aid can be combined with another public support scheme of up to 75% of the network connection cost. These charging stations will encourage the use of electric vehicles outside urban areas, especially for deliveries. Nevertheless, for private individuals, a study conducted in Norway indicates that 97% of electric vehicle owners recharge their vehicles at home (OECD/IEA, 2018). The 2021 Budget extends the flat-rate tax credit for the installation of electric charging stations in private car parks to tenants, free occupants and secondary residences, which is a step in the right direction. To allow those who do have a private car park to access a charging station close to their homes, a programme for the deployment of on-demand charging stations, managed on a decentralised basis by regional and local authorities, was introduced in 2016: the

ADVENIR programme. This programme, which has been extended for the 2021-2023 period, can ensure that on-street charging stations will be adequately used. This programme also provides support for the installation of charging station in co-owned and office parkings. Information about the ADVENIR programme should be more widely circulated.

Regulating demand for road transport

The introduction of congestion charges could be envisaged in large towns and cities. Urban congestion charges can already be introduced on a trial basis, but the excessively short trial period deters local authorities, given the high fixed costs of setting up such systems. The “Crit’air” vignette, introduced in 2017, classifies vehicle’s according to their environmental impact and can be used to impose bans on the most polluting vehicles in certain zones and/or at certain times. Under the “Climate and Resilience Law”, these low-emission zones will be expended significantly. However, there is still significant social opposition to banning polluting vehicles from urban centres (Box 2.4). The benefit of congestion charges, as opposed to traffic bans, is that, in the absence of public transport alternatives, lower-income households can still access urban centres, using carpooling and cost sharing, for instance, which increases the social acceptability of the measure. Furthermore, revenue from these charges can be used to invest in the development of public transport, which may partially compensate for the regressive effect of the congestion charges. Adjusting the amount of the charges based on the time of the day or week and traffic volumes allows users to adapt their behaviour so as to equalise the charge paid and the marginal cost to society of using the vehicle to access urban centres (OECD/ITF, 2021; OECD, 2019e). Several European cities have successfully introduced congestion charges on road traffic (Box 2.7). The trial period for urban congestion charges should be extended in France to increase its feasibility.

Box 2.7. Congestion charges in London, Stockholm and Milan

Congestion charges in London, Stockholm and Milan have brought a number of benefits. The number of private vehicles on the road in the city centre has fallen by 21% in London, 28.5% in Milan and 29% in Stockholm. Emissions of fine particulate matter (PM₁₀) have also fallen by 18% in Milan and Stockholm and by 12% in London. In the three cities, congestion charges also created advantages for public transport services, increasing the speed and regularity of the bus network.

In Stockholm, to encourage social acceptance of congestion charges, the scheme was initially introduced for a seven-month trial period. The trial scheme was accompanied by significant investment in the public transport network.

Source: OECD/ITF (2018a; 2018b; 2019 and 2021).

In order to reduce demand for road passenger transport, the use of other means of transport must be encouraged, particularly active means of mobility. Restricting the eligibility for electric bicycles premiums to individuals living in an area where local authorities offer co-financing, has held back the development of this means of transport (Rüdinger et al., 2018). Eligibility criteria for help-to-buy schemes for electric bicycles should be more relaxed. The measure in the “Climate and Resilience Bill” to extend the conversion premium for the scrappage of polluting vehicles to electric bicycles purchases is a positive step. Measures to encourage the faster deployment of cycling infrastructures should also be considered.

Developing rail freight

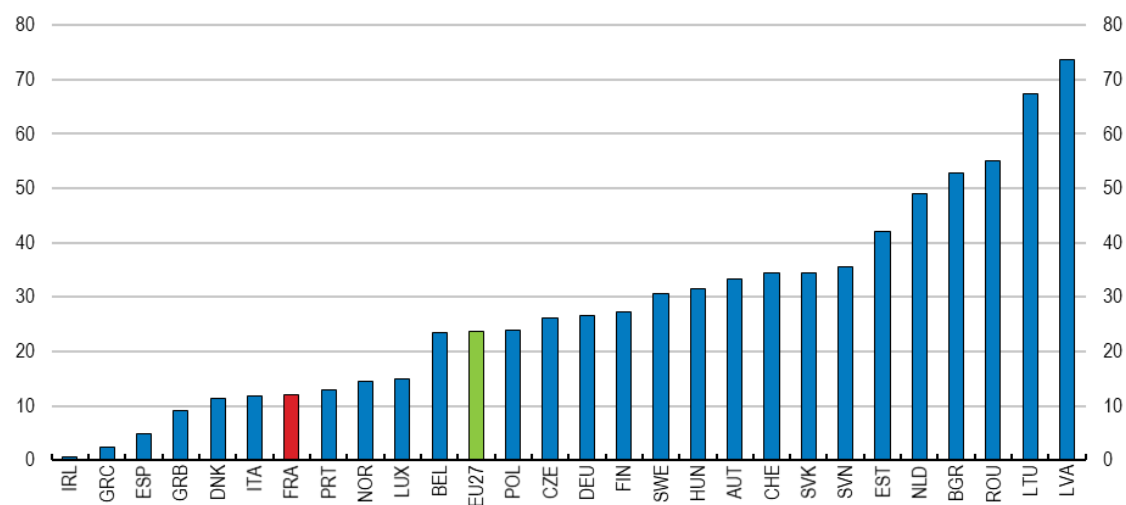
The share of rail freight in goods transport has fallen since 2000 and has stagnated in recent years, whereas it could contribute to reduce greenhouse gas and pollutant emissions (Briand et al., 2019). The share of rail in goods transport, per tonne-km, in 2019 was only 12% (Figure 2.19). However, rail freight emits eight times less fine particulate matter than road freight transport and nine times less CO₂ per tonne-kilometre (Geoffron, 2020).

Freight is too often penalised in relation to passenger transport, which limits its attractiveness. Throughout the rail network, the risks of breakdown and delays are too high and primarily penalise freight on account of the priority given to passenger transport, particularly high-speed lines, the socio-economic benefit of which is not always proven or evaluated prior to the investment decision. In Switzerland, passenger and goods transport by rail have been on an equal footing since 2018. Further studies are needed to assess the relative socio-economic benefits of passenger rail and freight rail transport to optimise the share of freight that should have priority over passenger rail transport.

The lack of maintenance of existing rail transport infrastructure has been detrimental to the quality of rail transport services (OECD, 2019a). A great deal of maintenance and renovation work is needed to make rail transport more efficient, particularly for freight (Geoffron, 2020). Some feeder lines running closer to shippers, for example, would need to be modernised (Dive and Duvergé, 2019). Investment in rail infrastructure has increased in recent years, but efforts must continue (Figure 2.20). In a welcome move, the government announced in September 2021 that financial support to the rail freight transport sector, representing EUR 170 millions per year, would be prolonged up until 2024.

Figure 2.19. The share of rail freight is relatively low

% of goods transport by rail



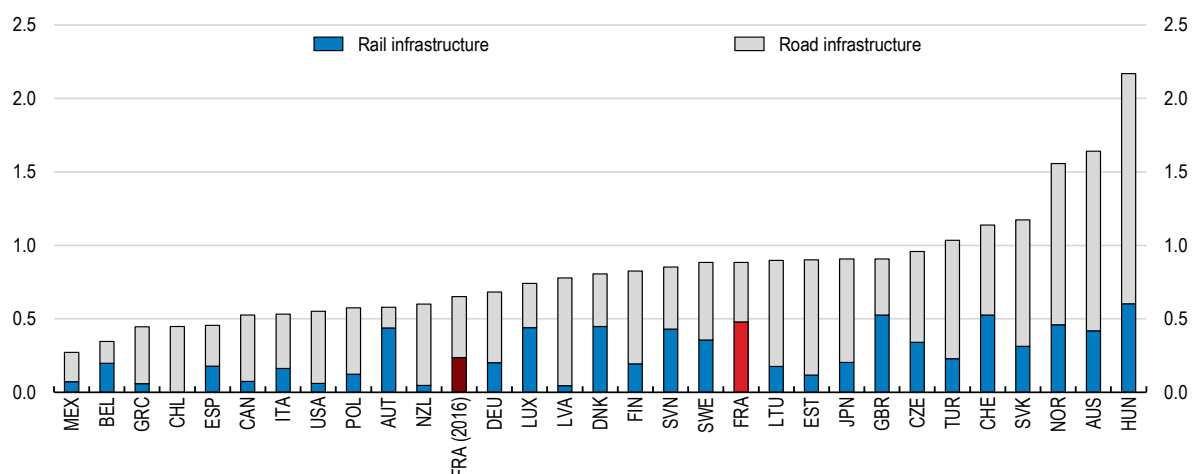
Source: Eurostat, Rail transport statistics.

StatLink  <https://doi.org/10.1787/888934286027>

The strategic planning of rail infrastructures and logistics networks should be better coordinated. Recently, certain ports have been redesigned to improve their road connectivity and excluding the possibility that shipments are carried by rail following their arrival at the port (Dive and Duvergé, 2019). The planning of major logistics infrastructure projects, such as ports or large warehouses, must anticipate and take into account the planned development of rail freight and rail network in distribution chains.

Figure 2.20. Investment in rail infrastructure has increased

As percentage of GDP, 2019 or latest year available



Source: OECD, International Transport Forum (database).

StatLink  <https://doi.org/10.1787/888934286046>

Buildings' energy performance must increase

The new Environmental Regulation for Energy Efficiency of New Buildings (RE2020), announced in 2020 and set to replace the 2012 rules, is particularly stringent regarding insulation, decarbonisation of energy systems and selection of construction materials with a low environmental impact. It should help to reduce greenhouse gas emissions from new buildings. However, its entry into force, initially planned for 2021, was delayed to 2022 for the residential sector and postponed six months for offices and buildings in the tertiary sector.

Support programmes for the energy renovation of existing buildings is the main tool for increasing their energy efficiency and reducing their energy consumption and carbon footprint. This policy could also create jobs and boost economic activity at a time when the government is seeking to revitalise the economy following the COVID-19 crisis. The buildings sector has already benefited from substantial investments. In 2015, renovation works in the residential-tertiary sector had already amounted to almost EUR 40 billion (Rüdinger, 2015). The recovery plan devotes an additional sum of more than EUR 6 billion to the renovation of buildings up to the end of 2022. Nevertheless, the results observed consistently seem to fall short of expectations. Even if renovations are carried out in many buildings, they do not systematically lead to an improvement in their thermal performance (CGDD, 2021).

Strengthening the statistical monitoring of energy renovations

In the absence of comprehensive, reliable survey tools, it is not possible to record the exact number of energy renovations carried out each year. Unlike building construction works, there is no requirement to make an administrative declaration for energy renovations. Surveys on existing individual buildings or private housing are conducted only on an *ad hoc* basis. Statistical monitoring of energy renovation works should improve and it should be possible to quantify the number of renovations that led to higher energy performance. The creation of a National Energy Renovation Observatory (ONRE) in 2019 could help addressing the issue. The first publication by ONRE, in May 2021, provides the most complete overview of energy renovations available up until now (CGDD, 2021). However, the resources allocated to the Observatory are meagre given the scale of the task (Descoeur and Meynier-Millefert, 2021). The "Climate and Resilience" law will oblige home owners, starting from 2023, to keep an online record of each new housing built and each energy renovation work carried. This will improve the statistical monitoring of building renovations, and in particular, for private housing.

Few of the energy renovation works surveyed so far have led to significant energy savings. Only 5% of energy renovation projects surveyed between 2014 and 2016 had a significant impact on energy consumption. The Rental Housing Observatory, which is attached to the Social Union for Housing, estimates that 162 503 social housing units were renovated in 2019, but only 104 000 changed energy label as a result of these works. The High Council on Climate estimates that only 0.2% of energy renovations in the residential and tertiary sectors led to the “low consumption building (BBC)” classification (HCC, 2020d). An analysis of the data available for the most recent period (2016-2019) shows that, even though the situation has improved, many energy renovation works still do not lead to thermal performance improvements (CGDD, 2021). Consequently, the net discounted benefit of the energy renovation for an average home is negative (Blaise and Glachant, 2019). The challenge seems to be, first and foremost, to improve the cost-effectiveness of energy renovations and to encourage renovations that lead to significant energy savings.

Simplifying support programmes for households and firms

The complexity of administrative procedures to benefit from public support programmes is often seen as a barrier to buildings energy renovation. A multitude of public policies and instruments are offered to individuals and firms to accelerate buildings energy renovation (Box 2.8), but information is scarce, scattered and the lack of guidance for those wishing to carry out renovation works is detrimental to their effectiveness (Sichel, 2021). The Public Service for Energy Performance in Housing (SPPEH), created in 2013, refers households to specialised agencies based on their needs. Branch offices of the National Housing Agency (ANAH), ADEME and some regional and local authorities also offer dedicated information and advice services, for both households and firms. However, even here, the multiplicity of information and support points requires simplification. The “Climate and Resilience Law” creates a new status of certified public operators, who will offer guidance to households in their energy renovation plans, in particular to set up a financing plan and apply for the available public support, which is already a significant improvement compared to the current situation. Nevertheless, further steps could be taken to simplify access to public support programmes. Public programmes could be centred and entrusted to a single agency, like in Germany (Box 2.9), potentially ANAH that has already substantial expertise in the area of building energy renovations. This single point of contact would simplify access to information and the administrative procedures to apply for public funds. It would also make statistical monitoring and assessing the effectiveness of different programmes easier, to improve budgeting efficiency. Finally, the creation of this single agency would reduce the number of interlocutors and the administrative costs associated with support programmes. The government has recently announced the intention to create this single agency by 2023-2024.

Energy renovation projects can be complex to implement. The choice between alternative equipment, materials, suppliers and the supervision of renovation works call for technical expertise that private individuals and business owners do not possess. A building renovation professional has more expertise and information, which creates information asymmetries and can give rise to frauds, such as incomprehensible quotes and misleading practices (Descoeur and Meynier-Millefert, 2021). The introduction of a new status of certified public operators, as mentioned above, who will also offer technical guidance to households regarding the quality and ambition of renovation works, will help minimising problems of information asymmetry. The establishment of a single information, guidance and financing agency, centred on the most effective programmes, with independent, certified experts who could also offer technical advice, will also minimise problems related to frauds and, therefore, improve the cost-effectiveness of public support.

A label was created in 2011 to certify qualified professionals in the area of buildings energy renovation: the “Recognised Guarantor of the Environment” (RGE) label. The label is a minimum quality guarantee for craftsmen and energy renovation work companies. For most public support programmes, individuals and firms must hire a professional who has the RGE label. However, many professionals are not willing to

undertake the necessary training to obtain the RGE label, as it is expensive and does not necessarily lead to long-additional contracts in the longer-term (Descoeur and Meynier-Millefert, 2021). The introduction of a “project-by-project” RGE certification in January 2021, as part of the France Relance recovery plan and on a trial basis, is expected to simplify the certification procedures and allow smaller businesses and individual craftsmen to carry out energy renovation works eligible for public support. To that end, an official body will need to give its approval and conduct on-site inspections to certify, on an *ad hoc* basis, the qualifications of the craftsmen involved and the quality of the renovation works.

Box 2.8. Energy renovation support programmes for households and firms

MaPrimeRénov'

Under this programme, a premium is available to all private individuals, who are housing owners, and wish to carry energy renovation works. One-off and *ad hoc* interventions that do not necessarily imply a comprehensive renovation are eligible for this premium. Households can nevertheless receive a top-up compensation when comprehensive renovation works lead to energy savings of at least 55% or to significantly improve the building energy certificate. MaPrimeRénov' can be accumulated with ESCs and the éco-PTZ support programmes.

The ANAH “Habiter Mieux Sérénité” (“Living Better Serenity”) programme

The programme is targeted at low-income households interested in comprehensive energy renovation projects. To be eligible, renovation works must lead to energy savings of at least 35%. Project management assistance (advice, technical guidance) is compulsory and subsidised to ensure that renovation works are effective.

Energy Savings Certificates (ESCs)

Under this scheme, energy suppliers are obliged to encourage energy savings. Suppliers should proactively promote energy efficiency among consumer (households, regional and local authorities and professionals). Certificates are awarded by public authorities to energy suppliers that implement energy saving measures or finance programmes contributing to the reduction of energy consumption (training, awareness-raising or guidance).

Zero-interest eco loan (Éco-PTZ)

Eco-PTZ loans are offered by commercial banks to private individuals, and interests paid by the State, without any income-related conditions. The maximum amount of the loans is EUR 30 000, with a term of 3 to 15 years. Works must be carried out by a RGE certified company and must include at least one energy renovation measure or works leading to energy savings of at least 35%.

Lower rate of VAT of 5.5%

The lower rate is applicable to any intervention carried to improve housing energy efficiency. This programme can only benefit private individuals.

ADEME Support programmes

ADEME provides financial support to firms who want to complete an energy audit in their offices or premises to identify potential energy savings.

Local authorities support programmes

Some local authorities also provide financial support to renovate tertiary buildings.

Source: <https://www.ecologie.gouv.fr>; Descoeur and Meynier-Millefert, 2021; Dive and Duvergé, 2019.

Improving the scope and quality of renovation works

Some energy renovation support schemes do not necessarily encourage comprehensive renovations, but instead, provide incentives for staged renovations, which are not always effective. This is the case, for example, with most financial support allocated by MaPrimeRénov' and the éco-PTZ loans which, with a maximum amount and a short loan duration, are rarely used for comprehensive renovations in practice. Small, one-off energy renovation interventions are not usually sufficient to increase the energy performance of buildings and lead to meaningful energy savings. Some experts even question the capacity to achieve an efficient energy performance with staged renovation interventions, as transversal works are not performed (Rüdinger et al., 2015). The probability of reaching the “Low Consumption Building” certification, for example, decreases with the number of renovation work stages carried (ADEME, 2021d). Furthermore, it is often more expensive to carry out operations at different stages, since it is necessary to prepare the site, erect scaffolding, etc. each time (Descoeur and Meynier-Millefert, 2021). Support should be conditional on achieving a minimum energy performance level, as in the ANAH “Habiter Mieux Sérénité” programme. This could be done by granting more financial support to comprehensive energy renovations or by introducing a minimum level of energy savings requirement for all public support programmes.

Box 2.9. The Credit Institute for Reconstruction in Germany

The Credit Institute for Reconstruction (*Kreditanstalt für Wiederaufbau*, KfW) is a State-owned investment bank. It offers financing solutions for building energy renovations in the form of direct subsidies and preferential loans. Financial aid is conditional on experts being involved before and after the energy renovation works. The experts monitor renovation works from a technical point of view, verify the conformity of the planned intervention and the energy performance attained.

KfW is financed on international markets for a total of EUR 80 billion per year. It is fully guaranteed by the State, giving it an “AAA” rating. Except for local authorities, KfW does not directly finance project promoters. It relies on commercial banks to distribute financial aid to households and firms.

Source: HCC (2020d); Rüdinger (2015).

Even with public support, the remaining amount to be paid by households and firms for efficient comprehensive energy renovations is too high. Access to bank credit for this kind of renovation is difficult, and the terms of the loans are not always attractive (Descoeur and Meynier-Millefert, 2021). The “Climate and Resilience Law” reforms the “*Prêt avance mutation*” instrument, which has been barely used. This instrument allows households that do not have access to conventional credit to borrow a sum calibrated to the value of their property and the renovation works planned and to only repay the interest. The principal amount is only repaid when the property is transferred, sold or inherited. Banks still have a very limited appetite for this mechanism, since the term of the loan is very uncertain, which makes pricing of loan servicing extremely complicated (Sichel, 2021). The Law proposes that the State acts as guarantor when the renovated property selling price turns out lower than the estimated price when the loan was taken, reducing the risk for banks. However, risk relating to the uncertainty over the term of the loan remains. Authorities should consider a similar programme for firms wishing to renovate their offices or premises.

To improve credit access for energy renovation works, a mechanism could also be envisaged where third-party operators selected by the State finance energy renovation operations and monitor the works to ensure their effectiveness. Such operators would be progressively reimbursed from the savings made in the energy bills of the beneficiaries (France Stratégie, 2020c). The amount and duration of the éco-PTZ loan should also be increased, following the German example where these loans can reach EUR 120 000 for a duration of up to 30 years (HCC, 2020d). To encourage comprehensive energy renovations, the amount of financial aid must be proportional to the project's ambition and costs. The top-up compensation recently introduced in the MaPrimeRénov' programme for comprehensive energy renovations are flat rate and do not necessarily reflect the costs incurred (Box 2.8).

Even when households or firms want to carry comprehensive energy renovation works, there is not yet a structured offer for this kind of overall building renovations. Instead, there is a multitude of craftsmen offering one-off services: changes to glass walls, external roof insulation, internal insulation, etc. Clear and credible communication regarding building energy renovation policies in the longer-term could give more visibility to the sector and create incentives for such structured comprehensive energy renovation professionals and businesses to develop. The recovery plan is generous, but does not offer any visibility beyond 2023.

The quality of works carried out with public support is not always monitored. To achieve the energy renovation targets set by the government, it should be mandatory to carry out exhaustive performance diagnostics before and after major subsidised energy renovation works, as is already the case with the ANAH “Habiter Mieux Sérénité” programme (Descoeur and Meynier-Millefert, 2021). Quality controls by thermal insulation and energy specialists would improve the effectiveness of public support and make promoters accountable (Rüdinger, 2013). Recentering the different public support programmes around a single agency and the most cost-effective programmes, as discussed, namely those that encourage comprehensive renovation works, would make monitoring the quality of major renovation works feasible.

The development of renewable energies must accelerate

To reduce greenhouse gas emissions, pollution and diversify the electricity mix, the development of renewables must accelerate. The progressive reduction of nuclear power in the long term cannot be envisaged without augmenting the share of renewable energies to guarantee security of energy supply without increasing fossil fuels consumption (OECD/IEA and RTE, 2021). A 60-65% share of renewables in the electricity mix in 2050 would, for example, require at least 50 GW from onshore wind (three times the current installed capacity), 30 GW from offshore wind (equivalent to 60 offshore wind farms with a capacity of 500 MW, whereas no farms have come into operation so far) and 100 GW from solar PV (10 times today’s level) (OECD/IEA and RTE, 2021). Achieving carbon neutrality in 2050 will be impossible without a significant development of renewable energies (RTE, 2021).

Beyond ecological motivations, the development of renewable energies also has advantages from an economic point of view. Compared to a fossil fuel supply scenario, the cost of a carbon neutral electricity system would be more stable and would no longer depend on fossil gas and oil prices (RTE, 2021). In addition, renewable energies are becoming increasingly competitive. The cost of an electric kWh associated with large wind and photovoltaic farms is now lower than with new thermal and nuclear power plants. The costs associated with an electricity system relying increasingly on renewable energies will largely depend on the system’s storage capacity and flexibility (RTE, 2021).

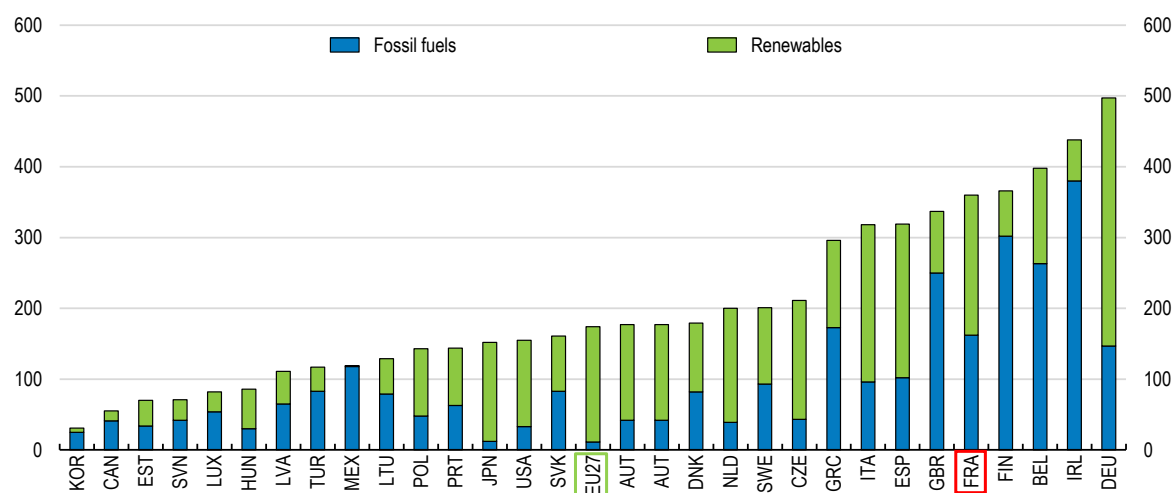
In fact, the power grid must also be adapted to allow greater diversity and decentralisation of potentially variable sources of energy supply. Currently, the system’s flexibility and running capacity is based primarily on nuclear, hydroelectric and fossil-fired power plants. The gradual closure and the construction ban for thermal power stations, as well as the reduction of the share of nuclear power, will significantly reduce the flexibility and running capacity of the electricity system (OECD/IEA and RTE, 2021). The development of energy storage and electricity demand management solutions must accelerate. The investments planned under the France Relance plan and announced with the “France 2030” programme, to develop a low-carbon hydrogen option, which would allow the surplus electricity generated at certain times to be stored and subsequently redelivered, are welcome developments (OECD/IEA, 2019). These developments must be accompanied by more efforts to upgrade and adapt electricity transmission and distribution networks, as envisaged in the 10-year network development plan of the electricity transmission system operator (RTE) (OECD/NEA, 2019). Whatever the share of renewable energies envisaged in the French electricity system, the networks must be rapidly resized (RTE, 2021).

Redirecting public support to low-carbon sources

Although public support for the development of renewable energy has increased, several implicit fossil fuel subsidies reduce incentives for private investment in low-carbon energy sources. Subsidies for renewable energy production, including direct subsidies, purchase obligation programmes and additional remuneration mechanisms, rose from EUR 1.5 billion in 2011 to EUR 4.8 billion in 2018 (CGDD, 2020c). However, public support for renewable energy production is still comparatively lower than in other OECD countries. At the same time, implicit fossil fuel subsidies are higher than in other OECD countries, such as Germany, Italy and Spain (Figure 2.21). Implicit subsidies for fossil fuels, mostly in the form of tax exemptions, tax credits and reduced rates, negatively affect the relative competitiveness of renewable energy production technologies and, therefore, reduce incentives to invest in their development. Environmental taxation arrangements that favour fossil fuels should be gradually withdrawn (section 2.2).

Figure 2.21. Fossil fuel subsidies are still too high

Euros per capita, 2018



Note: The following subsidies are included: direct transfers, preferential loans, collateralised loans, capital injections, tax credits, tax reductions and other fiscal incentives involving a loss of revenue, public provision of services and public purchases of goods, public price and income support.

Source: European Commission (2020), "Energy Subsidies: Energy costs, taxes and the impact of government interventions and investments", Final Report.

StatLink  <https://doi.org/10.1787/888934286065>

Public support for renewables is disproportionately focused on renewable electricity sources. In 2016, renewable electricity sources received EUR 4.4 billion in public spending compared with only EUR 567 million for renewable thermal energy (Cour des comptes, 2018). However, the cost per tonne of oil equivalent produced by renewable thermal energy is very competitive compared with renewable electricity (Rüdinger et al., 2018). Renewable electricity benefits from operating subsidies, particularly purchase obligations and compensation mechanisms. The development of gas and heat from renewable sources (thermal solar, heat pumps, geothermal and biomass) benefits from investment subsidies through the heat fund. The resources available under the heat fund should be increased to meet the development targets set for renewable thermal energy. In 2020, this fund distributed EUR 350 million, its entire allocated budget, to achieve 60% of its objective of greening heat networks. To reach the aimed trajectory, established in the Multiannual Energy Programme, 8 TWh of renewable heat installations would be needed each year, while the current budget allows for only 3 to 3,5 TWh to be installed annually (ADEME, 2021c). Nonetheless, the fund's budget for 2021 remained unchanged.

The government announced a new investment plan in October 2021, called "France 2030", with financial support of up to EUR 15 billion towards research and development of low-carbon technologies. Nuclear

energy, renewables and green hydrogen are among the government's top priorities. Indeed, achieving carbon neutrality in 2050 without new nuclear reactors would imply a pace of development of renewable energies even more accelerated than those of the most dynamic European countries in the field, in particular, Sweden, Denmark or Norway. In addition, the development of "low-carbon" hydrogen is necessary to store energy in a system where renewable energies will occupy an increasingly important place (RTE, 2021). To select the most cost-effective low-carbon technology projects and monitor their implementation, France could consider the creation of an agency like Enova in Norway (Box 2.10).

Uncertainty over the trajectory of the French electricity system is also an obstacle to private-sector investment in low-carbon energies. No document defines the projected trajectory for nuclear power plants beyond 2035. The question of the long-term share of nuclear power in national strategies should be addressed to improve predictability for the stakeholders concerned and so that labour markets, and training provision in particular, adapt accordingly (ASN, 2020). The lack of visibility and the absence of a timetable or clear roadmap for the relative shares of nuclear power and renewables after 2035 weaken the nuclear industry and constrain the emergence of a strong domestic renewables industry. Some of the difficulties encountered in recent nuclear reactor construction projects relate specifically to the lack of visibility for the sector, which has led to skill depreciation (OECD/NEA, 2020b). The support offered to the nuclear industry under the recovery plan regarding skill retention can help to overcome these difficulties in the short term. In the long term, however, it is important to reduce uncertainty.

Box 2.10. ENOVA in Norway

In Norway, a government agency has been created in 2001 to promote the development and use of renewable sources of energy, as well as cleaner and more energy-efficient technologies. Enova manages the Climate and Energy Fund on behalf of the Ministry of Climate and Environment. It attributes financial support to selected projects that aim at testing new energy and climate technologies in industry, transport or buildings. Financial support is distributed in arrears based on actual projects costs. Enova also supervises the implementation of the supported projects.

Centralising financial support and project monitoring in one single agency brings several advantages. Access to information is facilitated, the processing of most applications can be digitalised and automated so that manual case processing can be reserved for complex projects, staff build on expertise, easily share knowledge and experience, and finally, communication with stakeholders and the general public is also simplified.

Source: <https://www.enova.no/about-enova/>

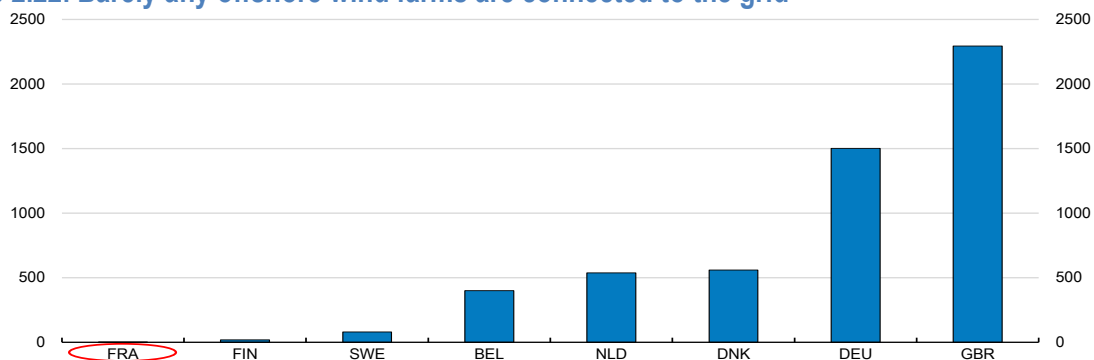
The financing mechanisms for the decommissioning of nuclear plants, laid down in the Environmental Code, can still be improved. The costs of decommissioning nuclear power plants and restoring land on former sites are still uncertain, and the process may take between 20 and 25 years (Cour des comptes, 2020b). Radioactive waste management also raises a number of environmental problems, and the average lifespan of radioactive waste is 100 000 years (IRSN, 2013). Those costs are currently provisioned by producers of nuclear waste in according to the polluter-pays principle. These provisions are covered by dedicated assets. As of 31 December 2018, the future value of the discounted nuclear liabilities of EDF was estimated at EUR 44.1 billion, EUR 43.3 billion of which was covered by dedicated assets, resulting in a long-term provision coverage ratio of 98.3% (OECD/NEA, 2021). Nevertheless, certain smaller expenditures are excluded from these assessments, like post-operation charges (taxes, levies and insurance premiums). Provisions should be adapted to long-term needs and the scope of the charges covered could be clarified further (OECD, 2019a; Cour des comptes, 2020b).

Removing regulatory constraints on the development of renewables

The development of offshore wind energy faces multiple obstacles. France enjoys an excellent geographical location for the development of offshore wind energy. However, the country has just one floating wind turbine in service, a pilot project off Le Croisic. Four calls for tenders have been launched for the development of offshore wind farms since 2011, but none of the planned sites has entered into service yet. In comparison with other European countries, France is lagging far behind when it comes to offshore wind energy (Figure 2.22). The numerous administrative procedures, the lack of social acceptability, the length of appeal proceedings and the complexity of grid connection largely explain this delay (Dive and Duvergé, 2019).

A number of measures have been taken to bring offshore wind farms into service since 2017, in particular by the Law on Hydrocarbons and the ESSOC Law. For example, certain administrative steps, such as the selection of candidates admitted to the competitive dialogue, can be initiated concurrently with the start of the public consultation process on the potential location of new projects. The government has also abolished one level of appeal in proceedings brought against offshore wind projects to save time in the development timelines for these projects. Connection is no longer under the responsibility of the producer but is carried out by RTE, the public electricity transmission network operator, in order to decouple establishing the connection from operation of the wind farms and to limit the risk of delaying its supply. However, the farms allocated since 2011 and prior to the introduction of these measures did not benefit from these simplifications.

Figure 2.22. Barely any offshore wind farms are connected to the grid



Source: Wind Europe, End-of-year data for 2020, expressed as the number of projects. Several projects should enter into service in France in 2021.

StatLink  <https://doi.org/10.1787/888934286084>

The simplification of administrative processes could go even further, provided that the environmental impact of projects is properly taken into account, namely risks for marine biodiversity, and that consultations with the public and local upstream stakeholders is not neglected. These consultations are essential to obtain social acceptability and to minimise subsequent litigation procedures. One possibility could be to create an agency that would manage the entire procedure, including the organisation of the different phases of dialogue, the organisation of public consultations and calls for tenders, the issuing of the various permits and operating licences, among other things, thereby simplifying interactions between different stakeholders, like in Denmark (Box 2.11).

Social acceptability remains the main constraint on the development of offshore wind energy, namely due to the potential impact of offshore wind farms on marine biodiversity. However, several solutions exist to minimise that impact. Floating wind turbines, for instance, can be set further away from coasts, where the avifauna is not so developed, while also minimising the impact of underwater vibrations on fish and marine mammals. This option is not possible with fixed foundation wind turbines, which require shallow water bottoms. These solutions should be given further consideration and the location choice for wind farms must take biodiversity into account, avoiding “Natura 2000” and “ZPS Oiseaux” delimited areas (CNP, 2021).

Few projects involve private individuals or local authorities, which adds to the social acceptability problems (CESE, 2018). The regulation governing “participatory” or “citizen” projects, where private individuals, regional and local authorities are directly involved in the financing and governance of renewable energy production infrastructures, could be simplified. At present, several schemes coexist with differentiated fundraising ceilings and rules on the maximum amount that an individual may contribute. The many layers of regulation cause mounting complexity for all the stakeholders involved (Rüdinger, 2019). The “participatory bonus” scheme, introduced in 2016, provides additional points on a flat-rate basis for projects submitted in calls for tenders when a minimum amount of financing comes from a minimum number of private individuals or at least one local authority. The amount of the bonus points could be calculated proportionally, based on several participation thresholds, to increase participation incentives (Rüdinger, 2019).

Box 2.11. Implementation of offshore wind projects in other OECD countries

Denmark

The Danish Energy Authority (DEA) is a single agency that provides the three successive licences needed for carrying out preliminary investigations and for establishing and exploiting offshore wind farms. Offshore wind projects can be proposed freely by promoters to the DEA (“open door” procedure) or in response to a call for tenders issued by the DEA. In both cases, the DEA organises all procedures and actions before authorising the development of the site. It takes only 16 months on average to bring into service an offshore wind farm in Denmark.

Germany

The competent authority depends on the site’s distance from the coast. Within 12 nautical miles, consent is granted by the government of the coastal region concerned. Beyond that distance, consent is granted by the federal government. However, the government of the coastal region must still authorise the laying of cables and the installation of network connection infrastructure. Projects are freely proposed by potential developers, which must present environmental impact and navigation safety studies with their application documents and show that consultations with local stakeholders have taken place. Processing times in Germany are three years, on average.

Netherlands

The procedure was similar to that in Germany up to 2015. Since then, the government has moved from an “open door” procedure to a tendering procedure. The government (Ministry of Economic Affairs and Ministry of Infrastructure and Environment) actively participates in the preselection of potential sites and the development of environmental impact and navigation safety studies, which simplifies the preliminary work carried out by potential promoters. Calls for tender are then launched for the selected sites. Prior to this reform, processing times were two years. There are no estimates for the average processing time since new procedures were introduced.

United Kingdom

The Crown Estate, as owner of the seabed belonging to the United Kingdom, preselects locations that are eligible for installation of offshore wind farms and launches calls for tenders. The selected promoters must carry out environmental impact and navigation safety studies and organise consultations with local stakeholders themselves. Once all these conditions have been met, promoters must apply for development consent to the Planning Inspectorate in England and Wales or the Marine Scotland agency in Scotland. The procedure lasts 18 months, on average.

Source: Salvador, Gimeno and Larruga (2018), “Streamlining the consent process for the implementation of offshore wind farms in Spain, considering existing regulations in leading European countries”, *Ocean and Coastal Management*, Vol. 157, pp. 68-85.

Administrative constraints are also an obstacle to the development of other, more mature, renewable energy sources. Calls for tenders are particularly complex for solar photovoltaic energy, for example, demotivating small-scale project promoters. The first calls for tenders were very demanding on research and innovation aspects and an insufficient number of projects ended up being submitted to achieve the proposed objective (CESE, 2018). Licence issuing still takes too long. Since 2017, to encourage small-scale projects, installations below 100 kWp located on buildings or structures have benefitted from an “open counter” mechanism with regulated tariffs, a purchase obligation and without any open competition. The government is planning to take up the proposal made by the Citizens’ Convention on Climate to increase the threshold of this open counter from 100 to 500 kWp by the end of 2021. Tendering and administrative authorisation procedures must also be simplified to speed up the deployment of larger-scale projects.

Increasing investment in grid infrastructure

Grid connection difficulties are also an obstacle to the development of renewables. Much more investment will be needed in the next few years to adapt electricity transmission and distribution networks to changes in the electricity mix. Renewable energy production is seasonal and geographically dispersed. The electricity distribution network must be capable of capturing locally produced renewable energy and carrying it to the high-voltage transmission network when that energy is not consumed locally (France Stratégie, 2019d). Without additional investment, to ensure grid stability in current conditions, a minimum level of conventional electricity generation of between 20% and 40% would still be required, depending on operational conditions (OECD/IEA and RTE, 2021). Investment in the grid has increased considerably since 2005, particularly investment in grid expansion. However, the manager of the electricity transmission networks estimates that annual spending will need to increase from around EUR 1.3 billion in 2020 to more than EUR 2.5 billion in 2035, primarily on account of the adaptation of networks to renewable energy and connection costs for offshore wind farms. The necessary investments identified by the French transmission network operator remain nevertheless lower than those planned by other European countries (RTE, 2019).

To support such investments, electricity tariffs should be adjusted. Currently, the tariff comprises a fixed component (20% of the tariff, on average) and a variable component, proportional to energy consumption so as to encourage energy savings (80% of the tariff on average). The tariff structure would be more adapted with the network management cost structure, composed predominantly of investments, if the fixed component would increase compared to its variable component, without undermining energy efficiency incentives (France Stratégie, 2019d).

2.4. Land use must be more carefully considered to preserve biodiversity

The green transition depends on more sustainable use of soils, which represent one of the most important land-based reservoirs of biodiversity (Bardgett, 2005; Wall et al., 2010; Nielsen et al., 2011, 2015). Forests and natural soils form the habitat for many plant and animal species; they constitute carbon sinks and can offer biomass potential. Agricultural land can also help to store carbon dioxide, provide nitrogen and water to cultivated plants and regulate water quality. Waste from cattle rearing can produce renewable natural gas, including biomethane. Elements of biodiversity in urban environments (green spaces, presence of plant species, etc.) are also advantageous for adaptation to climate change; they help to regulate the temperature locally and can attenuate flood risks (Bureau et al., 2020). However, little attention is paid to these positive externalities connected with land use, just like the negative externalities connected with land take or waste landfilling.

Biodiversity protection and economic development are compatible

France has a wide diversity of protected areas (MTE, 2021). A recent study, which covers both areas with significant biodiversity challenges and areas with regulatory protection, reveals that 95% of the areas that play a key role for biodiversity and may be under pressure from urbanisation or intensive agriculture are protected (CGDD, 2019). However, protected areas are not always supported by adequate financial and human resources to enforce the rules. Funding granted to supervisory bodies should be increased. But most importantly, market-based instruments, that offer the private sector incentives to conserve and restore biodiversity, must be strengthened.

Reconciling biodiversity protection and local development objectives

Competition between local authorities to attract residents and businesses so as to maintain local dynamism can encourage land take and go against biodiversity conservation objectives. Major public and private development projects must be subject to an environmental impact assessment (EIA). Currently, the environmental code specifies the list of projects and planning documents that are systematically subject to EIAs. The law also defines another list of smaller-scale projects for which a case-by-case decision is made to determine whether an EIA is needed. However, in 80% of the cases, this decision is taken by the departmental or regional prefects, who also represent the project developer or assist the project promoter. The European Commission has raised questions with the French administration regarding the independence of environmental assessment decision-making, the potential conflict of interests and the excessive number of exemptions granted. Case-by-case decisions should be taken by the the Environmental Authority (Ae) and the Environmental Authority Regional Missions (MRAe), attached to the General Council for the Environment and Sustainable Development (CGEDD), which are independent institutions. The list of projects and planning documents that are systematically subject to EIA should also be revised and extended to minimise the number of case-by-case decisions and limit it to even smaller projects. Under the “Climate and Resilience” law, new commercial developments leading to an increase in land take are prohibited, unless there is a specific derogation. This new measure will only be effective if such derogations are granted by an independent party.

Strengthening environmental compensation

Economic incentives for biodiversity protection are not effective enough. The deployment of the “Avoid, Reduce, Compensate” sequence (“*Séquence Éviter, Réduire, Compenser*”, ERC, Box 2.12), aiming to avoid environmental damage, reduce damage that cannot be avoided and compensate for its effects, has failed to live up to its ambitions. There is not enough emphasis on the “Avoid” part of the sequence. Furthermore, according to a study of 24 major infrastructure projects, environmental compensation is not sufficiently rigorous in 80% of cases. The measures introduced preserve habitats that are already of good quality, where the ecological benefit is less, and do not therefore allow a tangible return of biodiversity to counterbalance the effects of development projects (Weissgerber et al., 2019). Monitoring and review of the measures introduced continue to be negligible and offer a low incentive to comply with the law (Bureau et al., 2020). To improve the implementation of environmental compensation measures and ensure that net ecological benefits are achieved, in 2021 France published a national framework for designing and shaping compensation measures, which is a step in the right direction.

Box 2.12. The principles of the “Avoid, Reduce, Compensate” sequence

Under this mechanism, certain major projects and plans, in particular those requiring an environmental impact assessment, must detail all the measures taken and choices made to **avoid** degradation of the quality of the environment. If certain significant impacts cannot be avoided at a reasonable cost, technical solutions to **reduce** degradation must be adopted. Lastly, if there are still significant impacts, **compensation measures** must offer an equivalent counterpart.

Compensation measures can include rehabilitation, restoration or creation of natural habitats. The positive impact on biodiversity of these measures must be at least equivalent to the loss caused by the project. It must therefore be possible to quantify the environmental impact of projects and the benefits of the compensation. The benefit must be realised close to the impacted site and in accordance with the principle of ecological equivalence.

The developer has two ways to make compensation: (i) *demand-based compensation*, where it carries out the compensatory works itself or delegates them to other actors; and (ii) *supply-based compensation*, where it acquires “offset units” from a dedicated natural compensation site. In the latter case, the environmental benefits are integrated and managed by a third-party “operator”.

Source: CGDD, 2017.

Supply-based compensation, where the project promoter purchases “offset units” from a dedicated natural compensation site certified by the State, must be further developed (OECD, 2016). In fact, supply-based compensation is more easily monitored (CEDD, 2016b). The upstream implementation of projects that it entails offers visibility and reduces uncertainty. Further developing supply-based compensation would also make it feasible to extend the compensation obligation to all projects, regardless of their size, since the “offset units” can be purchased in small quantities without fragmenting the compensation projects (Bureau et al., 2020; CGDD, 2017b). However, natural compensation sites currently account for a still very limited area. Clarification regarding the operation and implementation arrangements for supply-based compensation and reflection on public-private partnerships, which form the basis for “mitigation banks” in the United States, could contribute to the development of supply-based compensation (Box 2.13).

Another instrument inspired by English-speaking countries was introduced to assist compensation measures in 2016: Real Environmental Obligations (REOs). This instrument enables any land owner to establish environmental protection for their land, such as restoration of elements of biodiversity, introduction of environmentally friendly infrastructure allowing movement of species, etc. REOs can be used for compensation purposes. The land owner signs a contract with a developer subject to a compensation obligation, committing to take environmental action in exchange of a financial counterpart. At present, REOs are very rare in France (Bureau et al., 2020). To make these instruments more attractive, the 2021 Law on Finance introduces two fiscal incentive measures which complement those brought in by the 2016 Law on Biodiversity: exemption from the property security contribution and the option for public establishments for inter-municipal cooperation (EPCI), in respect of their share, to exempt undeveloped land from property tax where the owners have signed a REO. However, that exemption remains optional. This should be made compulsory to encourage the development of REOs by proposing that this exemption is covered by the general state budget.

Box 2.13. “Environmental mitigation banks” in the United States

The compensation element in the United States can be provided by public-private partnerships. A private entity called a “mitigation bank” acquires land and undertakes to conserve biodiversity there, whoever the future owners might be.

The mitigation bank must establish monitoring with precise indicators that can attest to its actions to promote biodiversity. The public administration certifies these indicators, which it can review regularly, and grants a number of “offset credits” to the bank, depending on the scale of the actions undertaken and as ecological benefits are shown by the indicators. The administration keeps a register of mitigation banks, with information on their location, the total number of credits granted and the number of credits available for sale. The bank can then sell those offset credits within a geographical area defined by the administration. Developers based in that area that have an offset obligation can purchase those credits. The price of offset credits is freely determined in each defined area. The administration must therefore regulate the quantity of offset credits granted to banks so that the price gives a further incentive to avoid and reduce damage to biodiversity.

In 2016, just over 2 000 mitigation banks had already been created. The offset credits market allows better monitoring of the compensatory actions that have been taken and their location, size and quality. Mitigation banks can gain a reputation with the administration, which reduces information asymmetry. The development of these markets has also allowed the formation of a new sector of activity, thereby creating jobs.

Source: CEDD, 2016b.

Reforming land taxes

Taxation on land generally promotes land take: the transformation of agricultural, natural or forest land by development activities which can result in total or partial soil sealing (Colsaet, 2019). This change in land use, which is generally irreversible, has potentially detrimental consequences for the environment and agricultural production. Numerous exemptions and lower rates exist for developed land, while undeveloped land, including agricultural land or natural spaces, is subject to a number of taxes that systematically make its annual after-tax return negative and compel its owners to build on it (Sainteny, 2018).

The measures introduced to encourage space saving are often optional and are still little used by regional and local authorities. The possibilities for exemption entail a direct loss of tax revenue for local authorities that choose to apply them. However, even measures that do not necessarily entail losses of tax revenue are often seen as an obstacle to local development and are therefore little used. That was the case, for example, with the low density tax, which was created in 2010 and aimed at limiting urban sprawl by taxing new constructions that did not meet a minimum development density threshold. Having met with very modest success, the tax was repealed by the 2021 Law on Finance. The planning tax could be reformed by integrating a “bonus-malus” mechanism to discourage land take and encourage densification. Revenue from the malus would finance spending connected with the bonus so as to ensure that the measure is neutral with regard to local public finances (Comité pour l’Économie Verte, 2019).

A number of construction support schemes have also contributed to the acceleration of land take (OECD, 2021c). For example, some regional and local authorities have committed to selling land to developers at a symbolic price of EUR 1 to encourage new construction projects. These programmes should be better monitored to prevent land take in areas where there is no pressure on access to housing. The Pinel investment rental scheme, which permits a tax reduction calculated on the basis of the purchase price of a new home that is rented out, has also encouraged urban sprawl. Until 2018, the scheme applied without distinction as to the location of the building. In order to stimulate densification, in 2018 the Pinel scheme was reoriented to areas where there was an imbalance between housing supply and demand, and, in

2021, it was also reserved for housing in multiple occupancy residential buildings. The scheme is to be progressively cut back in 2023 and 2024.

Action could be taken to facilitate further development of abandoned urban brownfield sites, former industrial, commercial, military, railway and even administrative areas. These provide an opportunity to revitalise urban centres and reduce pressure on land without increasing land take. However, the number of brownfield sites is still not really known (AdCF, 2019). A current inventory or a regularly updated map of urban brownfield sites should be made available and universally accessible in order to disseminate information on the opportunities available (France Stratégie, 2019c).

Financing for urban brownfield site revitalisation operations must be targeted. Decontamination costs, for example, are estimated to be at least EUR 1 million per hectare (Adam and Kerbarh, 2021). The human, material and R&D resources needed may also be significant. Third-party financing mechanisms may work for sites in dynamic regions where reconversion to accommodation will mean that long-term financing of the necessary work will be easy. Rehabilitation operations in less favoured sites require public support to establish an economic balance between projects. The creation of a “brownfield fund” under the recovery plan, the government announcement that the amounts initially earmarked for the fund would be doubled in May 2021, from EUR 300 million to EUR 650 million, and the presidential announcement in September 2021 that the fund would become permanent, are encouraging developments.

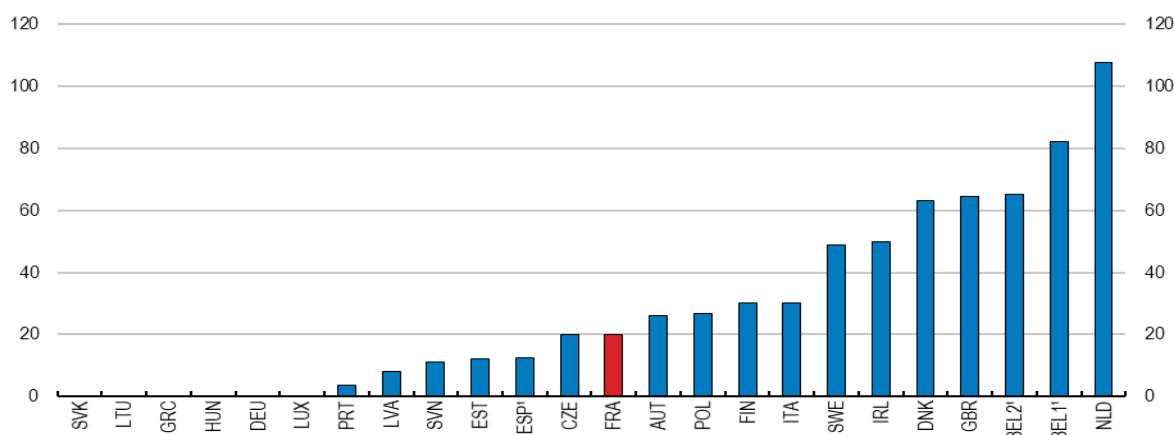
Encouraging waste reduction

Landfill charges are low in France in comparison with other OECD countries (Figure 2.23). Charges on all stored or incinerated waste increased considerably between 2008 and 2015 to encourage local authorities and businesses to prioritise recycling. However, the rate has not increased since then (CGDD, 2017). The optional use of incentive-based charging for waste, which was introduced by law in 2012 and charges users of waste management services according to the quantities that they produce, has still not had much uptake. In 2020, it had been implemented by 200 authorities, and charging applied to almost 6 million inhabitants, well short of the target of 15 million inhabitants set by the Law on Energy Transition. Several OECD countries have introduced large-scale incentive-based charging with very satisfactory results. These include the Netherlands, Japan, Switzerland and South Korea (OECD, 2019c). These systems, which have already proven their effectiveness, should be widely adopted.

Plastic is still not sufficiently recycled in France. According to Plastics Europe, just over 26% of the plastic used in France was recycled in 2019. The plastic recycling rate is almost 40% in Germany, by way of example, although calculation methods are not fully harmonised from one country to the next (Plastics Europe, 2020). France has recently published a law which seeks progressively to limit the marketing and use of single-use plastics, becoming the first OECD country to introduce an objective to eliminate plastic packaging by 2040 (Box 2.1). The law also sets the target of 100% for recycled plastic in 2025. In order to meet this target and increase the recycling rate for plastic or its re-use, France could introduce a plastic bottle deposit scheme as in Germany (Box 2.14).

Figure 2.23. Landfill charges are relatively low

Landfill charge, euros per tonne



Note: BEL 1 – Dutch-speaking Flemish region; BEL 2 – French-speaking Walloon region; ESP refers only to the Catalan region.

Source: European Environment Agency.

StatLink  <https://doi.org/10.1787/888934286103>

Box 2.14. The plastic bottle deposit scheme in Germany

The deposit or “*Pfand*” began in the 1990s in Germany. At the checkout, customers must pay a deposit on most bottles, large glass jars (yoghurt, for example), nearly all aluminium cans, cartons and drinks in plastic bottles. The deposit can then be reclaimed by returning the packaging. For that purpose, machines called “*Pfandautomaten*” are provided at nearly all points of sale. The barcode on the packaging enables the product to be identified and the amount of the associated deposit to be reimbursed. The amount of the deposit varies between 8 and 15 cents, and the practice is optional for customers. Retailers have been required to offer the scheme to their customers since 2006. The collection rate was 98.5% in 2018.

Source: Centre Européen de la Consommation.

Farming must gradually shift to more sustainable practices

Emissions from the agricultural sector have barely changed since the 1990s (Figure 2.24). However, potential for emissions reduction in the sector is high, and abatement costs are lower than in other sectors (CEDD, 2019a). A number of practices and technical measures have already been identified to reduce net emissions from agriculture (both greenhouse gases and ammonia) and the use of chemical inputs. Certain techniques may even lead to carbon sequestration. Some of these practices do not entail major additional costs but are still not well understood by farmers. Others may even improve the economic situation of farmers. However, they require specific investments and considerable working time, and they may alter the cropping system. They therefore represent a risk to short-term yield and require an adaptation period.

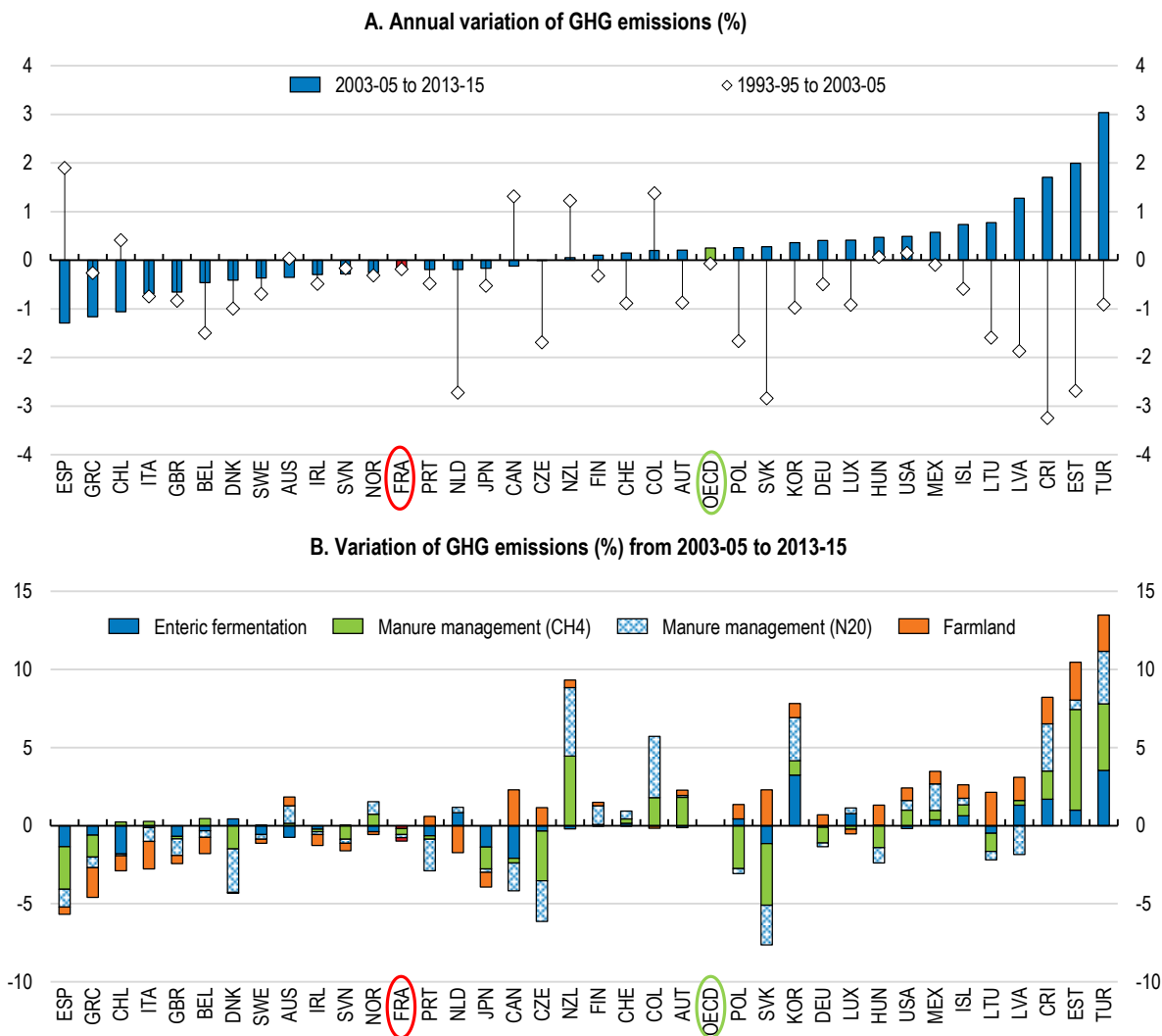
A number of support measures have already been introduced to encourage the adoption of these more environmentally friendly practices, mostly using funds from the second pillar of the European Union’s Common Agricultural Policy (CAP). For example, to compensate, at least partially, for investment costs and initial revenue losses associated with organic farming practices (agriculture without synthetic chemicals and subject to strict conditions), an “organic farming conversion and maintenance premium” has been created. In 2018, a three-year trial for payments for environmental services (PSE) was launched, with a total budget of EUR 150 million. The government also introduced agro-environmental and climate payments (PAEC), in 2020, to support the development of agroecology, a farming practice where there is greater reliance on the natural resources offered by ecosystems and only natural inputs are used.

However, the bulk of agricultural support comes in the form of direct payments from the first pillar of the Common Agricultural Policy, distributed depending on the farming land area and with little real environmental counterpart. In Europe, 20% of transfers to farmers could distort the market and even contribute to increase greenhouse gas emissions in the agriculture sector (OECD, 2021f). In contrast, in 2018, financial support aimed at rewarding biodiversity conservation efforts represented only 2% of public financial support to farmers (Bureau et al., 2020). The ongoing negotiations of the new EU Common Agricultural Policy could result in better environmental incentives. The European Commission wants direct payments to be subject to more stringent environmental requirements. Farmers would have to comply with a minimum set of environmental standards to be eligible for income support from the first pillar. The share of direct payments from the CAP budget allocated to these new “ecoschemes” should be about 25%.

Pending the CAP reform and the introduction of these eco-regimes, the share of funding from the second pillar of the CAP allocated to payments for environmental services (PSE) and payments linked to agro-environmental and climate projects (PAEC), could be raised. The design of these payments could also be improved to enhance their environmental effectiveness (DeBoe, 2020). Many farmers believe that these payments are not flexible enough. The payments should be focused less on the specific practices implemented and more on the results achieved, measured by easily observable biodiversity indicators so as to minimise administrative costs, which would allow farmers greater flexibility to optimise methods. Good practice in agroecology, for example, is largely dependent on local conditions and will not necessarily be the same throughout France. A similar payment for environmental services programme, but based on quantitative results achieved, is currently being experimented in Argentina, Finland, Sweden, the Netherlands and Canada (OECD, 2021d). Introducing a minimum revenue in areas of significant environmental interest, in exchange for labour-intensive conservation and restoration efforts, could also be considered (Bureau et al., 2020).

Experience sharing and the widespread dissemination of sustainable farming practice should be stepped-up. Training and awareness-raising activities already exist to promote knowledge transfer and encourage farmers to take action (OECD, 2015). Efforts must therefore be focused on the generalisation and dissemination of those training programmes and awareness-raising activities, in particular through agricultural cooperatives and chambers of agriculture, which should circulate the information more pro-actively (Bamière et al., 2017).

Figure 2.24. Direct agricultural GHG emissions trends in OECD countries



Source: OECD Agri-Environmental Statistics (database); and OECD (2021), *Measuring the environmental performance of agriculture across OECD countries*, OECD Publishing, Paris.

StatLink  <https://doi.org/10.1787/888934286122>

Table 2.2. Chapter recommendations to combine economic recovery and green transition

CONCLUSIONS (main conclusions in bold)	RECOMMENDATIONS (key recommendations in bold)
Reinforce economic incentives	
Exemptions and reduced rates weaken the incentives of environmental taxes. The level of the carbon price remains uneven across sectors.	Gradually withdraw exemptions and reduced rates on environmental taxes. Prioritise the progressive alignment of carbon prices across sectors while resuming the gradual upward trend of the carbon component of energy taxes.
Public acceptance of environmental taxes is low, in part due to their regressive and sectoral effect.	Link economic incentives with measures to increase their social acceptability when needed. Prioritise help-to-buy schemes to compensate vulnerable households and firms. Make the use of environmental tax revenues more transparent.
Banking actors do not have adequate knowledge about the risks and opportunities associated with climate change.	Training in the banking sector must be adapted to include a minimum knowledge base on the financial implications of climate change.
The short-term orientation of investors is an obstacle to the financing of environmentally sustainable projects.	Continue international collaboration efforts towards a standard and harmonised definition of “green” investments. Continuously align official investment labels to the most recent developments towards a taxonomy of sustainable activities.
Improve the cost-effectiveness of sectoral policies	
Help-to-buy schemes for less polluting vehicles are not ambitious enough.	Make the eligibility criteria for the conversion premium and the ecological malus scale more stringent.
Some support schemes for building renovations do not encourage efficient energy renovations.	Make aid conditional on achieving a minimum energy efficiency standard and tighten controls on major projects.
Demand for mobility continues to grow, in particular with increased use of passenger cars.	Introduce a charge for entering large urban centres to reduce congestion and pollution problems and use the revenue to develop public transport.
Road freight transport is increasing to the detriment of rail freight.	Planning of logistics networks, including the location of large warehouses, must be closer to railway lines.
Reliable information on the number of energy renovation building works carried out is unavailable.	Improve statistical monitoring of building works carried out to improve building energy efficiency.
The complexity of public support programmes is a barrier to the energy renovation of buildings.	The different support programmes should be centralised in a single agency which would also act as a single point of contact.
Subsidies for fossil fuels reduce the relative attractiveness of investing in renewable energies.	Taxation arrangements that favours fossil fuels must be phased out.
Support for renewables is focused disproportionately on renewable electricity sources.	The resources available under the renewable heat fund should be increased further.
Reform land use policies	
The bulk of support to the agricultural sector comes with little environmental counterparts. The reform of the CAP should increase environmental conditionality. France has also introduced its own incentives, notably based on the second pillar of the CAP, but they remain limited.	Reallocate support to the agricultural sector towards payments for agro-environmental services.
A high number of development and infrastructure projects are still exempt from an environmental impact assessment.	Systematically conduct independent environmental impact assessment for projects that could have significant adverse environmental effects.
Environmental compensation is not sufficiently rigorous, and supply-based compensation is not common.	Supply-based compensation, where the project promoter purchases “offset units”, must be developed further.
Taxation on land generally promotes land take.	The planning tax could be reformed by integrating a “bonus-malus” mechanism to discourage land take and encourage densification.
Landfill charges are low in France in comparison with other OECD countries.	Incentive-based charging for waste should be widely adopted.
Plastic is still not sufficiently recycled.	Introduce a deposit scheme for plastic bottles.

References

- ACPR and Banque de France (2021), Une première évaluation des risques financiers dus au changement climatique: les principaux résultats de l'exercice pilote climatique 2020, Analyses et synthèses No. 122.
- Adam, D. and S. Kerbarh (2021), Mission d'information commune sur la revalorisation des friches industrielles, commerciales et administratives, Information Report submitted to the National Assembly on 27 January 2021.
- AdCF (2019), La revitalisation des friches industrielles: Enjeux et synthèse de 40 fiches-actions portées par les Territoires d'industrie, Note, October 2019.
- ADEME (2013a), Analysis of the potential of 10 practices for reducing ammonia emissions from French livestock farms by 2020 and 2030, Study carried out for ADEME by the Centre Interprofessionnel Technique d'Etudes de la Pollution Atmosphérique (CITEPA), December 2013.
- ADEME (2013b), How can French agriculture contribute to reducing greenhouse gas emissions? Abatement potential and cost of ten technical measures, Summary of the study report conducted by INRA on behalf of ADEME, MAAF and MEDDE. July 2013.
- ADEME (2018), Enquête TREMI: Travaux de Rénovation Énergétique des Maisons Individuelles, Campagne 2017, Faits & Chiffres, Agency for Ecological Transition (ADEME), September 2018.
- ADEME (2019a), La contribution climat-solidarité: une taxe carbone pour la transition écologique et pour plus de solidarité fiscale, Fiche Technique, Agency for Ecological Transition (ADEME), March 2019.
- ADEME (2019b), Summary of the study "Guide des bonnes pratiques agricoles pour l'amélioration de la qualité de l'air", ADEME in partnership with the Ministry of Agriculture and Food and the Ministry of the Ecological and Inclusive Transition (MTES), May 2019.
- ADEME (2020a), Déchets chiffres-clés – Édition 2020, Faits & Chiffres, Agency for Ecological Transition (ADEME).
- ADEME (2020b), Étude sur la caractérisation des effets rebond induits par le télétravail, Report prepared by ADEME in partnership with Greenworking, September 2020.
- ADEME (2021a), La face cachée du numérique: Réduire les impacts du numérique sur l'environnement, Agency for Ecological Transition (ADEME), January 2021.
- ADEME (2021b), Évolution du marché, caractéristiques environnementales et techniques – véhicules particuliers neufs vendus en France, Faits & Chiffres, Agency for Ecological Transition (ADEME).
- ADEME (2021c), Bilan Fonds Chaleur 2020, Communiqué de Presse, 18 mai 2021.
- ADEME (2021d), La rénovation performante par étapes : Étude des conditions nécessaires pour atteindre la performance BBC rénovation ou équivalent à terme en logement individuel. Janvier 2021.
- Allen, T. et al. (2020), "Climate-Related Scenarios for Financial Stability Assessment: an Application to France", Banque de France Working Paper, No. 774, July 2020.
- ANDRA (2014), Évaluation des coûts afférents à la mise en œuvre des solutions de gestion à long terme des déchets radioactifs de haute et de moyenne activité à vie longue, Proposal by ANDRA, National Agency for Radioactive Waste Management, October 2014.
- ASN (2021), ASN Report on the state of nuclear safety and radiation protection in France in 2020, Nuclear Safety Authority (ASN).
- Bamière, L. et al. (2017), Analyse des freins et des mesures de déploiement des actions d'atténuation à coût négatif dans le secteur agricole: couplage de modélisation économique et d'enquêtes de terrain, I Care & Consult, INRA and CEREOPA, October 2017.
- Banque de France (2019), "Greening the financial system: the new frontier", Financial Stability Review No. 23, June 2019.
- Banque de France et al. (2020), Réponse des autorités françaises à la consultation de l'Union européenne sur la stratégie renouvelée pour la finance durable, Banque de France, Prudential Supervision and Resolution Authority (ACPR) and Financial Markets Regulator (AMF).
- Bardgett, R. (2005), The Biology of Soil: A community and ecosystem approach, Oxford University Press, Oxford, United

Kingdom.

- Blaise, G. and Glachant, M. (2019), "What is the impact on energy consumption of housing retrofits? An ex-post assessment based on panel data", *La Revue de l'Énergie*, No. 646, September-October 2019.
- Blanchard, O. et Tirole, J. (2021), *Les grands défis économiques*, Commission internationale présidée par Olivier Blanchard et Jean Tirole, juin 2021.
- Boffo, R. et Patalano, R. (2020), "ESG Investing : Practices, Progress and Challenges", Éditions OCDE, Paris.
- Briand, Y. et al. (2019), *Trajectoires de décarbonation profonde du transport de marchandises en France*, Narrative Report, IDDRI, December 2019.
- Bureau, D. et al. (2019), "A Proposal for the Climate: Taxing Carbon not People", *Les notes du conseil d'analyse économique, French Council of Economic Analysis (CAE)*, No. 50, March 2019.
- Bureau, D. et al. (2020), "Biodiversity in Danger: What Can Economics Do?", *Les notes du conseil d'analyse économique, French Council of Economic Analysis (CAE)*, No. 59, September 2020.
- Bureau, D. and K. Schubert (2020), "Compensation écologique: à la demande ou par le développement d'une offre?", *French Council of Economic Analysis (CAE), Focus*, No. 047-2020, September 2020.
- Carney, M. (2015), "Breaking the tragedy of the horizon – climate change and financial stability", Speech by the Governor of the Bank of England and Chairman of the Financial Stability Board, London, 29 September 2015.
- CCPI (2020), *Climate Change Performance Index: Results 2021*, C. Bals et al., Climate Action Network, Germanwatch and New Climate Institute.
- CEDD (2015), "Changement climatique: points de repère", *Références économiques*, No. 33, Economic Council for Sustainable Development (CEDD), 2015.
- CEDD (2016a), "Élevage, choix alimentaires et environnement", *Synthèse*, No. 29, Economic Council for Sustainable Development (CEDD), November 2016.
- CEDD (2016b), "Biodiversité et économie: Obligations de compensation et incitations", *Références économiques*, No. 35, Economic Council for Sustainable Development (CEDD), 2016.
- CEDD (2017), "Mobilité et émissions de gaz à effet de serre: Comment construire les politiques de transports?", *Synthèse*, No. 30, Economic Council for Sustainable Development (CEDD), March 2017.
- CEDD (2018a), "Politique Agricole Commune et prix de l'environnement: Coût social des nuisances et rémunération des services rendus", *Synthèse*, No. 34, Economic Council for Sustainable Development (CEDD), October 2018.
- CEDD (2018b), "Quelle fiscalité incitative pour l'économie circulaire? Le cas des déchets ménagers", *Synthèse*, No. 32, Economic Council for Sustainable Development (CEDD), February 2018.
- CEDD (2019a), "Agriculture, forêts et affectation des sols: des marges de manœuvre à mobiliser pour réduire efficacement nos émissions de gaz à effet de serre", *Synthèse*, No. 38, Economic Council for Sustainable Development (CEDD), July 2019.
- CEDD (2019b), "Aides à la transition écologique: Les conditions d'efficacité", *Synthèse*, No. 40, Economic Council for Sustainable Development (CEDD), November 2019.
- CEDD (2019c), "Quels instruments pour la stratégie climatique? Premières leçons de la crise", *Synthèse*, No. 37, Economic Council for Sustainable Development (CEDD), February 2019.
- CESE (2016), "La transition agroécologique: défis et enjeux", Report submitted by Ms Cécile Claveirole, *Les avis du CESE*, No. 2016-13, Opinion of the Economic, Social and Environmental Council (ESEC), November 2016.
- CESE (2018), "Comment accélérer la transition énergétique? Avis sur la mise en œuvre de la loi relative à la transition énergétique pour la croissance verte (LTECV)", Guillaume Duval and Madeleine Charru, *Les avis du CESE*, No. 2018-04, Opinion of the Economic, Social and Environmental Council (ESEC), February 2018.
- CETE (2018), *Respect des budgets carbone: rapport sur la mise en œuvre de la SNBC pour le premier budget carbone 2015-2018*, Expert Committee on Energy Transition (CETE), 24 December 2018.
- CGAAER (2020), *Déterminants de la prise de décision par l'exploitant agricole d'une transition vers l'agroécologie*, General Council for Food, Agriculture and Rural Areas (CGAAER), Report No. 19070, November 2020.

- CGDD (2017), Fiscalité environnementale: Un état des lieux, General Commission for Sustainable Development (CGDD), Ministry of the Ecological and Inclusive Transition (MTES), January 2017.
- CGDD (2018), Biodiversité: Les chiffres clés – Édition 2018, French Biodiversity Agency (AFB), French National Biodiversity Observatory (ONB), General Commission for Sustainable Development (CGDD), Ministry of the Ecological and Inclusive Transition (MTES), December 2018.
- CGDD (2019), “Trajectoires vers l’objectif ‘zéro artificialisation nette’: Éléments de méthode”, Théma Essentiel, General Commission for Sustainable Development (CGDD), Ministry of the Ecological and Inclusive Transition (MTES), December 2019.
- CGDD (2020a), Bilan de la qualité de l’air extérieur en France en 2019, General Commission for Sustainable Development (CGDD), Ministry of the Ecological and Inclusive Transition (MTES), September 2020.
- CGDD (2020b), Chiffres clés de l’énergie: Édition 2020, General Commission for Sustainable Development (CGDD), Ministry of the Ecological and Inclusive Transition (MTES), September 2020.
- CGDD (2020c), Chiffres clés des énergies renouvelables: Édition 2020, General Commission for Sustainable Development (CGDD), Ministry of the Ecological and Inclusive Transition (MTES), July 2020.
- CGDD (2020d), L’empreinte carbone des français reste stable, General Commission for Sustainable Development (CGDD), Ministry of the Ecological and Inclusive Transition (MTES), January 2020.
- CGDD (2020e), Les facteurs d’évolution des émissions de CO₂ liées à l’énergie en France de 1990 à 2018, General Commission for Sustainable Development (CGDD), Ministry of the Ecological and Inclusive Transition (MTES), April 2020.
- CGDD (2021a), Bilan énergétique de la France pour 2019, General Commission for Sustainable Development (CGDD), Ministry of the Ecological and Inclusive Transition (MTES), January 2021.
- CGDD (2021b), Chiffres clés du climat: France, Europe et Monde – Édition 2021, General Commission for Sustainable Development (CGDD), Ministry of the Ecological and Inclusive Transition (MTES).
- CGDD (2021c), Indicateurs clés pour le suivi de l’économie circulaire – Édition 2021, General Commission for Sustainable Development (CGDD), Ministry of the Ecological and Inclusive Transition (MTES), April 2021.
- CGDD (2021d), La rénovation énergétique des logements: Bilan des travaux et des aides entre 2016 et 2019, National Energy Renovation Observatory (ONRE), May 2021.
- CITEPA (2019), Gaz à effet de serre et polluants atmosphériques: Bilan des émissions en France de 1990 à 2017, National Inventory Report, July 2019 Edition, Technical Reference Centre for Air Pollution and Climate Change (Citepa).
- CITEPA (2020), Gaz à effet de serre et polluants atmosphériques: Bilan des émissions en France de 1990 à 2018, National Inventory Report, June 2020 Edition, Technical Reference Centre for Air Pollution and Climate Change (Citepa).
- Colsaet, A. (2019), “Land take in France: what political progress, for what results?”, Sciences Po and Institute for Sustainable Development and International Relations (IDDRI), Issue Brief, No. 02/19, January 2019.
- Comité pour l’Économie Verte (2019), Comment construire la fiscalité environnementale pour le quinquennat et après 2022?, D. Bureau and B. Peyrol, Green Economy Committee (CEV).
- Conseil des prélèvements obligatoires (2019), La fiscalité environnementale au défi de l’urgence climatique, Summary, Council of Mandatory Contributions (CPO), September 2019.
- Cour des comptes (2018), Le soutien aux énergies renouvelables, Communication to the French Senate Finance Committee, March 2018.
- Cour des comptes (2019), L’aval du cycle du combustible nucléaire: Les matières et les déchets radioactifs, de la sortie du réacteur au stockage, Thematic Public Report, July 2019.
- Cour des comptes (2020a), Les politiques de lutte contre la pollution de l’air, Survey commissioned by the French Senate Finance Committee, July 2020.
- Cour des comptes (2020b), L’arrêt et le démantèlement des installations nucléaires, Communication to the French Senate Finance Committee, February 2020.
- Cour des comptes (2021), Une stratégie de finances publiques pour la sortie de crise: Concilier soutien à l’activité et soutenabilité, Communication to the Prime Minister, June 2021.

- CNPN (2021), Autosaisine du CNPN sur le développement de l'énergie offshore en France et ses impacts sur la biodiversité, le patrimoine naturel et les paysages, Conseil National de la Protection de la Nature, juillet 2021.
- European Commission (2020), Commission recommendations for France's CAP strategic plan, Commission Staff Working Document, SDW(2020) 379 final.
- European Court of Auditors (2021), Common agricultural policy and climate: Half of EU climate spending but farm emissions are not decreasing, Special Report, June 2021, Luxembourg.
- DeBoe, G. (2020), "Economic and environmental sustainability performance of environmental policies in agriculture", OECD Food, Agriculture and Fisheries Papers, No. 140, OECD Publishing, Paris.
- Dechezleprêtre, A. et al., (forthcoming), Understanding public acceptability of climate change mitigation policies across OECD and non-OECD countries, OECD publishing, Paris.
- Dechezleprêtre, A. and T. Kruse (2018), "A review of the empirical literature combining economic and environmental performance data at the micro-level", OECD Economics Department Working Papers, No. 1514.
- DeFries, R. et al. (2019), "The missing economic risks in assessments of climate change impacts", Policy Insight, Grantham Research Institute on Climate Change and the Environment, September 2019.
- Descoeur, V. and M. Maynier-Millefert (2021), Rapport d'information déposé par la mission d'information sur la rénovation thermique des bâtiments au nom de la commission du développement durable et de l'aménagement du territoire, No. 3871, Information Report submitted to the National Assembly on 10 February 2021 by the fact-finding mission on the thermal rehabilitation of buildings on behalf of the Committee on Sustainable Development and Planning and presented by Mr V. Descoeur, Chairman, and Ms M. Maynier-Millefert, Rapporteur, Members of the French National Assembly.
- Direction Générale du Trésor (2020), "Effets économiques du changement climatique", Trésor-Éco, No. 262, Directorate General of the Treasury, July 2020.
- Direction Générale du Trésor (2021), "Un mécanisme d'ajustement carbone aux frontières de l'Union Européenne", Trésor-Éco, No. 280, Directorate General of the Treasury, March 2021.
- Dive, J. and B. Duvergé (2019), Rapport d'information déposé par la mission d'information relative aux freins à la transition énergétique, No. 2068, Information Report submitted to the National Assembly on 25 June 2021 by the fact-finding mission on bottlenecks in the energy transition and presented by Mr Julien Dive, Chairman, and Mr Bruno Duvergé, Rapporteur, Members of the French National Assembly.
- Durrmeyer, I. and M. Samano (2017), "To rebate or not to rebate: fuel economy standards vs. feebates", Working Papers, No. 16-732, Toulouse School of Economics, May 2017.
- Dussaux, D. (2020), "The joint effects of energy prices and carbon taxes on environmental and economic performance: Evidence from the French manufacturing sector", OECD Environment Working Papers, No. 154, January 2020.
- EEA (2020a), Air quality in Europe – 2020 report, European Environment Agency (EEA), EEA Report No. 09/2020, ISSN 1977-8449.
- EEA (2020b), Monitoring CO₂ emissions from passenger cars and vans in 2018, European Environment Agency (EEA), EEA Report No. 02/2020, ISSN 1977-8449.
- EEA (2020c), State of nature in the EU: Results from reporting under the nature directives 2013-2018, European Environment Agency (EEA), EEA Report No. 10/2020, ISSN 1725-9177.
- EEA (2020d), Trends and drivers of EU greenhouse gas emissions, European Environment Agency (EEA), EEA Report No. 03/2020, ISSN 1977-8449.
- EEA (2020e), Trends and projections in Europe 2020: Tracking progress towards Europe's climate and energy targets, European Environment Agency (EEA), EEA Report No. 13/2020. ISSN 1977-8449.
- EEA (2021), EEA greenhouse gases – data viewer, Data viewer on greenhouse gas emissions and removals, sent by countries to UNFCCC and the EU Greenhouse Gas Monitoring Mechanism (EU Member States), European Environment Agency (EEA), Dashboard, 13 April 2021.
- Eskeland, G. S. and S. Yan (2021), "The Norwegian CO₂-differentiated motor vehicle registration tax: An extended cost-benefit analysis", OECD Environment Working Papers, No. 177, June 2021.

- Flues, F. and K. van Dender (2017), "The impact of energy taxes on the affordability of domestic energy", OECD Taxation Working Papers, No. 30.
- France Stratégie (2018), "Panorama des politiques publiques en faveur des véhicules à très faibles émissions", Note de synthèse, D. Auverlot et al., May 2018.
- France Stratégie (2019a), "Comment faire enfin baisser les émissions de CO₂ des voitures", Note d'analyse No. 78, N. Meilhan, Department of Sustainable and Digital Development, June 2019.
- France Stratégie (2019b), Faire de la Politique Agricole Commune un levier de la transition agroécologique, public report, J. Foss et al., October 2019.
- France Stratégie (2019c), Objectif "zéro artificialisation nette": quels leviers pour protéger les sols?, Report to the Minister for Minister for Ecological and Solidarity Transition, the Minister for Territorial Cohesion and Relations with Territorial Communities and the Minister responsible for Cities and Housing, J. Foss et al., July 2019.
- France Stratégie (2019d), "Les réseaux de distribution d'électricité dans la transition énergétique", Working Paper No. 2019-07, É. Beeker, November 2019.
- France Stratégie (2020a), "Les performances économiques et environnementales de l'agroécologie", Note d'analyse No. 94, J. Fosse and A. Grémillet, Department of Sustainable and Digital Development, August 2019.
- France Stratégie (2020b), "Les solidarités entre territoires: un levier pour la transition écologique", Note de synthèse, M. Dégremont, Department of Sustainable and Digital Development, August 2020.
- France Stratégie (2020c), "Comment accélérer la rénovation énergétique des logements", Note d'analyse No. 95, V. Aussilloux and A. Baiz, Economics Department, October 2020.
- Furceri, D., Ganslmeier, M. et Ostry, J.D. (2021), "Are climate change policies politically costly?", IMF working paper No. 2021/156, June 4, 2021.
- Geoffron, P. and B. Thirion (2020), Les co-bénéfices du fret ferroviaire: Éléments d'évaluation et propositions, Report for the "Fret Ferroviaire Français pour le Futur" (French Rail Freight of the Future, 4F) coalition, Altermind, June 2020.
- GRDF et al. (2021), Panorama du Gaz Renouvelable en 2020, 6th Edition, Gaz Réseau Distribution France (GRDF), GRTgaz, SPEGN, French Renewable Energy Trade Association (SER) and Teréga, February 2021.
- Hardelin, J. and J. Lankoski (2018), "Land use and ecosystem services", OECD Food, Agriculture and Fisheries Papers, No. 114, OECD Publishing, Paris.
- HCC (2019), Évaluer les lois en cohérence avec les ambitions, High Council on Climate (HCC), December 2019.
- HCC (2020a), "France Relance": quelle contribution à la transition bas-carbone, Opinion of the High Council on Climate (HCC), December 2020.
- HCC (2020b), Maîtriser l'empreinte carbone de la France, High Council on Climate (HCC), October 2020.
- HCC (2020c), Redresser le cap, relancer la transition, Annual Carbon Neutrality Report for the general public, High Council on Climate (HCC), September 2020.
- HCC (2020d), Rénover mieux: leçons d'Europe, High Council on Climate (HCC), November 2020.
- HCC (2021a), Renforcer l'atténuation, engager l'adaptation, 2021 Annual Report of the High Council on Climate (HCC), June 2021.
- HCC (2021b), Avis portant sur le projet de loi climat et résilience, Opinion of the High Council on Climate (HCC), February 2021.
- Husson, J.F. (2017), Mission « Écologie, développement et mobilités durables », « Transition Énergétique », « Aides à l'acquisition de véhicules propres » et « Financement des aides aux collectivités pour l'électrification rurales », Première partie, Chapitre 3 : Une fiscalité énergétique punitive aux contreparties notoirement insuffisantes. Jean-François Husson, rapporteur spécial pour le Sénat, novembre 2017.
- I4CE (2018a), "La contribution climat énergie en France: fonctionnement, revenus et exonérations", J. Grimault, S. Postic and L. Rogissart, Point climat No. 56, Institute for Climate Economics (I4CE), Paris, October 2018.
- I4CE (2018b), Green Bonds: Improving their contribution to the low-carbon and climate resilient transition, I. Cochran, M. Nicol and I. Shishlov, Green Bonds Research Program Work Package 1, February 2018.

- I4CE (2019), Climat et fiscalité: trois scénarios pour sortir de l’impasse, A. Guillou and Q. Perrier, Institute for Climate Economics (I4CE), Paris, February 2019.
- I4CE (2020a), Évaluation climat des budgets locaux: objectifs et démarche, Special Edition, Institute for Climate Economics (I4CE), Paris, November 2020.
- I4CE (2020b), Plan de relance et budget 2021: L’analyse du I4CE, L. Kessler, Institute for Climate Economics (I4CE), Paris, October 2020.
- I4CE (2020c), Relance: comment financer l’action climat, H. Hainaut et al., Institute for Climate Economics (I4CE), Paris, July 2020.
- I4CE (2021a), La réglementation financière peut-elle accélérer la transition bas-carbone?, M. Cardona and J. Evain, Point climat No. 66, Institute for Climate Economics (I4CE), Paris, January 2021.
- I4CE (2021b), Panorama des financements climat: Édition 2020, H. Hainaut and M. Ledez, Institute for Climate Economics (I4CE), Paris, March 2021.
- IKEM/I4CE (2019), “Panorama des investissements dans la transition énergétique en France et en Allemagne: Comparaison des méthodologie et résultats-clés”, I. Cochran et al., Note de synthèse, Institute for Climate Protection, Energy and Mobility (IKEM) and Institute for Climate Economics (I4CE), September 2019.
- IMF (2021), “Building back better: How big are green spending multipliers?”, IMF Working Paper, WP/21/87, March 2021.
- INSEE (2021), Selon les polluants atmosphériques, les effets immédiats sur les admissions aux urgences et sur mortalité différent. Insee Analyses, nr. 67, juillet 2021.
- INSEE (2014), Une inscription territoriale diffuse pour la centrale nucléaire de Fessenheim, Insee Analyses, Nr. 2, juillet 2014.
- IPCC (2014), Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R. K. Pachauri and L. A. Meyer (eds.)], Geneva, Switzerland, www.ipcc.ch/assessment-report/ar5.
- IRSN (2013), “La gestion des déchets radioactifs: Collecter, trier, traiter, conditionner, entreposer et finalement stocker pour se protéger”, Collection of thematic booklets, Radioprotection and Nuclear Safety Institute (IRSN).
- Kirsch, A. et al. (2017), “Aides directes et environnement: la politique agricole commune en question”, A. Kirsch, J.-C. Kroll and A. Trouvé, Économie rurale, No. 359, May-June 2017.
- Koźluk, T. and V. Zipperer (2013), “Environmental policies and productivity growth – a critical review of empirical findings”, OECD Journal: Economic Studies, Vol. 2014/1, OECD Publishing, Paris.
- Metcalf, G. E. and J. H. Stock (2020), “Measuring the macroeconomic impact of carbon taxes”, AEA Papers and Proceedings, Vol. 110, pp. 101-106.
- Météo France (2020), Les nouvelles projections climatiques de référence DRIAS 2020 pour la métropole, Collaboration between Météo France, CNRM, Cerfacs and IPSL.
- MTE (2019), La biodiversité s’explique, June 2019 Edition, Ministry of the Ecological Transition (MTE).
- Nielsen, U. E. et al. (2011), “Soil biodiversity and carbon cycling: a review and synthesis of studies examining diversity-function relationships”, European Journal of Soil Science, Vol. 62, No. 1, pp. 105-116.
- Nielsen, U. N., D. H. Wall et J. Six (2015), Soil biodiversity and the environment, Annual Review of Environment and Resources, vol. 40, no 1, pp. 63–90.
- OECD (2012), Water quality and agriculture: Meeting the policy challenge, OECD Studies on Water, OECD Publishing, Paris.
- OECD (2014), OECD Environmental Performance Reviews: Sweden 2014, OECD Publishing, Paris.
- OECD (2015), Fostering green growth in agriculture: The role of training, advisory services and extension initiatives, OECD Green Growth Studies, OECD Publishing, Paris.
- OECD (2016), Farm management practices to foster green growth, OECD Green Growth Studies, OECD Publishing, Paris.
- OECD (2017a), Employment implications of green growth: Linking jobs, growth, and green policies, OECD Report for the G7 Environment Ministers, June 2017, OECD Publishing, Paris.
- OECD (2017b), Getting Skills Right: France, OECD Publishing, Paris.

- OECD (2018), *Effective Carbon Rates 2018: Pricing carbon emissions through taxes and emissions trading*, OECD Publishing, Paris.
- OECD (2019a), *OECD Economic Surveys: France 2019*, OECD Publishing, Paris.
- OECD (2019b), *Taxing Energy Use 2019, Country Note – France*, OECD Publishing, Paris.
- OECD (2019c), *Waste management and the circular economy in selected OECD countries: Evidence from Environmental Performance Reviews*, OECD Environmental Performance Reviews, OECD Publishing, Paris.
- OECD (2019d), *Human acceleration of the nitrogen cycle: Managing risks and uncertainty*, OECD Publishing, Paris.
- OECD (2019e), *Assessing incentives to reduce congestion in Israel*, OECD Publishing, Paris.
- OECD (2019f), *Trends and drivers of agri-environmental performance in OECD countries*, OECD Publishing, Paris.
- OECD (2020a), *Environment at a Glance 2020*, OECD Publishing, Paris.
- OECD (2020b), *Developing sustainable finance definitions and taxonomies*, Green Finance and Investment, OECD Publishing, Paris.
- OECD (2020c), *Making the green recovery work for jobs, income and growth*, OECD Policy Responses to Coronavirus (COVID-19), OECD Publishing, Paris.
- OECD (2020d), *“France” in Taxation in Agriculture*, OECD Publishing, Paris.
- OECD (2020e), *Climate policy leadership in an interconnected world: What role for border carbon adjustments?*, OECD Publishing, Paris.
- OECD (2021a), *Assessing the economic impacts of environmental policies: Evidence from a decade of OECD research*, OECD Publishing, Paris.
- OECD (2021b), *Effective Carbon Rates 2021: Pricing carbon emissions through taxes and emissions trading*, OECD Publishing, Paris.
- OECD (2021c), *OECD Housing Policy Toolkit – Synthesis Report*, OECD Publishing, Paris.
- OECD (2021d), *Practical design principles for high-performing agri-environmental schemes: From actions to outcomes, Literature Review, Spectrum Framework and Policy Simulations*.
- OECD (2021e), *OECD Economic Surveys: Euro Area 2021*, OECD Publishing, Paris.
- OECD (2021f), *Agricultural Policy Monitoring and Evaluation 2021: Addressing the challenges facing food systems*, OECD Publishing, Paris.
- OECD (2021g), *Green Recovery: Database of recovery measures with environmental implications, Cover note including initial results and information on tagging for environmental impacts*, Environment Directorate, ENV/EPOC(2021)5.
- OECD (2021h), *Scoping Paper: “Towards a framework for a decarbonisation strategy: A multistep approach towards a cost-effective, inclusive and comprehensive policy”*, Economics Department, ECO/CPE/WP1(2021)9.
- OECD (2021i), *Measuring the environmental performance of agriculture across OECD countries*, OECD Publishing, Paris.
- OECD/IEA (2018), *Nordic EV Outlook 2018: Insights from leaders in electric mobility*, International Energy Agency (IEA), OECD Publishing, Paris.
- OECD/IEA (2020), *Sustainable Recovery, World Energy Outlook Special Report in collaboration with the International Monetary Fund*, International Energy Agency (IEA), IEA Publications, July 2020.
- OECD/IEA (2021), *France 2021 Energy Policy Review*, International Energy Agency (IEA) (forthcoming).
- OECD/IEA and RTE (2021), *Conditions and requirements for the technical feasibility of a power system with a high share of renewables in France towards 2050*, International Energy Agency (IEA) and Réseau de Transport d'Électricité (RTE), IEA Publications, January 2021.
- OECD/IEA and UNEP (2020), *Cooling emissions and policy synthesis report: Benefits of cooling efficiency and the Kigali Amendment*, United Nations Environment Programme (UNEP), Nairobi, and International Energy Agency (IEA), Paris.
- OECD/IEA and OECD/NEA (2020), *Projected costs of generating electricity: 2020 Edition*, International Energy Agency (IEA) and Nuclear Energy Agency (NEA), OECD Publishing, Paris.

- OECD/IEA (2019), The costs of decarbonisation: System costs with high shares of nuclear and renewables, Nuclear Energy Agency Report No. 7299, OECD Publishing, Paris.
- OECD/ITF (2018a), “Policy priorities for decarbonising urban passenger transport”, International Transport Forum Policy Papers, No. 59, OECD Publishing, Paris.
- OECD/ITF (2018b), The Social Impacts of Road Pricing: Summary and Conclusions, International Transport Forum (ITF) Roundtable Reports, No. 170, OECD Publishing, Paris.
- OECD/ITF (2019), “Understanding consumer vehicle choice: A new car fleet model for France”, International Transport Forum Policy Papers, No. 72, OECD Publishing, Paris.
- OECD/ITF (2021), Reversing Car Dependency: Summary and Conclusions, International Transport Forum (ITF) Roundtable Reports, No. 181, OECD Publishing, Paris.
- OECD/NEA (2020a), Management and disposal of high-level radioactive waste: Global progress and solutions, Radioactive Waste Management, Nuclear Energy Agency (NEA), OECD Publishing, Paris.
- OECD/NEA (2020b), Unlocking reductions in the construction costs of nuclear: A practical guide for stakeholders, Nuclear Technology Development and Economics, Nuclear Energy Agency (NEA), OECD Publishing, Paris.
- OECD/NEA (2021), Ensuring the adequacy of funding arrangements for decommissioning and radioactive waste management, Nuclear Technology Development and Economics, Nuclear Energy Agency (NEA), OECD Publishing, Paris.
- OECD and The World Bank (2019), “France” in Fiscal Resilience to Natural Disasters: Lessons from Country Experiences, OECD Publishing, Paris.
- OFB (2020), Six questions sur la biodiversité en France: Bilan 2020 de l’ONB, French Office for Biodiversity (OFB).
- Office Fédéral du développement territorial (2015), Equitable et efficiente : la redevance sur le trafic des poids lourds liée aux prestations en Suisse. Berne, janvier 2015.
- ONERC (2018), Changement Climatique: Impacts en France, French National Observatory on the Effects of Global Warming (ONERC), Ministry of the Ecological and Inclusive Transition (MTES), December 2018.
- Plastics Europe (2020), Plastics – the Facts 2020: An analysis of European plastics production, demand and waste data, Plastics Europe, Association of Plastics Manufacturers, Brussels.
- Quirion, Philippe (2013), L’effet net sur l’emploi de la transition énergétique en France : une analyse input-output du scénario négaWatt, Document de travail No. 46-2013, Centre International de Recherches sur l’Environnement et le Développement, avril 2013.
- Rexecode (2021), “Les émissions françaises de gaz à effet de serre d’ici 2030: L’impact de la récession et du plan de relance”, Rexecode, Working Paper No. 76, January 2021.
- RTE (2017), Bilan prévisionnel de l’équilibre offre-demande d’électricité en France – Édition 2017, Réseau de Transport d’Électricité (RTE).
- RTE (2019), Schéma décennal de développement du réseau – Édition 2019: Principaux résultats, Réseau de Transport d’Électricité (RTE).
- RTE (2021), Futurs énergétiques 2050 – Principaux résultats. Le Réseau de transport d’électricité. Octobre 2021.
- Rüdinger, A. (2015), “Comment financer la transition énergétique? Éléments d’analyse pour une approche stratégique”, IDDRI Working Papers, No. 01/15, Institute for Sustainable Development and International Relations (IDDRI) and Sciences Po, Paris, France, February 2015.
- Rüdinger, A. (2018a), “Best practices and challenges for effective climate governance frameworks: A case study on the French experience”, IDDRI Studies, No. 03/18, Institute for Sustainable Development and International Relations (IDDRI) and Sciences Po, Paris, France, May 2018.
- Rüdinger, A. (2018b), “Le suivi et l’évaluation de la transition bas-carbone en France”, IDDRI Studies, No. 07/18, Institute for Sustainable Development and International Relations (IDDRI) and Sciences Po, Paris, France, July 2018.
- Rüdinger, A. (2018c), “Vers un tableau de bord de la transition bas-carbone en France”, IDDRI Studies, No. 11/18, Institute for Sustainable Development and International Relations (IDDRI) and Sciences Po, Paris, France, October 2018.

- Rüdinger, A. (2019), "Les projets participatifs et citoyens d'énergies renouvelables en France: État des lieux et recommandations", IDDRI Studies, No. 03/19, Institute for Sustainable Development and International Relations (IDDRI) and Sciences Po, Paris, France, May 2018.
- Rüdinger, A. and L. Vallejo (2018), "Le comité pour le changement climatique au Royaume-Uni: Quel retour d'expérience et quels enseignements pour la France?", IDDRI Studies, No. 06/18, Institute for Sustainable Development and International Relations (IDDRI) and Sciences Po, Paris, France, July 2018.
- Rüdinger, A. et al. (2018), "Évaluation de l'état d'avancement de la transition bas-carbone en France", IDDRI Studies, No. 12/18, Institute for Sustainable Development and International Relations (IDDRI) and Sciences Po, Paris, France, October 2018.
- Sainteny, G. (2018), "La fiscalité peut-elle contribuer à limiter l'artificialisation des sols?" Responsabilité et Environnement, No. 91, July 2018, Annales des Mines, pp. 41-45.
- Santé Publique France (2021), "Impact de la pollution de l'air ambiant sur la mortalité en France métropolitaine", Études et enquêtes Santé-Environnement, April 2021.
- Saujot, M., N. Berghmans and L. Chancel. (2019), "Après le gel de la taxe carbone, quelles priorités pour la transition écologique?", IDDRI Policy Briefs, No. 01, Institute for Sustainable Development and International Relations (IDDRI) and Sciences Po, Paris, France, March 2019.
- Sen, S. and H. Vollebergh (2018), "The effectiveness of taxing the carbon content of energy consumption", Journal of Environmental Economics and Management, Vol. 92, pp. 74-99.
- Sichel, O. (2021), Rapport pour une réhabilitation énergétique massive, simple et inclusive des logements privés, March 2021.
- Sud, M. (2020), "Managing the biodiversity impacts of fertiliser and pesticide use: Overview and insights from trends and policies across selected OECD countries", OECD Environment Working Papers, No. 155, OECD Publishing, Paris.
- UICN (2020), La liste rouge des espèces menacées en France: 13 ans de résultats, French Committee of the International Union for Conservation of Nature (IUCN), French Office for Biodiversity (OFB) and French National Museum of Natural History (MNHN), Paris, France.
- Wall, D. H., R. Bardgett and E. Kelly (2010), "Biodiversity in the dark", Nature Geoscience, Vol. 3, No. 5, pp. 297-298.
- Weissgerber, M. et al. (2019), "Biodiversity offsetting: Certainty of the net loss but uncertainty of the net gain", Biological Conservation, Vol. 237, September 2019, pp. 200-208.
- World Bank (2019), "Using carbon revenues", Technical Note No. 16, The World Bank Group and French Development Agency (AFD), World Bank, Washington, DC, August 2019.



From:
OECD Economic Surveys: France 2021

Access the complete publication at:

<https://doi.org/10.1787/289a0a17-en>

Please cite this chapter as:

OECD (2021), “Steering the recovery towards an ecological transition”, in *OECD Economic Surveys: France 2021*, OECD Publishing, Paris.

DOI: <https://doi.org/10.1787/2f1e8fcd-en>

This work is published under the responsibility of the Secretary-General of the OECD. The opinions expressed and arguments employed herein do not necessarily reflect the official views of OECD member countries.

This document, as well as any data and map included herein, are without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area. Extracts from publications may be subject to additional disclaimers, which are set out in the complete version of the publication, available at the link provided.

The use of this work, whether digital or print, is governed by the Terms and Conditions to be found at <http://www.oecd.org/termsandconditions>.