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COMMISSION STAFF WORKING DOCUMENT

Environmental Implementation Review 2022
Country Report - LUXEMBOURG

Accompanying the document

Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions

Environmental Implementation Review 2022: *Turning the tide through environmental compliance*

{COM(2022) 438 final} - {SWD(2022) 252 final} - {SWD(2022) 253 final} - {SWD(2022) 254 final} - {SWD(2022) 255 final} - {SWD(2022) 256 final} - {SWD(2022) 257 final} - {SWD(2022) 258 final} - {SWD(2022) 259 final} - {SWD(2022) 260 final} - {SWD(2022) 261 final} - {SWD(2022) 262 final} - {SWD(2022) 263 final} - {SWD(2022) 264 final} - {SWD(2022) 265 final} - {SWD(2022) 266 final} - {SWD(2022) 268 final} - {SWD(2022) 269 final} - {SWD(2022) 270 final} - {SWD(2022) 271 final} - {SWD(2022) 272 final} - {SWD(2022) 273 final} - {SWD(2022) 274 final} - {SWD(2022) 275 final} - {SWD(2022) 276 final} - {SWD(2022) 277 final} - {SWD(2022) 278 final}

This report has been written by the staff of the Directorate-General for Environment, European Commission. Any comments are welcome to the following e-mail address: ENV-EIR@ec.europa.eu

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Table of Contents

Executive summary

The main challenges in Luxembourg's implementation of EU environmental policy and law identified in past environmental implementation reviews (EIRs) were:

- improve nitrate concentrations in groundwater and the trophic state of surface water;
- take short-term measures to reduce vehicle emissions;
- monitor the risk of increased particulate-matter emissions from greater use of biomass to reduce greenhouse-gas emissions; and
- monitor habitat fragmentation and biodiversity loss.

On **water management**, Luxembourg achieved sufficient levels of collection and treatment of urban waste water. Water pollution by heavy metals significantly decreased in recent years. However, concerns remain as all surface water bodies and a major part of groundwater bodies failed to achieve a good ecological status in 2020. Nutrient losses from waste water treatment plants have been cut by half since 2000. However, further work is needed to reduce nitrate pollution where agriculture pressure is significant. 77% of the nutrient flux comes from agriculture.

On **air quality**, there has been some progress. Key air pollutants decreased in recent years, although in some sensitive areas, concerns on traffic-induced air pollution remain. The authorities should monitor the situation closely and adjust measures if needed, also taking into account pollution from private cars.

On **biodiversity**, there has been progress, starting with the full implementation of the Natura 2000 network management plans. Although, Luxembourg has one of the highest rates of protected terrestrial areas in the EU, the share of habitats and species with a bad conservation status has increased. Luxembourgish authorities should continue to take regulatory measures to stengthen biodiversity. They should also furhter integrate biodiversity issues in other policies, in particular to decrease agriculture pressures on the environment.

There has been substantial progress on the **circular economy**, with a significant increase in circular material-use rate, resource productivity, and eco-innovation, illustrating Luxembourg's action.

On **waste management**, there has been only limited progress. Waste generation is stagnating at high levels and recycling rates did not progres in recent years. More action will be necessary to comply with the EU's post-2020 recycling targets.

Environmental implementation in Luxembourg continues to receive some support from **EU financing**, but 99% is financed from national sources. From the European Structural and Investment Funds, Luxembourg received EUR 4 million to cover direct environmental investment and climate and risk management in 2014-2020. Luxembourg is due to receive over EUR 93 million through its national recovery and resilience plan (RRP) (2021-2026) and a EUR 58.7 million cohesion-policy allocation (2021-2027). The main funding to deal with investment needs must come from national and private sources. Luxembourg's total financing for environmental investment came to 0.49% of GDP in 2014-2020. In 2021-2027, Luxembourg's environmental investment needs are estimated to reach over 0.77% of GDP, **suggesting an environmental financing gap of at least 0.27% of GDP**. This financing gap needs to be addressed by additional environmental financing measures and by raising financial resources.

Luxembourg's RRP shows good practice. It contains direct investments to support nature and biodiversity, including groundwater protection and restoration of watercourses to their natural condition.

Part I: Thematic areas

1. Circular economy and waste management

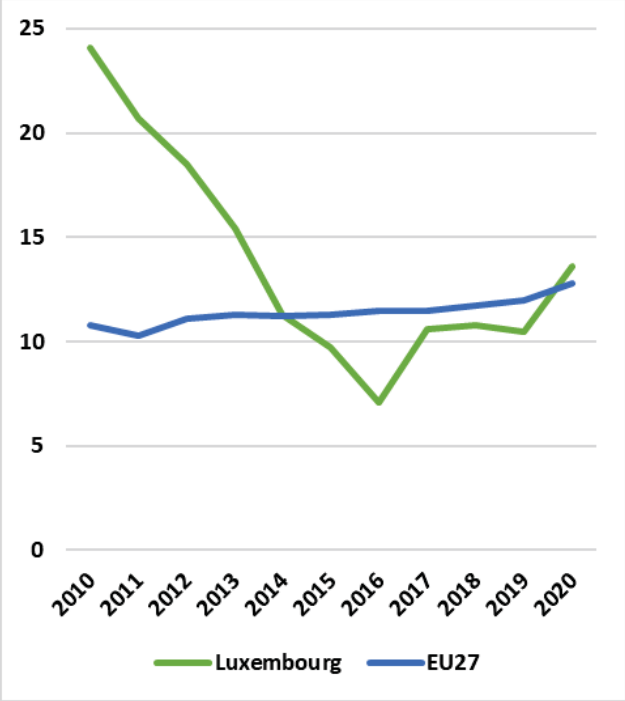
Measures towards a circular economy

The new Circular Economy Action Plan adopted in March 2020 is one of the main building blocks of the European Green Deal. The EU's transition to a circular economy will reduce pressure on natural resources and will create sustainable growth and jobs. It is also a prerequisite to achieve the EU's 2050 climate neutrality target and to halt biodiversity loss. The Action Plan announces initiatives along the entire life cycle of products, aiming to reduce the EU's consumption footprint and to double the EU's circular material use rate by 2030. It targets how products are designed, promotes circular economy processes, encourages sustainable consumption, and aims to ensure that waste is prevented and the resources used are kept in the EU economy for as long as possible.

The circular material-use rate is a good indicator of an economy's circularity, as it includes all the materials that are fed back into our economy. Large differences in the circularity rate exist between countries. To help achieve the goal in the EU circular economy action plan of doubling the EU's circular material-use rate by 2030, ambitious measures targeting the whole product life cycle are needed at Member-State level. Such measures range from sustainable product design that makes it possible to increase the durability, reparability, upgradability and recyclability of products to other measures like: (i) 'remanufacturing'[1]; (ii) increasing circularity in production processes; (iii) recycling; (iv) boosting eco-innovation; and (v) increasing the uptake of green public procurement.

Luxembourg's circular (secondary) material-use rate was 11.3% in 2014 and 13.6% in 2020, compared to the EU average of 12.8%. As shown in Figure 1, Luxembourg performed better than the EU average again in 2020.

Figure 1: Circular material-use rate (%), 2010-2020[2]

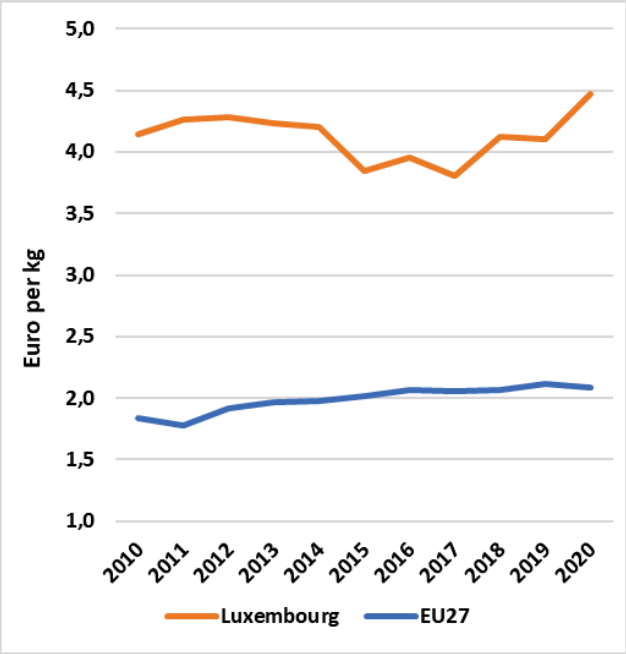


Resource productivity expresses how efficiently the economy uses material resources to produce wealth. Improving resource productivity can help to minimise negative impacts on the environment and reduce dependency on volatile raw-material markets. As shown in Figure 2, with EUR 4.47 generated per kg of material consumed, resource productivity in Luxembourg was well above the EU average of EUR 2.09 per kg in 2020. This positive performance is further supported by a continuous increase in Luxembourg's resource productivity over the last few years.

[1] A standardised industrial process that takes place within industrial or factory settings, in which cores are restored to original as-new condition and performance or better.

[2] Eurostat, *Circular Economy Monitoring Framework*.

Figure 2: Resource productivity, 2010-2020[3]



Circular-economy strategies

The European Commission encourages Member States to adopt and implement national/regional circular-economy strategies covering the whole life cycle of products. This is because such strategies are one of the most effective ways to progress towards a more circular economy. Since the launch of the online Circular Economy Stakeholder Platform in 2017[4], national, regional or local authorities have used the platform to share their strategies and roadmaps.

In February 2021, Luxembourg adopted a new circular-economy strategy called *Circular Economy Strategy Luxembourg*, to be implemented in 3 years. The strategy is comprehensive and targets products' entire life cycle. The strategy was developed jointly by four ministries: the Ministry of Energy and Spatial Planning, the Ministry of the Economy, the Ministry of the Environment, Climate and Sustainable Development, and the Ministry of Finance.

Luxembourg created a new public administration unit, called the National Coordination Unit. It aims to centralise the monitoring of the strategy's implementation. The strategy includes an implementation timeline. However, this timetable sets implementation targets by group of deliverables rather than for the implementation of each deliverable announced in the strategy separately.

The strategy also includes specific action on construction. The country has no sectoral strategies on plastics and textiles in place.

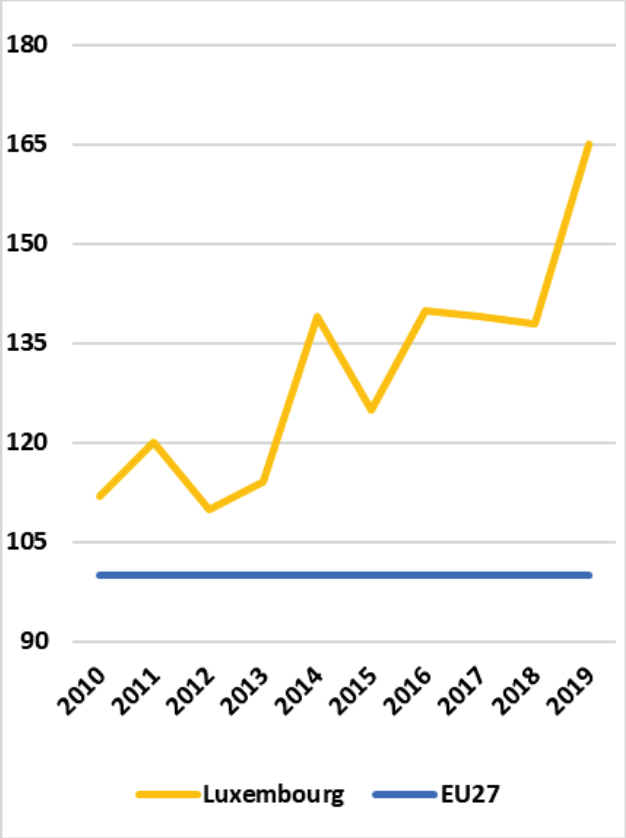
Eco-innovation

A successful transition to a circular economy requires social and technological innovation. This is because the full potential of the circular economy can only be reached when it is implemented across all value chains. Eco-innovation is an important enabling factor for the circular economy. New approaches to product design and new business models can help to produce circularity innovations, creating new business opportunities.

On the overall 2021 eco-innovation scoreboard, Luxembourg ranked first of all EU countries, with a total score of 171. The country is thus an eco-innovation leader. In 4 out of 5 components of the 2021 eco-innovation index, Luxembourg outperforms the EU average (eco-innovation inputs, eco-innovation outputs, resource-efficiency outcomes, and socio-economic outcomes). It performs below the EU average in eco-innovation activities.

[3] Eurostat, *Resource productivity*.
[4] https://circulareconomy.europa.eu/platform/en/strategies

Figure 3: Eco-innovation performance, 2010-2019[5]



Green public procurement

Public procurement accounts for a large proportion of European consumption, with public authorities' purchasing power representing around 14% of EU GDP. Public procurement can help drive the demand for sustainable products that meet reparability and recyclability standards. To date, reporting to monitor the uptake of green public procurement is voluntary.

A national action plan or a national strategy on green public procurement is currently not in place in Luxembourg. Nevertheless, Luxembourg's public-procurement law formally encourages contracting authorities to use tender procedures to promote sustainable development. The country does not have any targets, specific measures or mandatory criteria in place to promote green public procurement. Some guidance on criteria that can be imposed is provided in the terms of reference and links to the EU's green public procurement website and toolkit.

[5] European Commission - Directorate-General for Environment (DG ENV), Eco-innovation Observatory', *Eco-innovation index*.

EU Ecolabel and the Eco-Management and Audit Scheme (EMAS)

The number of EU Ecolabel products and EMAS-licensed[6] organisations in a given country provides some indication of the extent to which the private sector and national stakeholders in that country are actively engaged in the transition to a circular economy. It also shows how committed public authorities are to supporting instruments designed to promote the circular economy.

In September 2021, Luxembourg had 1 product and 1 licence registered under the EU Ecolabel scheme out of 83 590 products and 2 057 licences in the EU[7]. This is a further decrease of the already low level in 2019, when Luxembourg had 9 products and 2 licences registered under the EU Ecolabel scheme. As regards EMAS, there was a positive development, as in October 2021, Luxembourg[8] had 7 registered organisations, up from 4 in 2019.

Waste management

Turning waste into a resource is supported by:
(i) fully implementing EU waste legislation, which includes the waste hierarchy, the need to ensure separate collection of waste, the landfill diversion targets, etc.;
(ii) reducing waste generation and waste generation per capita in absolute terms;
(iii) limiting energy recovery to non-recyclable materials and phasing out landfilling of recyclable or recoverable waste.

This section focuses on the management of municipal waste[9], for which EU law sets mandatory recycling targets.

Preventing products and materials from becoming waste for as long as possible is the most efficient way to improve resource efficiency and to reduce the environmental impact of waste. Waste prevention and re-use are the most preferred options, and are therefore

[6] EMAS is a European Commission programme to encourage organisations to behave in a more environmentally sustainable way.
[7] European Commission, *Ecolabel Facts and Figures*.
[8] European Commission, *EMAS*.
[9] Municipal waste consists of: (a) mixed waste and separately collected waste from households, including paper and cardboard, glass, metals, plastics, bio-waste, wood, textiles, packaging, waste electrical and electronic equipment, waste batteries and accumulators, and bulky waste, including mattresses and furniture; and (b) mixed waste and separately collected waste from other sources, where such waste is similar in nature and composition to waste from households. (Article 3, point (2b), of Directive 2008/98/EC).

at top of the waste hierarchy. The amount of municipal waste generated is a good indicator of the effectiveness of waste-prevention measures.

Luxembourg generates much more municipal waste than the EU average of 505 kg per year per person. However, this is partially caused by the very high number of cross-border commuters. After a continuously decreasing trend and having reached its lowest point (607 kg per year per person) in 2015, municipal-waste generation in Luxembourg has increased significantly, reaching 790 kg per year per person in 2020, as Figure 4 shows. This increase can be partially explained by a change in the definition of municipal waste, which induce a higher share of non-household waste (from 12% to 35%). Since 2016, municipal waste generation has slightly decreased, which potentially indicates a decoupling trend between waste generation and economic growth in Luxembourg.

Figure 4: Municipal waste by treatment in Luxembourg, 2010-2020[10]

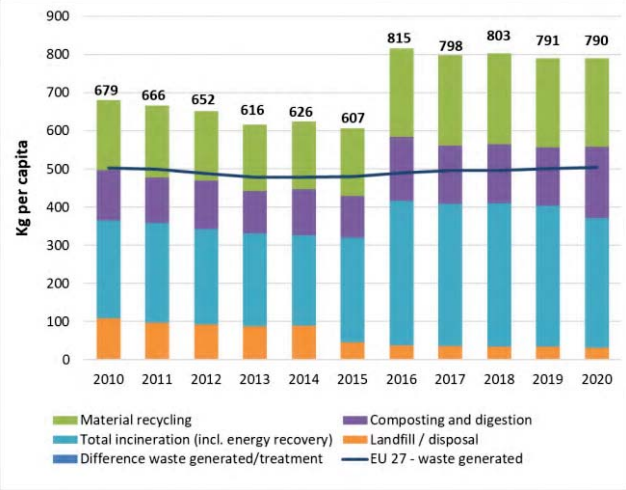
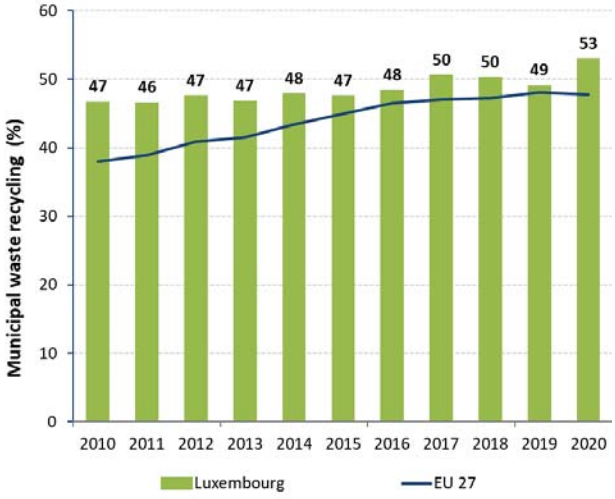


Figure 5 shows that Luxembourg's recycling rate for municipal waste has slightly increased in recent years, from 47% in 2012 to 50% in 2017. Luxembourg's performance then stagnated in 2019 (49%), but it improved again in 2020 (53%).

Figure 5: Recycling rate of municipal waste, 2010-2020[11]



The Commission's early-warning report[12] did not list Luxembourg as one of the countries at risk of missing the EU's 2020 target of recycling 50% of municipal waste. However, Luxembourg needs to do more to reach the post-2020 recycling targets (55% in 2025 and 60% in 2030), particularly on total incineration, which remains at a high level of 47% of municipal waste (e.g. 369 kg per person in 2019). The Commission is currently finalising its analyses of progress on the recommendations of the 2018 early-warning reports and of progress towards achieving the 2025 waste-recycling targets. A report covering both analyses will be presented at the end of 2022 and will assess progress made by then.

Implementation of the 2018 legislative package on waste

By 5 July 2020, Member States had to bring their national laws in line with changes included in the revised Waste Framework Directive, the Packaging and Packaging Waste Directive and the Landfill Directive[13]. Luxembourg had still not done this for the whole package by July 2021. Therefore, the Commission sent four reasoned opinions urging Luxembourg to fully transpose the new EU rules on waste into national legislation. Otherwise, the case

[10] Eurostat, *Municipal waste by waste operation*, April 2022.

[11] Eurostat, *Recycling rate of municipal rate*, April 2022.

[12] European Commission, *Report on the implementation of waste legislation, including the early warning report for Member States at risk of missing the 2020 preparation for re-use/recycling target on municipal waste*, SWD(2018)422 accompanying COM(2018)656.

[13] Directive (EU) 2018/851, Directive (EU) 2018/852, Directive (EU) 2018/850 and Directive (EU) 2018/849 amend the previous legislation on waste and set more ambitious recycling targets for the period up to 2035.

may be referred to the Court of Justice of the European Union.

Waste-management plans and waste-prevention programmes are instrumental in properly implementing the EU legislation on waste. They set out key requirements and investment to ensure compliance with current and new legal requirements (e.g. waste prevention, separate collection for a number of specific waste streams, and recycling and landfill targets). Revised plans and programmes were due on 5 July 2020.

In 2018, Luxembourg notified the Commission of its updated waste-management plan. The Commission is currently carrying out a conformity assessment to verify whether the plan meets the requirements of Article 28 of the revised Waste Framework Directive.

Luxembourg has not yet ratified the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships and the International Convention for the Control and Management of Ships' Ballast Water and Sediments.

In the 2019 EIR, Luxembourg received two priority actions in the field of waste management. There has been limited progress on the first priority action (introducing new policies and economic instruments to promote waste prevention and make product reuse and recycling more economically attractive), as detailed above. Therefore, this priority action is reiterated. On the priority action related to the introduction of an incineration tax to shift to reusable and recyclable waste, there has been no progress. In light of the 2022 early-warning report, this priority action is reiterated. New priority actions to ensure compliance with the revised Waste Framework Directive are added.

2022 priority actions

- Introduce new policies, including economic instruments, to implement further the waste hierarchy, i.e. promote prevention, and make reuse and recycling more economically attractive; implement the policies which are already in place.
- Shift reusable and recyclable waste away from incineration by gradually phasing out subsidies to incineration or by introducing an incineration tax. Channel those revenues towards measures to improve waste management in line with the waste hierarchy.
- Put in place a national waste management plan in line with the revised Waste Framework Directive is in place.
- Ratify relevant international conventions on ship recycling and on ballast water and sediments.

2. Biodiversity and natural capital

The 2030 EU biodiversity strategy adopted in May 2020 aims to put the EU's biodiversity on a path to recovery and sets out new targets and governance mechanisms to achieve healthy and resilient ecosystems.
In particular, the strategy sets out ambitious targets to:
(i) protect a minimum of 30% of the EU's land area and 30% of its sea area and integrate ecological corridors, as part of a true trans-European nature network;
(ii) strictly protect at least a third of the EU's protected areas, including all remaining EU primary and old-growth forests;
(iii) effectively manage all protected areas, defining clear conservation objectives and measures, and monitoring them appropriately.
The strategy also sets out an EU nature restoration plan – a series of concrete commitments and actions to restore degraded ecosystems across the EU by 2030, and manage them sustainably, addressing the key drivers of biodiversity loss.

The EU's Habitats and Birds Directives are key legislative tools to deliver on the targets in the EU's biodiversity strategy for 2030, and are the cornerstone of European legislation aimed at conserving the EU's wildlife[14].

On January 2017, Luxembourg's national plan on nature protection (PNPN)[15] was approved by the government[16].

This new plan identifies goals for 2030, reflected into more than 100 measures, each with corresponding indicators, priorities, deadlines, verification means, tools and responsible entities. The Commission encourages Luxembourg to update the plan to make it compliant with the 2030 EU biodiversity strategy.

Nature protection and restoration

Natura 2000[17], the largest coordinated network of protected areas in the world, is the key instrument to achieve the objectives in the Birds and Habitats Directives. These objectives are to ensure the long-term protection, conservation and survival of Europe's most valuable and threatened species and habitats and ecosystems they underpin. Key milestones towards meeting the objectives of the Birds and Habitats Directives are to: (i) setting up of a coherent Natura 2000 network; (ii) designate sites of community importance (SCIs) as special areas of conservation (SACs); and (iii) set conservation objectives and measures for the Natura 2000 sites.

Setting up a coherent network of Natura 2000 sites

Luxembourg hosts 28 habitat types[18] and 60 species[19] covered by the Habitats Directive. The country also hosts populations of 44 bird taxa listed in Annex I to the Birds Directive[20].

By 2021, 27.1% of Luxembourg's territory was covered by Natura 2000 (EU average: 18.5%). Special protection areas (SPAs) classified under the Birds Directive covered 16.1% (EU average: 12.8%) and SCIs under the Habitats Directive covered 16% (EU average: 14.2%) of the Member State's territory.

The latest assessment of the SCI part of the Natura 2000 network was carried out in 2016, on the basis of the 2014 database. At that time, the only insufficiency was related to *Coenagrion mercuriale*. Luxembourg has designated a site for this species (site LU0001013, Vallée de l'Attert de la frontière à Useldange). A final evaluation of the situation in the country will be sufficient to conclude this procedure.

Considering both Natura 2000 and other nationally designated protected areas, Luxembourg legally protects 51.5% of its terrestrial areas (EU-27 average: 26.4%)[21].

[14] According to the new EU biodiversity strategy, these should be strengthened by the Nature Restoration Law.
[15] Luxembourgish Ministry of Sustainable Development and Infrastructure, Environment Department, *Plan National concernant la Protection de la Nature 2017-2021*, Luxembourg, 13 January 2017.
[16] Décision du Gouvernement en Conseil du 13 janvier 2017 relative au plan national concernant la protection de la nature 2017-2021 et ayant trait à sa première partie intitulée « Stratégie nationale Biodiversité ».
[17] Natura 2000 comprises SCIs designated under the Habitats Directive and SPAs classified under the Birds Directive. Figures of coverage do not add up because some SCIs and SPAs overlap. SACs are SCIs designated by Member States.
[18] European Environment Agency, Article 17 dashboard, Annex I total, 2019.
[19] European Environment Agency, Article 17 dashboard, Annex II + Annex IV excluding those in Annex II + Annex V excluding those in Annex II, 2019. This counting only takes into account species and habitats for which assessment of conservation status was requested.
[20] European Environment Agency, Article 12 dashboard, Annex I, 2020. This counting only takes into account birds taxa for which information was requested.
[21] European Environment Agency, *Protected Areas*, terrestrial protected area percentage (2021), March 2022.

Figure 6: Terrestrial protected area coverage, 2021[22]

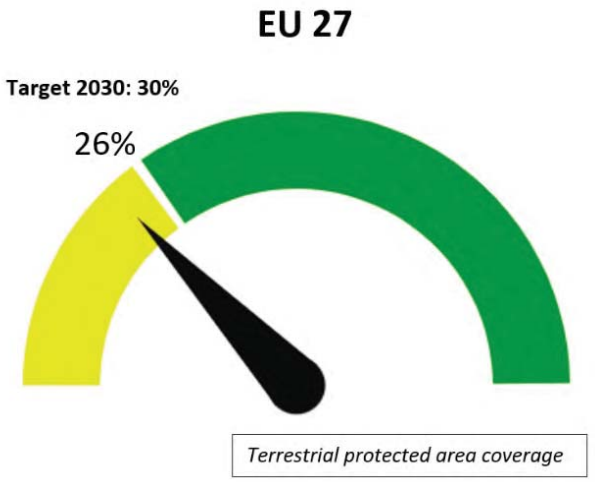
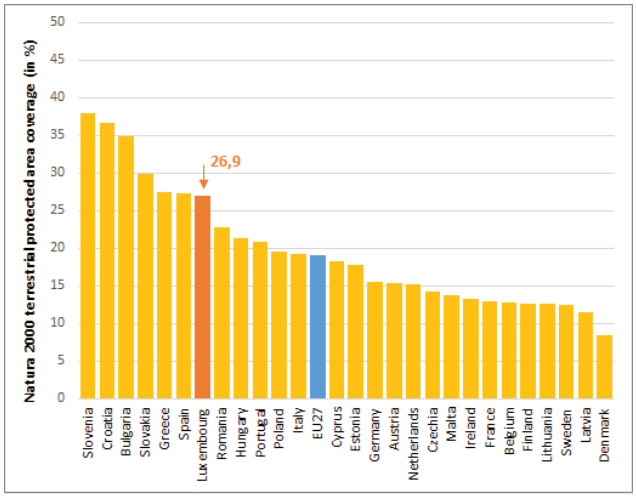


Figure 7: Natura 2000 terrestrial protected area coverage, 2021[23]



Designating SACs and setting conservation objectives and measures

Luxembourg has designated all its 48 SACs within the six-year deadline. For each SAC, conservation measures are set out in a comprehensive management plan (some management plans are shared by several SACs; management plans are available at www.emwelt.lu) or in the PNPN. Grand-ducal decrees already set conservation objectives that are not repeated in the Natura 2000 management plans. Some conservation objectives of the management plans should be improved to provide quantified objectives.

Progress in maintaining or restoring the favourable conservation status of species and habitats

To measure the performance of Member states, Article 17 of the Habitats Directive and Article 12 of the Birds Directive require reporting on the progress made towards maintaining or restoring the favourable conservation status of species and habitats.

According to Luxembourg's report on the conservation status of habitats and species covered by Article 17 of the Habitats Directive for 2013-2018, the share of habitats with a good conservation status was 32.14% in 2018 (9 good assessments). This is more than the 25% (7 good assessments) reported for 2007-2012. The share of protected species with a good conservation status was 15% in 2018 (11 assessments). This is less than the 18.3% (11 assessments) reported for 2007-2012. 42.86% of the forest area protected under the Birds and Habitats Directives shows a favourable conservation status[24] (86.0% has a good conservation status). For birds, 65% of breeding species showed short-term increasing (15%) or stable (50%) population trends. For wintering species, 50% of species showed a short-term increase.

At the same time, the share of habitats with a bad conservation status has increased to 50% and the share of species with a bad conservation status has increased to 45%. The main pressures as reported under Article 17 of the Habitats Directive and Article 12 of the Birds Directive are: (i) agriculture; (ii) development, construction and use of residential, commercial, industrial and recreational infrastructure and areas; and (iii) natural processes and changes in land use.

[22] EU Biodiversity Strategy Dashboard, indicators A1.1.1 and A1.2.1, February 2022.
[23] European Environment Agency, 2021.
[24] European Environment Agency, State of Nature Report, 2021.

Figure 8: Assessments of habitat conservation status for 2007-2012 and 2013-2018[25]

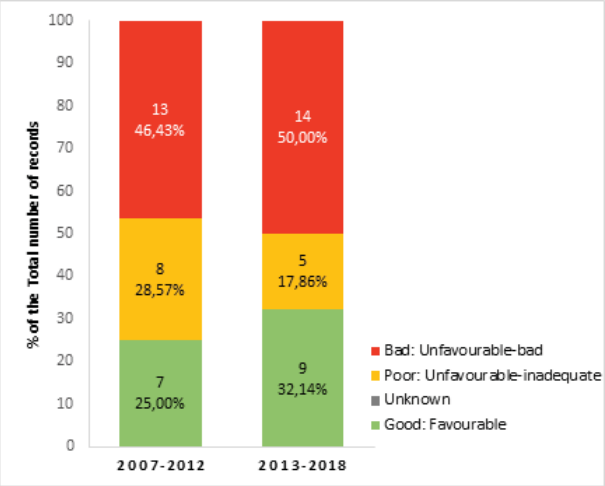
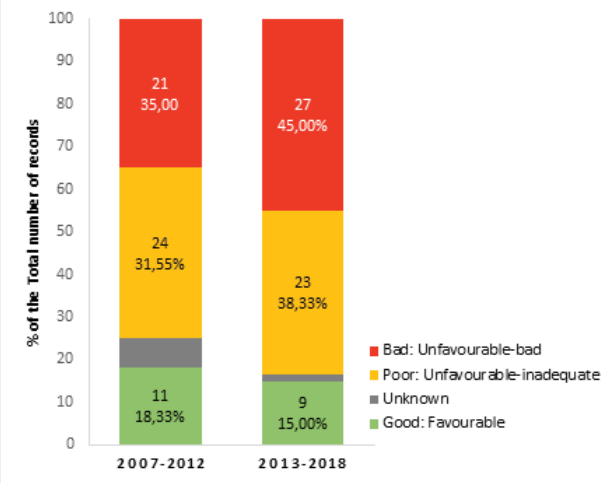


Figure 9: Assessments of species conservation status for 2007-2012 and 2013-2018[26]



For habitats, the threats and risks induced by natural processes are on par with those induced by agriculture.

Luxembourg has completely designated its Natura 2000 network. Each site has its management plan describing conservation objectives and measures. The country is under high pressure due to its high level of urbanisation and agriculture activities. The prioritised action framework (PAF) proposed by Luxembourg aims to improve the current situation, in particular by creating eight steering committees to improve site management and communication among stakeholders. Luxembourg is also investing to improve biodiversity monitoring, in particular to set up species monitoring. Luxembourg is also planning investment to maintain or restore the favourable status of grasslands and humid areas, with specific measures for each habitat (see Luxembourgish PAF).

Between 2014 and 2020, Luxembourg has used the LIFE programme to co-finance projects such as:

- LIFE Bats & Birds[27], improving habitats for endangered species; and
- The Voice for Nature[28], raising awareness about the environment, nature protection and the need to address climate change.

In 2021, the Commission received a complaint against Luxembourg related to the Habitats and Birds Directives. The complaint concerned the conservation status of: (i) the grey partridge (Perdix perdix) and other farmland birds; and (ii) semi-natural grasslands (habitat codes 6510, 6410, etc.). Despite supporting measures taken by Luxembourg, there are only four couples of partridges remaining in the country and the conservation status of semi-natural grasslands is worsening. The loss and deterioration are mainly caused by harmful agricultural practices. Binding rules are urgently needed to preserve these species and habitats, in particular to protect and restore semi-natural grasslands.

In the 2019 EIR, Luxembourg received two priority actions. The first priority action – effectively implementing Natura 2000 management plans – has been fully implemented. On the second one – integrating biodiversity concerns into other policies – there has been some progress, as detailed above. Therefore, it is important to continue this work.

Bringing nature back to agricultural land and restoring soil ecosystems

Agricultural land

The biodiversity strategy works alongside the new farm to fork strategy and the new common agricultural policy (CAP) to support and achieve the transition to fully sustainable agriculture.
The biodiversity and farm to fork strategies have set four important targets for 2030:
(i) a 50% reduction in the overall use of – and risk from

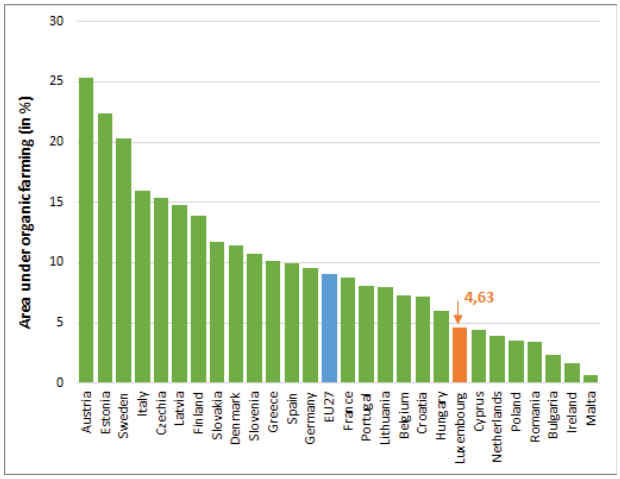
[25] European Environment Agency, Conservation status and trends of habitats and species, December 2021. Please note when comparing the figures shown for 2007-2012 and 2013-2018 these may also be affected by changes of methods or due to better data availability.
[26] Idem.

[27] LIFE Bats & Birds - providing Bed and Breakfast for Bats & Birds.
[28] The Voice for Nature - Empowering Volunteers to speak up for biodiversity and engage in direct action environmental conservation.

– chemical pesticides;
(ii) a 50% reduction in the use of more hazardous pesticides;
(iii) a 50% reduction in losses of nutrients from fertilisers while ensuring there is no deterioration of soil fertility (which will result in a 20% reduction in the use of fertilisers);
(iv) bring back at least 10% of agricultural area under high-diversity landscape features and increase areas under organic farming to at least 25%.

With an estimated 4.63% of agricultural area under organic farming, Luxembourg is far from the EU average of 9.07%. Figure 10 shows the situation in the EU on meeting the organic-farming target.

Figure 10: Share of total utilised agricultural area occupied by organic farming per Member State, 2020[29]



According to the Commission recommendations for Luxembourg's CAP strategic plan[30], farm production in Luxembourg's rural areas is characterised by a high share of livestock, causing significant pressure on natural resources and biodiversity. Considering that 21% of Luxembourg's Natura 2000 sites are agricultural zones, farming practices have a significant impact on nature conservation in the country. It is of utmost importance to further develop of organic farming and change rural practices (encouraging sustainable soil and water management, land-use mitigation and reduction of the use of pesticides). This will help bring about the climate and environmental transitions and counter the degradation of natural sites and the loss of biodiversity.

Soil ecosystem

Soil is a finite and extremely fragile resource. It is increasingly degrading in the EU.
The new EU soil strategy, adopted on 17 November 2021, stresses the importance of soil protection, of sustainable soil management and of restoring degraded soils to achieve the Green Deal objectives as well as land-degradation neutrality by 2030.
This entails:
(i) preventing further soil degradation;
(ii) making sustainable soil management the new normal;
(iii) taking action for ecosystem restoration.

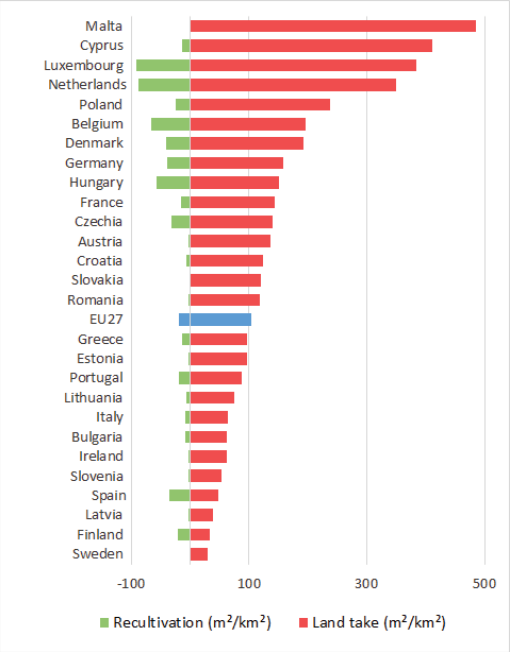
One factor in the degradation of soil ecosystems is the area of soil that is sealed or artificialised[31]. The land taken[32] per year in 2012-2018 can be seen as a measure of one significant pressure on nature and biodiversity – land-use change. At the same time, land-use change constitutes an environmental pressure on people living in urbanised areas.

Luxembourg ranks well above[33] the EU average, with one of the worst results for net land take: 292.8m^2/km^2 (EU-27 average: 83.8m^2/km^2).

In 2018, Luxembourg updated its reporting on land degradation according to the third version of the Performance Review and Implementation System (PRAIS3) reporting platform[34]. In particular, Luxembourg expanded its reporting to cover measures to reduce the degradation identified.

[29] https://ec.europa.eu/eurostat/databrowser/view/sdg_02_40/default/table?lang=en (Eurostat, Area under organic farming, February 2022).
[30] European Commission, *Commission Recomendations for Luxembourg's CAP Strategic Plan*, 2020.
[31] Artificial land cover is defined as the total of roofed built-up areas (including buildings and greenhouses), artificial non-built-up areas (including sealed-area features, such as yards, farmyards, cemeteries, car-parking areas, etc. and linear features, such as streets, roads, railways, runways and bridges) and other artificial areas (including bridges and viaducts, mobile homes, solar panels, power plants, electrical substations, pipelines, water-sewage plants, and open dumpsites).
[32] Land 'taken' means land that is sealed or artificialised.
[33] European Environment Agency, *Land take in Europe*, fig 6.
[34] All Reports | Prais3 (unccd.int).

Figure 11: Land take and recultivation in EU-27 (m^2/km^2), 2012-2018[35]



The United Nations' Global Mechanism and the secretariat of the United Nations Convention to Combat Desertification (UNCCD) use the Land Degradation Neutrality (LDN) Taget Setting Programme to support interested countries in their national LDN target-setting process. This process includes setting national baselines, targets and associated measures to achieve LDN. Target 15.3 of the Sustainable Development Goal states: 'By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world.' However, Luxembourg has not yet committed to setting LDN targets under the UNCCD[36].

Contamination can severely reduce soil quality and threaten human health or the environment. The latest available information from the Member States[37] estimated that potentially polluting activities have taken or are still taking place on approximately 2.8 million sites in the EU. Of these sites, 650 000 have been registered in national or regional inventories. 65 500 contaminated sites have been remediated already. Luxembourg had registered 12 000 sites where potentially polluting activities had taken or were taking place and the country had remediated or had applied aftercare measures on 1 060 sites already.

Soil erosion by water is a natural process that can be aggravated by climate change and human activities such as inappropriate agricultural practices, deforestation, forest fires or construction works. High levels of soil erosion can reduce productivity in agriculture and can have negative and transboundary impacts on biodiversity and ecosystem-service provision and on rivers and lakes (increased volume of sediments, transport of contaminants). According to the RUSLE2015 model[38], Luxembourg has an average soil-loss rate by water of 2.07 tonnes per hectare per year compared to a EU average of 2.46 tonnes per hectare, which indicates soil erosion is medium on average. These figures are the output of a model run at the EU level. Therefore, they should not be considered as values measured *in situ*. The actual soil-loss rate can vary strongly within a Member State depending on local conditions.

Soil organic matter plays an important role in the carbon cycle and in climate change. Soils are the second-largest carbon sink in the world after the oceans.

Forests and timber

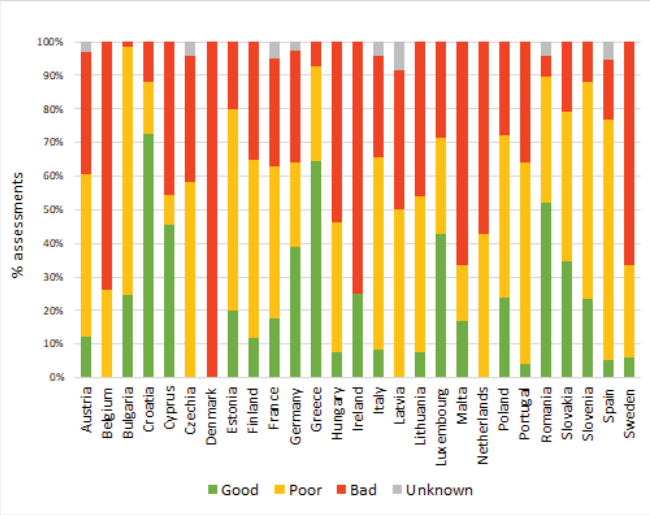
The EU forest strategy for 2030, adopted in July 2021, is part of the 'Fit for 55' package. The strategy promotes the many services that forests provide. Its key objective is to ensure healthy, diverse and resilient EU forests that contribute significantly to the strengthened biodiversity and climate ambitions.
Forests are important carbon sinks and conserving them is vital if the EU is to achieve climate neutrality by 2050.

Of the 27% of EU forest area protected under the Habitats Directive, less than 15% of assessments show a favourable conservation status[39]. The share of forested areas in the EU with a bad conservation status increased from 27% in 2015 to 31% in 2018.

In Luxembourg, forests cover 36.64%[40] of the territory[41], and more than 50% of assessments show a poor to bad status.

[35] European Environment Agency, *Land take in Europe*, December 2021.
[36] The LDN Target Setting Programme | UNCCD.
[37] Ana Paya Perez, Natalia Rodriguez Eugenio, *Status of local soil contamination in Europe: Revision of the indicator 'Progress in the management contaminated sites in Europe'*, 2018.
[38] Panagos, P., Borrelli, P., Poesen, J., Ballabio, C., Lugato, E., Meusburger, K., Montanarella, L., Alewell, C., 'The new assessment of soil loss by water erosion in Europe', *Environmental Science and Policy*, Vol. 54, 2015, pp. 438-447.
[39] European Environment Agency, *State of Nature in the EU*.
[40] European Environment Agency, *Forest information system for Europe*.
[41] COM SWD (2021) 652

Figure 12: Conservation status of forests protected under the Habitats Directive in EU Member States, 2013-2018[42]



The European Union Timber Regulation (EUTR)[43] prohibits the placing on the EU market of illegally harvested timber. In accordance with the EUTR, EU Member States' competent authorities must conduct regular checks on operators and traders and apply penalties for non-compliance. With the amendment of Article 20 of the EUTR, reporting every 2 years has been changed to annual reporting, and covers the calendar year as of 2019.

Between March 2017 and February 2019[44], Luxembourg carried out 16 checks on domestic timber operators. It also carried out 23 checks on operators importing timber. It is estimated that Luxembourg had 400 operators placing domestic and 484 operators placing imported timber types on the internal market over the reporting period.

A proposal for a regulation on the making available on the EU market and export of products associated with deforestation and forest degradation (Deforestation Regulation) was adopted on 17 November 2021. This proposal followed a request from the Council in 2019 to table a legislative proposal to address the problem, and a European Parliament resolution recommending the Commission to come forward with an EU legal framework to halt and reverse EU-driven global deforestation. The new Deforestation Regulation will repeal and replace the EUTR, as it will essentially integrate and improve the existing system to check the legality of timber.

Invasive alien species (IAS)

IAS are a key cause of biodiversity loss in the EU (alongside changes in land and sea use, overexploitation, climate change and pollution).
Besides inflicting major damage on nature and the economy, many IAS also facilitate the outbreak and spread of infectious diseases, posing a threat to humans and wildlife.
The implementation of the EU IAS Regulation and other relevant legislation must be stepped up.
The biodiversity strategy for 2030 aims to manage recognised invasive alien species and decrease the number of 'red list' species they threaten by 50%.

The core of Regulation (EU) No 1143/2014 on IAS (the 'IAS Regulation'[45]) is the list of IAS of Union concern. The total number of -IAS of Union concern is currently 66, of which 30 are animal species and 36 are plant species. Of all species, 41 are primarily terrestrial species; 23 are primarily freshwater species; 1 is a brackish-water species; and 1 is a marine species.

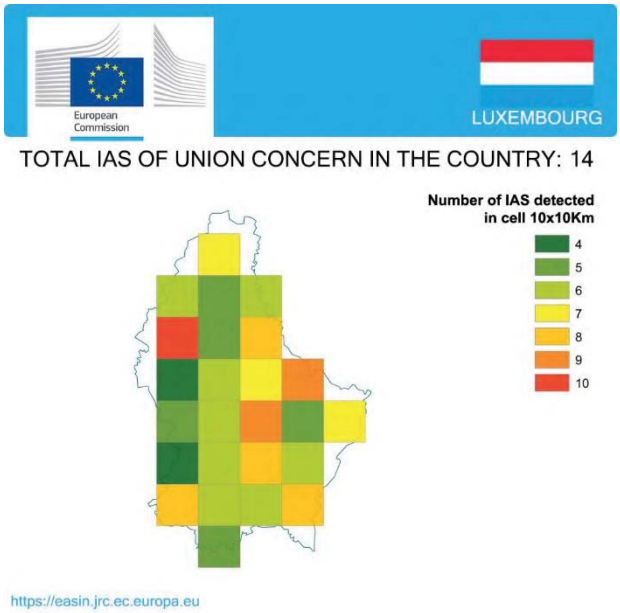
According to a 2021 report[46] on the review of the application of the IAS Regulation, the IAS Regulation is already starting to deliver on its objectives such as setting up a coherent framework for addressing IAS at EU level and increasing awareness about the problem of IAS. At the same time, the above report identified some challenges and areas for improvement. The various obligations of the IAS Regulation entered into force gradually between July 2016 and July 2019. Therefore, it is too early to draw conclusions on several aspects of the IAS Regulation's implementation.

A 2021 report[47] on the baseline distribution shows that of the 66 species on the Union list, 14 have been observed in the environment in Luxembourg. Figure 13 shows the spread of these species in the country

[42] European Environment Agency, *Conservation status and trends of habitat and species*, January 2022.
[43] Regulation (EU) No 995/2010 of the European Parliament and of the Council of 20 October 2010.
[44] COM (2020) 629 final

[45] Regulation (EU) No 1143/2014 of the European Parliament and of the Council of 22 October 2014 on the prevention and management of the introduction and spread of invasive alien species.
[46] Report from the Commission to the European Parliament and the Council on the review of the application of Regulation (EU) No 1143/2014 of the European Parliament and of the Council of 22 October 2014 on the prevention and management of the introduction and spread of invasive alien species, COM(2021) 628 final, 13.10.2021.
[47] Cardoso, A.C., Tsiamis, K., Deriu, I., D' Amico, F., Gervasini, E., *EU Regulation 1143/2014: assessment of invasive alien species of Union concern distribution, Member States reports vs JRC baselines*, EUR 30689 EN, Publications Office of the European Union, Luxembourg, 2021, ISBN 978-92-76-37420-6, doi:10.2760/11150, JRC123170.

Figure 13: Number of IAS of EU concern, based on available georeferenced information for Luxembourg, 2021



In the 2019 EIR, no priority action was proposed for Luxembourg in the fields of agriculture, soil, forest and IAS.

2022 priority actions

- Complete the Natura 2000 site designation process, including addressing the Special Areas of Conservation (SACs), and defining the conservation objectives and measures to achieve the favourable conservation status of protected habitats and species in the framework of site management plans or equivalent instruments.
- Continue the integration of biodiversity concerns into other policies (in particular in agriculture, but also in fisheries, urban and infrastructure planning and sustainable tourism) and promote communication between actors. Where relevant, avoid further habitat fragmentation and take measures to restore connectivity.
- Urgently adopt binding and regulatory measures to address root causes, for example to stop harmful agricultural practices and ensure effective enforcement to protect and restore the habitat of the grey partridge and other farmland birds.
- Achieve the 2030 target of increasing land under organic farming to at least 25%.
- Step up action on implementing the recommendations set out in Luxembourg's CAP strategic plan, especially on improving rural areas.
- Reduce the excessive area of sealed and artificialised soil and remediate degraded soils. To this end, consider formally committing to LDN targets under the UNCCD.
- Step up the implementation of the IAS Regulation.
- Ensure regional cooperation with neighbouring Member States to address predominant pressures.

Ecosystem assessment and accounting

The EU biodiversity strategy for 2030 calls on Member States to better integrate biodiversity considerations into public and business decision making at all levels and to develop natural capital accounting. The EU needs a better performing biodiversity observation network and more consistent reporting on the condition of ecosystems.

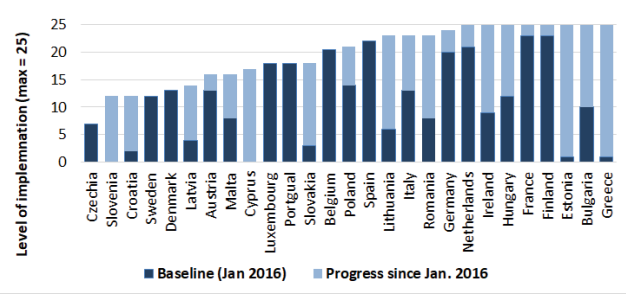
At the end of 2013, the Environment Department of the Ministry of Sustainable Development and Infrastructure launched the development of a methodological guide for the implementation of ecosystem assessment in Luxembourg. Based on this guide, the minister in charge prioritised 13 ecosystem services to be mapped by the end of 2014. At the beginning of 2014, a meeting with relevant stakeholders was arranged to: (i) present and discuss the ecosystem-assessment approach for Luxembourg; and (ii) ensure that the various departments (agriculture, environment (nature, forest, air, noise and climate) and tourism) and public research institutes involved would provide all relevant data for the ecosystem assessment. In 2015, habitat-quality mapping (i.e. ecosystem assessment with a methodology developed for restoring ecosystems using national fine-scale datasets) and ecosystem-services mapping were finalised[48].

Luxembourg is developing or engaged in several projects related to ecosystem services, such as the Values Project[49] or Nature4cities[50]. Some departments plan to integrate ecosystem services in the planning of their management action more systematically. For example, the Water Management Administration envisages to use the River Ecosystem Service Index[51]. These recent developments have not yet been integrated in the reporting on the progress made (Figure 14). This reporting is based on 27

[48] *Mapping and assessing ecosystems and their services in Luxembourg – Assessment results*, December 2015.
[49] www.lifecycle-values.lu/
[50] www.nature4cities.eu
[51] www.resi-project.info

implementation questions and updated every six months.

Figure 14: ESMERALDA MAES Barometer, January 2016 to March 2021[52]



Progress on implementing ecosystem accounting is assessed at a national scale based on 13 questions.

2022 priority actions

- Continue to support the mapping and assessment of: (i) ecosystems and their services; and (ii) ecosystem-accounting development, using appropriate indicators to integrate ecosystem extent, condition and services (including some monetary values) in national accounts and the planning of management and restoration action.
- Continue to support the development of national business and biodiversity platforms, including systems for natural-capital accounting, to monitor and value the impact of business on biodiversity.

[52] European Commission, Joint Research Centre, Publication Office, *EU ecosystem assessment – Summary for policymakers*, May 2021, p. 80.

3. Zero pollution

Clean air

EU clean-air policies and legislation need to significantly improve air quality in the EU, moving the EU closer to the quality recommended by the WHO and curbing emissions of key air pollutants.
Air pollution and its impacts on ecosystems and biodiversity should be further reduced with the long-term aim of not exceeding critical loads and levels. This requires strengthening efforts to reach full compliance with EU clean-air legislation and defining strategic targets and actions for 2030 and beyond.
The 2030 zero-pollution action-plan targets are to reduce the health impacts of air pollution by 55% and to reduce the EU ecosystems threatened by air pollution by 25%, compared to 2005.

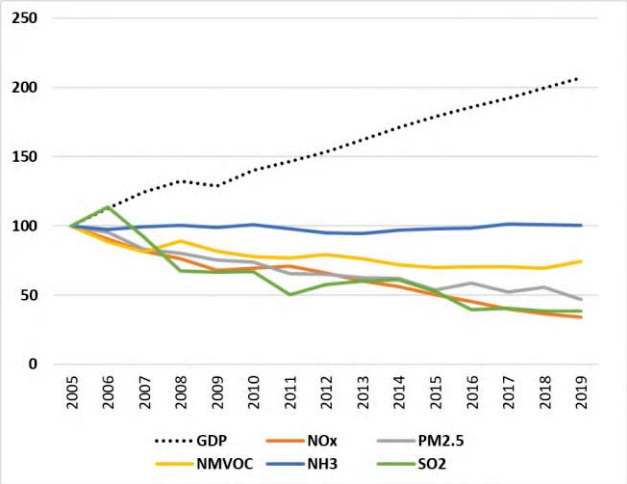
The EU has developed a comprehensive suite of air-quality legislation, which sets health-based standards[53] and emissions-reduction commitments[54] for a number of air pollutants.

Air quality in Luxembourg is generally good, with some exceptions. The latest available annual estimates (for 2019) by the European Environment Agency[55] point to about 200 premature deaths (or 2 100 years of life lost (YLL)) that can be attributed to fine particulate matter concentrations[56], 10 (100 YLL) that can be attributed to ozone concentrations[57] and 20 (300 YLL) that can be attributed to nitrogen dioxide concentrations[5859].

Over the last years, the emissions of key air pollutants in Luxembourg have decreased significantly, while GDP growth continued (see Figure 15). In the latest projections of air-pollutant emissions as submitted under Article 10(2) of the National Emission reduction Commitments Directive ((the 'NEC Directive')[60], Luxembourg expects to achieve its emission-reduction commitments for most air pollutants covered by the Directive for 2020-2029 and for 2030 onwards. However, it does not expect to achieve its emission-reduction commitments for 2020-2029 and 2030 onwards for ammonia (NH_3). The latest inventory data submitted by Luxembourg (which the Commission has not reviewed yet) indicate that in 2020, Luxembourg complied with the emission-reduction commitments for NOx, non-methane volatile organic compounds (NMVOC), sulfur dioxide (SO_2) and $PM_{2.5}$, and did not comply with the emission-reduction commitment for NH_3.

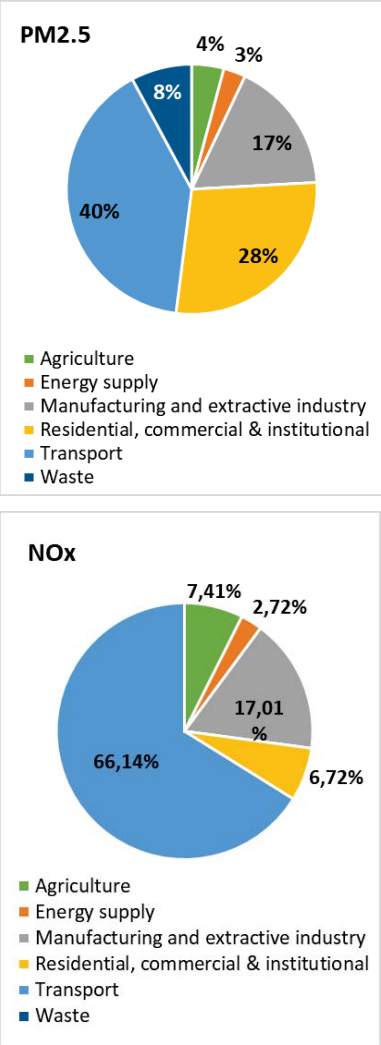
Luxembourg has submitted its national air pollution control programme (NAPCP) on 8 February 2021.

Figure 15: Trends of emissions of main pollutants and GDP in Luxembourg, 2005-2019[61]



[53] European Commission, *Air Quality Standards*, 2016.
[54] European Commission, *Reduction of National Emissions*.
[55] European Environment Agency, Air Quality in Europe – 2021 Report. See the details in this report on the underpinning methodology, p. 106.
[56] Particulate matter (PM) is a mixture of (solid and liquid) aerosol particles covering a wide range of sizes and chemical compositions. PM_{10} refers to particles with a diameter of 10 micrometres or less. $PM_{2.5}$ refers to particles with a diameter of 2.5 micrometres or less. PM is emitted from many human sources, including combustion.
[57] Low-level ozone is produced by photochemical action on pollution.
[58] Nitrogen oxides (NOx) are emitted during fuel combustion, e.g. from industrial facilities and the road-transport sector. NOx are a group of gases comprising nitrogen monoxide (NO) and nitrogen dioxide (NO_2).
[59] These figures refer to the impacts of individual pollutants. To avoid double-counting, they cannot be added up to derive a sum.
[60] Directive 2016/2284/EU.
[61] European Environment Agency.

Figure 16: PM2.5 and NOx emissions by sector in Luxembourg, 2019[62]



In 2020, no exceedances of the limit values set by the Ambient Air Quality Directive were registered. However, for several air-quality zones, the target values for ozone concentration have not been met[63].

The Commission is following up on persistent breaches of air-quality requirements, which have severe negative effects on health and environment. It launched infringement procedures (mainly over PM_{10} and NO_2 exceedances) covering all Member States concerned, including Luxembourg for exceedances of NO_2 limit values in several air-quality zones. The aim is that appropriate measures are put in place to make all air-quality zones compliant with the requirements.

In July 2017, the Commission sent a letter of formal notice to Luxembourg for failing to put an end to the repeated exceedances of NO_2 limit values in the city of Luxembourg. The city is not amongst the worst offenders and measures have been taken already (for example, a tramway has replaced buses, public transport has been made free, and an evaluation of the monitoring network has led to new locations of stations). Nevertheless, Luxembourg still fails to ensure full compliance. This is mainly due to traffic volumes (also linked with diesel cars, older buses and a large share of commuting). A 2018 monitoring campaign suggested the exceedance of NO_2 limit values in the two other air-quality zones (near busy streets).

On 16 November 2021, Luxembourg participated in an EIR peer to peer event on ammonia-reducing technology and measures. On 9 February 2022, Luxembourg participated in an EIR peer-to-peer event to present the EU action plan 'Towards Zero Pollution for Air, Water and Soil' and to provide advice and guidance, particularly on implementation and compliance aspects of the action plan[64].

In the 2019 EIR, Luxembourg received four priority actions in the field of clean air. On the first action, related to the reduction of main emission sources, there has been limited progress. On the reduction of NMVOC emissions, there has been limited progress. On the reduction of NOx emissions and NO_2 concentrations, there has been limited progress, as detailed above. On the upgrade and improvement of the air-quality monitoring network, there has been some progress as Luxembourg is monitoring air quality in the zones covered by the infringement procedures. However, work should continue.

2022 priority actions

- In the context of the NAPCP, take actions towards reducing emissions from the main emission sources mentioned above.
- Ensure full compliance with the EU air-quality standards and maintain downward trends of air-pollutants emissions, to reduce adverse impacts of air pollution on health and economy and to reach WHO guideline values.

[62] Idem.
[63] European Environment Agency, *Eionet Central Data Repository*.
[64] *TAIEX-EIR PEER 2 PEER*.

Industrial emissions

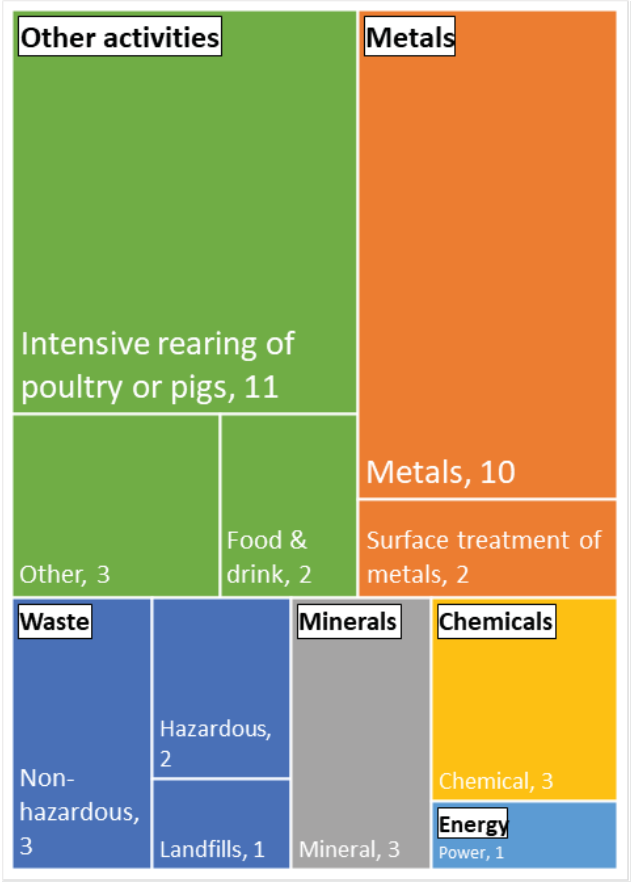
The main objectives of EU policy on industrial emissions are to:
(i) protect air, water and soil;
(ii) prevent and manage waste;
(iii) improve energy and resource efficiency;
(iv) clean up contaminated sites.
To achieve this, the EU takes an integrated approach to the prevention and control of routine and accidental industrial emissions. The cornerstone of the policy is the Industrial Emissions Directive (IED)[65].
The Commission tabled a proposal in April 2022[66]. The revision seeks to improve the Directive's contribution to the zero-pollution objective, as well as its consistency with climate, energy and circular-economy policies.

The below overview of industrial activities regulated by the IED is based on data reported to the EU Registry (2018)[67].

In Luxembourg, around 40 industrial installations are required under the IED to have a permit. The distribution of installations is shown in Figure 17.

In 2018, Luxembourg's industrial sector with the most IED installations was intensive rearing of poultry and pigs (27%), followed by the production and processing of metals (24%), the waste-management sector (including landfills) (15%), the mineral industries (7%) and the chemicals sector (7%).

Figure 17: Number of IED industrial installations per sector in Luxembourg, 2018[68]



The industrial sectors identified as placing the largest burden on the environment in terms of emissions to air were:

- the mineral industries (cement, glass and others) for sulfur oxides (SOx), NOx, lead (Pb) and cadmium (Cd);
- the metals sector for mercury (Hg) and Pb;
- intensive rearing of poultry and pigs for NH_3;
- surface treatment using organic solvents for NMVOCs; and
- the waste-management sector for $PM_{2.5}$ and dioxins.

The breakdown is shown in Figure 18.

[65] Directive 2010/75/EU covers industrial activities carried out above certain thresholds. It covers energy industry, metal production, mineral and chemical industry and waste management, as well as a wide range of industrial and agricultural sectors (e.g. intensive rearing of pig and poultry, pulp and paper production, painting and cleaning).
[66] The revision of the IED is performed in parallel to the revision of Regulation (EC) No 166/2006 on the European Pollutant Release and Transfer Register (E-PRTR).
[67] European Environment Agency, EU Registry, European Industrial Emissions Portal.
[68] Idem (data retrieved on 3 November 2021).

Figure 18: Emissions to air from IED sectors and rest of national total air emissions in Luxembourg, 2018[69]

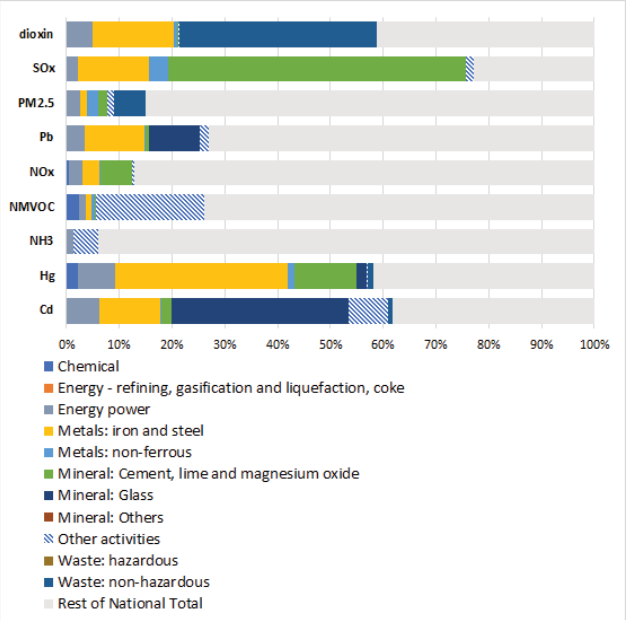
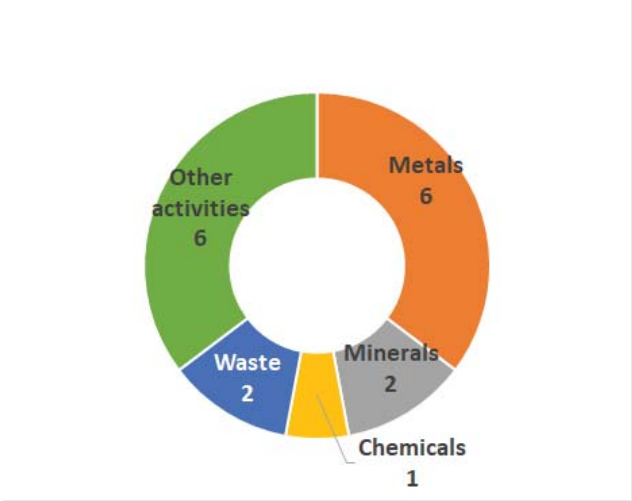


Figure 19: Number of inspections at IED installations in Luxembourg, 2018[70]



In Luxembourg, the ferrous-metals processing industry (particularly the processing of heavy metals) places the largest burden on the environment in terms of industrial emissions to water (based on E-PRTR data).

The EU approach to enforcement under the IED creates strong rights for the public to have access to relevant information and to participate in the permitting process for potentially polluting installations. This empowers the public and non-gouvernemental organisations (NGOs), to ensure that permits are appropriately granted and that the conditions of these permit are complied with. As part of environmental inspection, competent authorities undertake site visits at IED installations to take samples and to gather necessary information. According to Article 23(4) of the IED, site visits must be carried out between once a year and once every 3 years, depending on the environmental risks posed by the installations. In 2018, Luxembourg undertook 17 site visits, most of which to installations for the production and processing of metals (29%), installations for the intensive rearing of poultry and pigs (29%), waste-management sites (including landfills) (12%), and mineral-industry site (12%) (see Figure 19).

The development of best available technique (BAT) reference documents (BREFs) and BAT conclusions ensures good collaboration between stakeholders and enables better implementation of the IED[71]. Since the last EIR report, the Commission adopted BAT conclusions for Luxembourg for: (i) waste incineration; (ii) the food, drink and milk industries; and (iii) surface treatment using organic solvents including the preservation of wood and wood products with chemicals.

The Commission relies on the efforts of national competent authorities to implement the legally binding BAT conclusions and associated BAT emission levels in environmental permits. This should result in considerable and continuous reductions in pollution.

In 2019, Luxembourg received priority actions to review permits to comply with newly adopted BAT conclusions and to strengthen checks and enforcement to ensure compliance with BAT conclusions. The Commission followed Luxembourg's progress on these actions using the country's reporting to the EU Registry. The Commission is currently verifying with Luxembourg the reported information on the permits granted for each installation in the scope of the IED.

On addressing air-pollutant emissions from iron and steel plants, the ferrous-metal industry is still one of the main polluting sectors.

[69] European Environment Agency, LRTAP, *Air pollutant emissions data viewer (Gothenburg Protocol, LRTAP Convention) 1990-2019* (data retrieved on 3 November 2021).

[70] European Environment Agency, EU Registry, European Industrial Emissions Portal (data retrieved on 3 November 2021).

[71] European Commission, *BAT reference documents*

2022 priority action

- Address the pollution from metal production and processing.

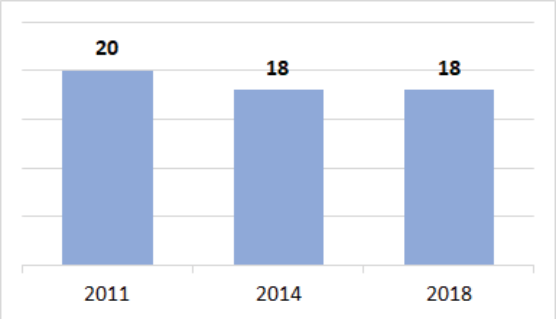
Prevention of major industrial accidents – SEVESO

The main objectives of EU policy on the prevention of major industrial accidents are to:
(i) control major accident hazards involving dangerous substances, especially chemicals;
(ii) limit the consequences of such accidents for human health and the environment;
(iii) continuously improve prevention, preparedness and response to major accidents.
The cornerstone of the policy is Directive 2012/18/EU (the Seveso-III Directive)[72].

The below overview of industrial plants regulated by the Seveso-III Directive ('Seveso establishments') is based on data reported to the eSPIRS database (2018)[73] and Luxembourg's report on the implementation of the Seveso-III Directive for 2015-2018[74].

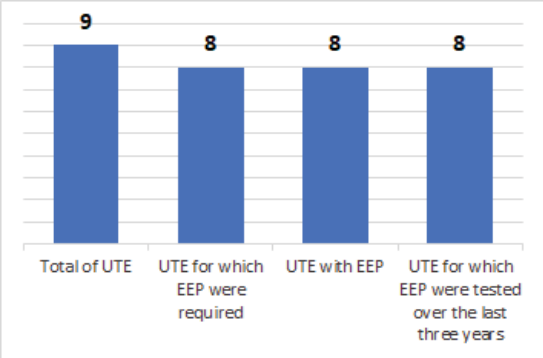
In Luxembourg, among the 18 Seveso establishments, 9 are categorised as lower-tier establishments (LTEs) and 9 as upper-tier establishments (UTEs) – based on the quantity of hazardous substances likely to be present. UTEs are subject to more stringent requirements. The trend of the number of Seveso establishments is presented in Figure 20.

Figure 20: Number of Seveso establishments in Luxembourg, 2011, 2014 and 2018[75]



Many Seveso establishments are required to draw up external emergency plans (EEPs). These EEPs are essential to allow proper preparation and effective implementation of the necessary actions to protect the environment and the population should a major industrial accident occur at them. According to Luxembourg, an EEP is required for 8 UTEs. In 2018, 8 UTEs had an EEP all of which had been tested over the last 3 years. The summary is shown in Figure 21.

Figure 21: Situation regarding EEPs in Luxembourg, 2018[76]



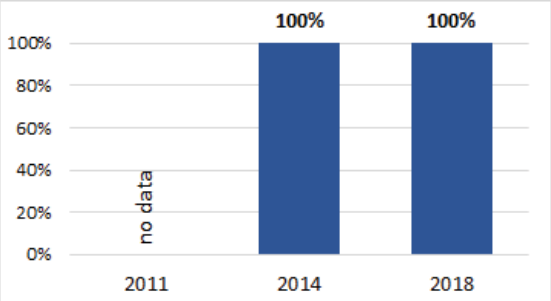
The information to the public referred to in Annex V to Seveso-III Directive is permanently available for the 100% of the SEVESO establishments in Luxembourg. This information is mainly about: (i) how the public concerned will be warned in the event of a major accident; (ii) the

[72] Directive 2012/18/EU on the control of major-accident hazards involving dangerous substances (OJ L 197, 24.7.2012, p. 1).
[73] European Commission, *Seveso Plants Information Retrieval System*.
[74] As required under Article 21(2) of the Seveso-III Directive.
[75] European Commission, *Assessment and summary of Member States' implementation reports for Implementing Decision 2014/896/EU (implementing Directive 2012/18/EU on the control of major accident hazards involving dangerous substances)*, 2022.
[76] Idem.

appropriate behaviour in the event of a major accident; and (iii) the date of the last site visit.

The share of UTEs for which information on safety measures and required behaviour was actively made available to the public over the last years is presented in Figure 22. This is an important requirement of the Seveso-III Directive because if the public knows this information, this may reduce the consequences of a major industrial accident.

Figure 22: Share of UTEs for which information on safety measures and required behaviour was actively made available to the public in Luxembourg, 2011, 2014 and 2018[77]



Noise

The Environmental Noise Directive[78] provides for a common approach to avoid, prevent and reduce the harmful effects of exposure to environmental noise, although it does not set noise limits as such. The main instruments it uses in this respect are strategic noise mapping and planning. A relevant 2030 zero pollution action plan target is a reduction by 30% of the share of people chronically disturbed by transport noise compared to 2017.

Excessive noise from aircraft, railways and roads is one of the main causes of environmental-health-related issues in the EU. It can cause ischaemic heart disease, stroke, interrupted sleep, cognitive impairment and stress[79].

Based on a limited set of data[80], environmental noise is estimated to cause at least around 20 premature deaths and 60 cases of ischaemic heart disease in Luxembourg annually[81]. Moreover, some 20 000 people suffer from disturbed sleep. Overall, 305 000 people were exposed to environmental noise in Luxembourg in 2017, the latest year with complete data. Based on the latest full set of information that has been analysed, noise mapping of agglomerations, roads and railways is complete.

Water quality and management

EU legislation and policy requires that the impact of pressures on transitional, coastal and fresh waters (including surface and ground waters) be significantly reduced. Achieving, maintaining or enhancing a good status of water bodies as defined by the Water Framework Directive will ensure that EU citizens benefit from good quality and safe drinking and bathing water. It will further ensure that the nutrient cycle (nitrogen and phosphorus) is managed in a more sustainable and resource-efficient way.

Water Framework Directive

The Water Framework Directive (WFD)[82] is the cornerstone of EU water policy in the 21st century[83]. The WFD and other water-related legal acts[84] set the framework for sustainable and integrated water management, which aims at a high level of protection of water resources, prevention of further deterioration and restoration to good status.

By March 2022, Member States had to report the third generation of river basin management plans (RBMPs) under the WFD. The Commission will assess the reported status and progress, checking how the findings of the

[77] Idem.
[78] Directive 2002/49/EC
[79] WHO, *Environmental Noise Guidelines for the European Region*, 2018.
[80] For further information: European Environment Agency, *Noise Fact Sheets 2021*.

[81] These figures are an estimate by the European Environment Agency based on: (i) the data reported by the Member States on noise exposure covered by Directive 2002/49/EC; (ii) ETC/ATNI, 'Noise indicators under the Environmental Noise Directive 2021: Methodology for estimating missing data, *ETC/ATNI Report* No 2021/06, European Topic Centre on Air Pollution, Transport, Noise and Industrial Pollution, 2021; and (iii) the methodology for health impact calculations, ETC/ACM, 'Implications of environmental noise on health and wellbeing in Europe', *Eionet Report ETC/ACM* No 2018/10, European Topic Centre on Air Pollution and Climate Change Mitigation, 2018.
[82] Directive 2000/60/EC.
[83] https://ec.europa.eu/environment/water/index_en.htm
[84] This includes the Groundwater Directive (2006/118/EC), the Environmental Quality Standards Directive (2008/105/EC), the Floods Directive (2007/60/EC), the Bathing Water Directive (2006/7/EC), the Urban Waste Water Treatment Directive (91/271/EEC), the new Drinking Water Directive (2020/2184/EC), the Nitrates Directive (91/676/EEC), the Marine Strategy Framework Directive (2008/56/EC), the Industrial Emissions Directive (2010/75/EU) and the new Regulation on minimum requirements for water reuse ((EU) 2020/741).

second RBMPs[85] have been addressed. Luxembourg has not yet reported the third RBMP[86].

In December 2021, the Commission published the 6th Implementation Report, which assesses implementation of the WFD and the Floods Directive[87]. This report includes an interim assessment of: (i) the implementation of the programmes of measures; and (ii) the monitoring of new priority substances. The assessment report for Luxembourg[88] showed that the information and data provided by Luxembourg are incomplete and have only allowed the Commission to assess a limited number of indicators and measures, making any interpretation of the pace of progress impossible. Based on information reported electronically, no new regulation or legislation should be implemented under this programme of measures. It has been reported that no further rules are needed for the Rhine and Meuse river-basin districts, and the programme of measures has reached the status 'some measures are completed'.

Based on data reported in the 2nd RBMPs and data published in 2020[89], only 2.7% of all surface water bodies[90] in Luxembourg reached a good ecological status, and all surface water bodies (100%) failed to achieve a good chemical status. For groundwater bodies, 50% failed to achieve a good chemical status, and 100% had a good quantitative status.

Figure 23 illustrates the proportion of surface water bodies in Luxembourg and other European countries that failed to achieve a good ecological status so far.

Figure 23: Proportion of surface water bodies (rivers, lakes, and transitional and coastal waters) with a less than good ecological status per river basin district[91]

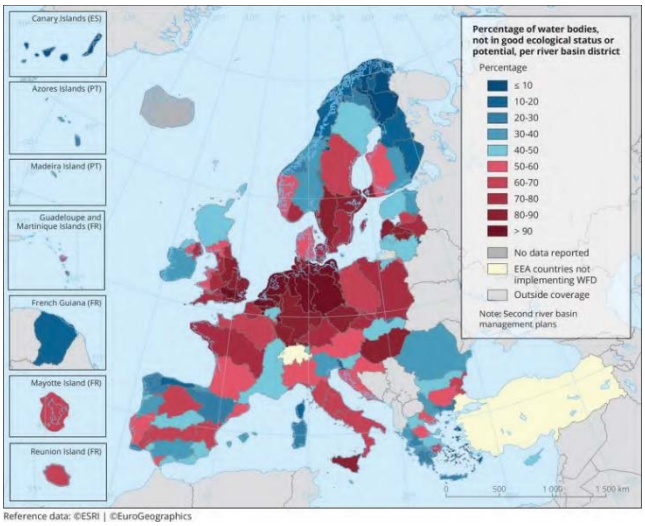


Figure 24 presents the percentage of surface water bodies in Luxembourg and other European countries failing to achieve a good chemical status. For Luxembourg, the percentage is 100%, including water bodies failing due to substances behaving as ubiquitous persistent, bio-accumulative and toxic substances (PBTs). Without PBTs, the percentage of surface water bodies failing to achieve a good chemical status remains the same (100%).

[85] Detailed information can be found in the 5th Report from the Commission on the implementation of the Water Framework Directive and the Floods Directive, and in the 2019 EIR.

[86] Based on information provided by the Luxembourgish authorities in April 2022.

[87] See the 6th implementation report of the WFD and the Floods Directive.

[88] European Commission, Directorate-General for Environment, *Assessment of Member States' progress in Programmes of Measures during the second planning cycle of the Water Framework Directive – Member State: Luxembourg*, 2022.

[89] https://water.europa.eu/freshwater

[90] Rivers, lakes, transitional waters, coastal waters, and territorial waters.

[91] European Environment Agency, 2021.

Figure 24: Percentage of surface water bodies not achieving a good chemical status[92]

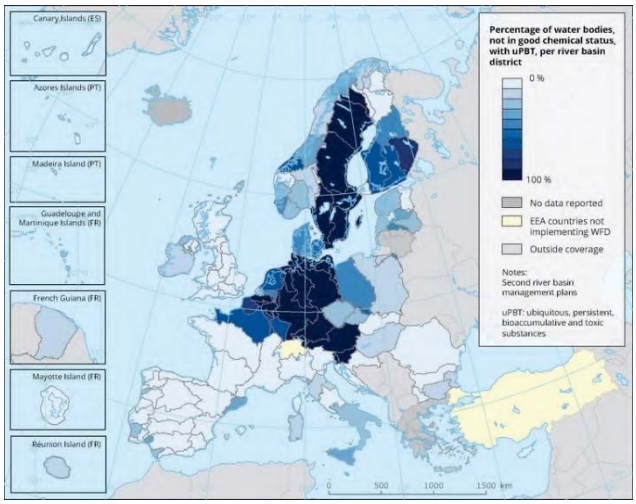
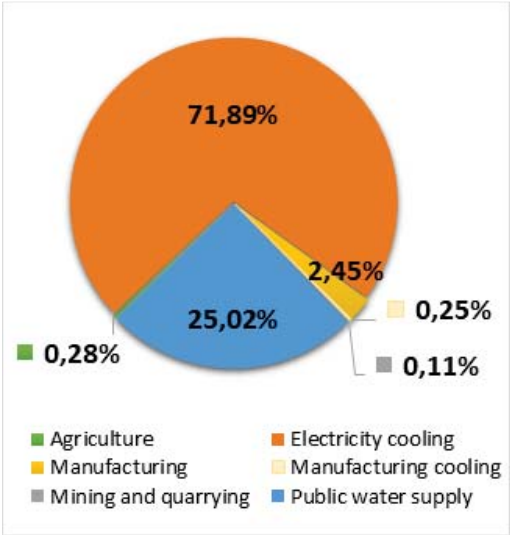


Figure 25: Water abstraction per sector in Luxembourg[95]

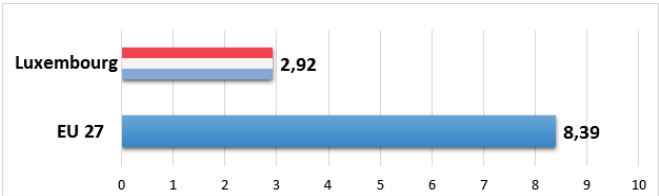


On the IED, it should be stressed that in the last decade, Luxembourg showed a significant decrease in releases to water of heavy metals (44.4%) like Cd, Hg, nickel (Ni) and Pb, and of total organic carbon (70.7%)[93]. Total water abstracted from surface and ground water sources in Luxembourg is 166.35 hm^3 a year (corresponding to the 2019 baseline) (European Environment Agency, 2022). The distribution of water abstraction by sector is: 0.28% for agriculture, 25.02% for public water supply, 71.89% for electricity cooling[94], 2.45% for manufacturing, 0.25% for manufacturing cooling, and 0.11% for mining and quarrying. This is illustrated in Figure 25. Luxembourg uses a register to check groundwater abstractions. A second register is kept for all authorised points in surface waters.

In Luxembourg, the Water-Exploitation Index plus (WEI+)[96] is 2.92%. This is below the 20% threshold, which is generally considered as an indication of water scarcity[97].

Figure 26 presents the WEI+ index in Luxembourg and the EU-27 average. Luxembourg is ranked 15th (from high to low score) in the EU-27.

Figure 26: WEI+ in Luxembourg and the EU, 2017[98]



Luxembourg's RRP directs EUR 6 million to conclude a 'Naturpakt' with municipalities to provide financial support for measures to protect nature and prevent biodiversity loss, including groundwater protection and

[92] European Environment Agency, December 2019.
[93] European Environment Agency, 2021.
[94] The percentage for electricity cooling was calculated by using data-gap filling (which corresponds to the 119.59 hm^3 reported in 2017). If electricity cooling is disregarded, public water supply takes the lion's share as regards water abstraction in Luxembourg.

[95] European Environment Agency, Water abstraction by source and economic sector in Europe, 2022.
[96] WEI+ is a measure of total freshwater use as a percentage of the renewable freshwater resources (groundwater and surface water) at a given time and place. It quantifies how much water is abstracted and how much water is returned to the environment after use.
[97] By May 2022, the European Environment Agency will develop a seasonal WEI+ at river-basin and NUTS2 level, which will provide a more complete picture of water stress and water scarcity for each Member State.
[98] European Environment Agency, *Water Exploitation Index Plus*, 2022.

restoration of watercourses to their natural condition[99]. Moreover, to make information on drinking-water quality more accessible, the Luxembourgish government, together with the drinking-water providers, has launched a new website[100] with information about tap water and safeguard for drinking-water catchments. Further information on general water quality is also available online[101].

Floods Directive

As mentioned before, in December 2021, the Commission published the 6th Implementation Report. It includes the review and update of the preliminary flood-risk assessments of the second cycle (2016-2021).

The Commission's assessment report[102] showed that Luxembourg's preliminary flood-risk assessment includes clear basic information. However, there is little detail on methods and very little background information. The assessment identified some areas for further improvements, such as factoring in long-term developments, the effectiveness of current artificial flood-defence infrastructure, and the impact of climate change.

The Commission will assess progress since the adoption of the first flood-risk management plans and publish a new report, like it did in 2019.

Drinking Water Directive

On the Drinking Water Directive, no new assessment of the quality of drinking water is available since the 2019 EIR. The quality of drinking water in Luxembourg has not been indicated as an area of concern.

The recast Directive entered into force on 12 January 2021, and Member States have until 12 January 2023 to transpose it into their national legal system. Luxembourg will have to comply with these reviewed quality standards.

Bathing Water Directive

In 2020, out of the 17 Luxembourgish bathing waters, 82.4% were of excellent quality[103].

Figure 27: Bathing-water quality in Europe in the 2020 season[104]

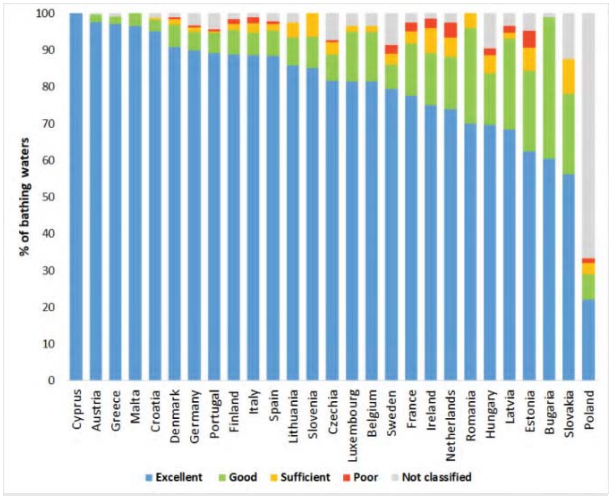
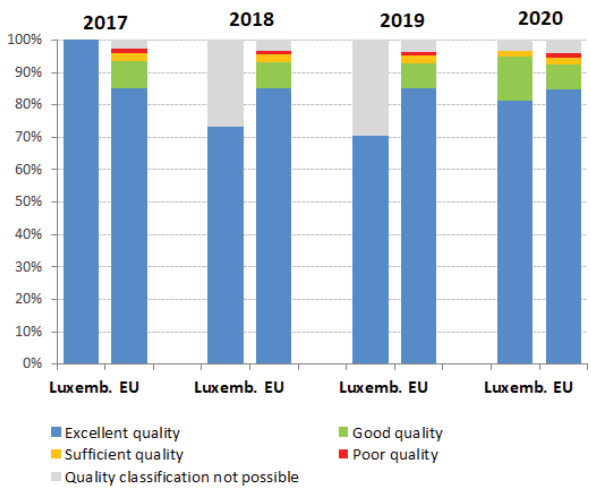


Figure 28: Bathing-water quality, Luxembourg and EU average, 2017-2020[105]



*For 2017, 2018 and 2019, data about the UK bathing waters are included under the EU average.

[99] https://ec.europa.eu/info/business-economy-euro/recovery-coronavirus/recovery-and-resilience-facility/luxembourgs-recovery-and-resilience-plan_en

[100] https://drenkwaasser.lu

[101] https://geoportail.lu; https://waasser.lu

[102] European Commission, Directorate-General for Environment, *Assessment of Second Cycle Preliminary Flood Risk Assessments and Identification of Areas of Potential Significant Flood Risk under the Floods Directive – Member State : Luxembourg*, 2022.

[103] European Environment Agency, *State of bathing water*, 2021, p. 17.

[104] European Environment Agency, *Bathing Water Quality in 2020*, 2022.

[105] European Environment Agency, European Bathing Water Quality in 2017, 2018, 2019, 2020.

Nitrates Directive

The latest Commission report on the implementation of the Nitrates Directive[106], covering 2016-2019[107], warns that nitrates are still causing harmful pollution to water in the EU. Excessive nitrates in water are harmful to both human health and ecosystems, causing oxygen depletion and eutrophication. Where national authorities and farmers have cleaned up waters, it has had a positive impact on drinking-water supply and biodiversity, and on sectors that depend on them, such as fisheries and tourism. Nevertheless, excessive fertilisation remains a problem in many parts of the EU.

According to the lastest report on the implementation of the Nitrates Directive, Luxembourg has a high number of groundwater-monitoring stations with nitrate concentrations above 50 mg/l, and a high number of monitoring stations have an increasing trend. A very high number of surface waters are found to be eutrophic.

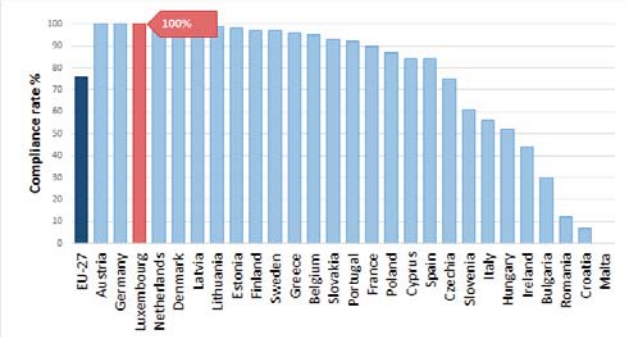
Livestock pressure in Luxembourg is above the EU average. For 2016-2019, Luxembourg assessed that the annual nitrogen discharge was 3 893 tonnes, 76% of which of agricultural origin. Luxembourg is among the Member States facing the greatest challenges in tackling nutrient pollution from agriculture.

Luxembourg updated its action programme in 2018.

Urban Waste Water Treatment Directive

Regarding the Urban Waste Water Treatment Directive (UWWTD), Luxembourg has a compliance rate of 100%, well above the EU average in 2018.

Figure 29: Proportion of urban waste water that meets all UWWTD requirements (collection, biological treatment, biological treatment with nitrogen and/or phosphorus removal) in compliant urban areas of the UWWTD ('compliance rate'), 2018[108]



In the 2019 EIR, Luxembourg received three priority actions. The first action, on the compliance of new projects with the WFD, has been fully implemented. The action to ensure correct levels of collection and treatment of urban waste water has been fully implemented as well. There is no information available on the action on clarifying the method used by Luxembourg for the prioritisation of measures, including the assessment of costs and benefits in relation to the flood-risk management plan.

2022 priority actions

- Assess new physical modifications of water bodies in line with Article 4(7) of the WFD. In these assessments, consider alternative options and appropriate mitigation measures.
- Facilitate implementation of measures to help achieve the WFD objectives and step up efforts to counteract pollution in water bodies.
- Strengthen Luxembourg's action programme under the Nitrates Directive to further reduce nitrate pollution and better address polluted hotspots of groundwater and eutrophication of surface water where agriculture pressure is significant.
- Better coordinate the implementation of water and nature policies.

[106] https://ec.europa.eu/environment/water/water-nitrates/index_en.html

[107] SWD(2021) 1001 final.

[108] European Commission, *WISE Freshwater*, 2021.

Chemicals

The EU seeks to ensure that chemicals are produced and used in a way that minimises any significant adverse effects on human health and the environment. In October 2020, the Commission published its chemicals strategy for sustainability - 'Towards a Toxic-Free Environment'[109], which led to some systemic changes in EU chemicals legislation. The strategy is part of the EU's zero-pollution ambition – a key commitment of the European Green Deal.

The EU's chemicals legislation[110] provides baseline protection for human health and the environment. It also ensures stability and predictability for businesses operating within the internal market.

Since 2007, the Commission has gathered information on the enforcement of the Regulation on the Registration, Evaluation, Authorisation and Restriction of Chemicals (the 'REACH Regulation') and the Regulation on Classification, Labelling and Packaging (the 'CLP Regulation'). In December 2020, the Commission assessed the Member States' reports on the implementation and enforcement of these Regulations[111], in line with Article 117(1) of the REACH Regulation and Article 46(2) of the CLP Regulation. According to the latest available data, national enforcement structures have not changed much in recent years. However, it is apparent from this report that there are still many disparities in the implementation of the REACH and CLP Regulations, and notably in the area of law enforcement. Recorded compliance levels in Member States, but with a slight worsening trend, which is likely due to: (i) enforcement authorities being more effective in detecting non-compliant products/companies; and (ii) more non-compliant products being put on the EU market.

In August 2021, the Commission published a measurable assessment of the enforcement[112] of the two main EU Regulations on chemicals (the REACH Regulation and the CLP Regulation) using a set of indicators on different aspects of enforcement.

In Luxembourg, responsibility for checking compliance with the REACH and CLP Regulations rests with the following authorities[113]:

- the Customs and Excise Administration;
- the Labour and mining inspection;
- the Health Directorate;
- the Water Management Administration;
- the Luxembourg Institute for Standardisation, Accreditation, Safety and Quality of Products and Services; and
- the Environmental Administration.

Luxembourg has devised and fully implemented enforcement strategies for both REACH and CLP[114]. Their main aspects are:

- risk-based prioritisation: focus on the areas where instances of non-compliance occur; and
- annual publication of the results.

In Luxembourg, two full-time equivalents are allocated to REACH and CLP enforcement[115]. In the reporting period, they carried out 37 REACH checks. The number of instances of non-compliance out of the total number of REACH checks is almost the average[116].

In 2019, Luxembourgish helpdesks received 58 and 45 enquiries on REACH and CLP, respectively. In Luxembourg, the main topics of enquiries on REACH were registration, chemical-safety reports and safety data sheets. On CLP, the main topics of enquiries were labelling and classification. To raise the public's awareness, the Luxembourgish competent authority mainly used articles, leaflets and newsletters, social media posts, and glossaries on specific substances.

The 2019 EIR did not provide priority actions for Luxembourg on chemicals.

[109] COM(2020) 667 final

[110] Principally for chemicals: REACH (OJ L 396, 30.12.2006, p. 1); for Classification, Labelling and Packaging: the CLP Regulation (OJ L 252, 31.12.2006, p. 1); together with legislation on biocidal products and plant protection products.

[111] European Commission, *Technical assistance to review the existing Member States reporting questionnaire under articles 117(1) of REACH and 46(2) of CLP – Final report*.

[112] European Commission, *REACH and CLP enforcement – EU level enforcement indicators*.

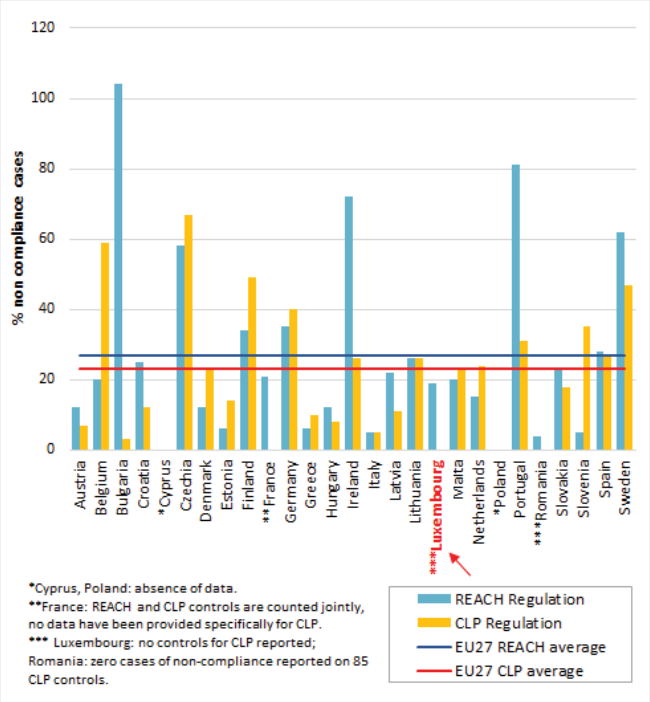
[113] European Commission, *Technical assistance to review the existing Member States reporting questionnaire under articles 117(1) of REACH and 46(2) of CLP – Final report*, p. 70.

[114] European Commission, *Technical assistance to review the existing Member States reporting questionnaire under articles 117(1) of REACH and 46(2) of CLP – Final report*, p. 76.

[115] European Commission, *Technical assistance to review the existing Member States reporting questionnaire under articles 117(1) of REACH and 46(2) of CLP – Final report*, p. 75.

[116] European Commission, *Technical assistance to review the existing Member States reporting questionnaire under articles 117(1) of REACH and 46(2) of CLP – Final report*, pp. 87-88.

Figure 30: Percentage of instances of non-compliance in total REACH and CLP checks per Member State and compared to the EU average, 2019[117]



2022 priority action

- Upgrade the administrative capacities in implementation and enforcement towards a policy of zero tolerance to instances of non-compliance.

[117] European Commission, *Technical assistance to review the existing Member States reporting questionnaire under articles 117(1) of REACH and 46(2) of CLP – Final report*, pp.87-88, 2022.

4. Climate action

In line with the Paris Agreement and as part of the European Green Deal, the European Climate Law sets the EU target of reaching climate neutrality by 2050 and reducing greenhouse gas (GHG) emissions by 55% by 2030 compared to 1990. The law also limits the contribution that carbon removals can make towards emission reductions in 2030 to ensure a sufficient mitigation effort.
The EU and its Member States submitted updated Nationally Determined Contribution (NDC) to the UNFCCC in December 2020.
The EU is working across all sectors and policies to cut GHG emissions and make the transition to a climate-neutral and sustainable economy, as well as addressing the unavoidable consequences of climate change.
EU climate legislation incentivises emissions reductions from power generation, industry, transport, the maritime sector and fluorinated gases (F-gases) used in products.
For road transport, EU legislation requires the GHG intensity of vehicle fuels to be cut by 6% by 2020 compared to 2010[118] and sets binding GHG emission standards for different vehicle categories[119].
Under the F-gas Regulation, the EU's F-gas emissions will be cut by two thirds by 2030 compared with 2014 levels.
From 2021, emissions and removals of GHGs from LULUCF have been included in the EU emission-reduction efforts.
The EU adaptation policy is an integral part of the European Green Deal. From 2021, Member States are required to report on their national adaptation policies[120], as the EU Climate Law recognises adaptation as a key component of the long-term global response to climate change. Member States will be required to adopt national strategies, and the EU will regularly assess progress as part of its overall governance on climate action. The updated EU adaptation strategy, published in February 2021, sets out how the EU can adapt to the unavoidable impacts of climate change and become climate resilient by 2050.

Key national climate policies and strategies

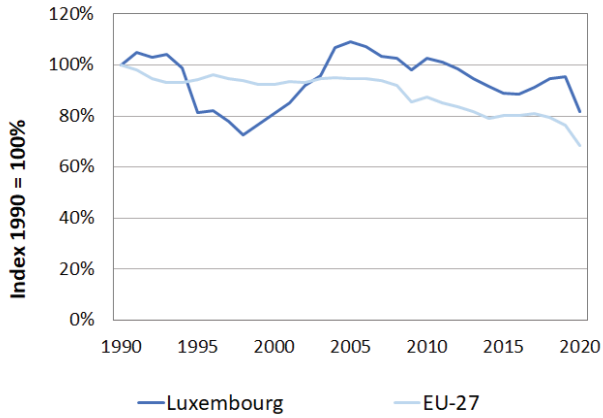
Luxembourg has an integrated national energy and climate plan (NECP) for 2021-2030. The work is consistent with the EU's Long-term Strategy 2050[121]. According to its Climate Law, Luxembourg aims to achieve climate neutrality by 2050. In line with its NECP, Luxembourg also has the objective to reduce its greenhouse-gas emissions by 55% by 2030 (compared to the 2005 level) for sectors not covered by the EU's emissions trading system (ETS)[122]. This is more ambitious than the country's current EU 2030 reduction target of 40%.

In its RRP, Luxembourg allocates nearly 61% of resources to climate objectives. It also outlines crucial reforms and investment to further the green transition.

Luxembourg adopted a national adaptation strategy in 2012 and has updated it frequently. The National Climate Law is the legal basis of the strategy. The Climate Law requires the government to draw up an adaptation strategy every 10 years.

The country's greenhouse gas emissions decreased by 18% between 1990 and 2020. Although the emission intensity of Luxembourg's economy is under the EU average, emissions per person are more than twice the EU average.

Figure 31: Total greenhouse-gas emissions (incl. international aviation) in Luxembourg, 1990-2020



[118] The Fuel Quality Directive (Directive 98/70/EC) sets strict quality requirements for fuels used in road transport in the EU to protect human health and the environment, and to make road travel across the EU safer.
[119] Directive 98/70/EC.
[120] Article 29 of Regulation (EU) 2018/1999.

[121] 2050 long-term strategy (europa.eu)
[122] Sectors currently outside of the ETS include buildings, road and domestic maritime transport, agriculture, waste and small industries, and F-gases.

Effort sharing target

For emissions not covered by the ETS, Member States have binding national targets under the Effort Sharing legislation[123] [124]. The country's target under the EU legislation is to reduce emissions not covered by the ETS (such as buildings, road transport, agriculture, small industry and waste) by 20% by 2020 and 40% by 2030 compared to 2005. Luxembourg exceeded its 2020 effort sharing emissions reduction target, but emissions are expected to increase again if no additional measures are implemented.

In its NECP, Luxembourg intends to achieve a greater reduction than its current non-ETS target of -40% by 2030.

Figure 32: Emissions and targets under the Effort Sharing Decision/ Effort Sharing Regulation in Luxembourg, 2020 and 2030 as a percentage change from 2005

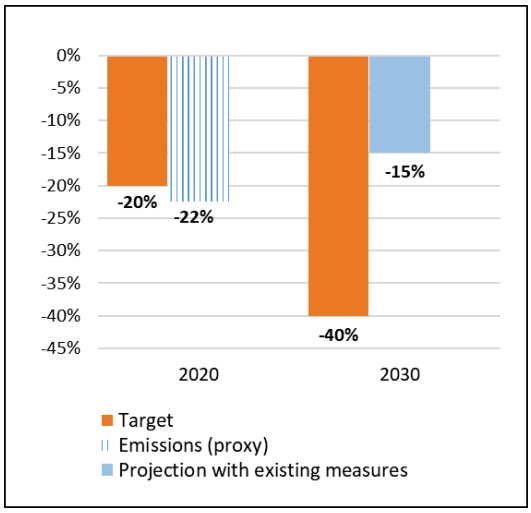
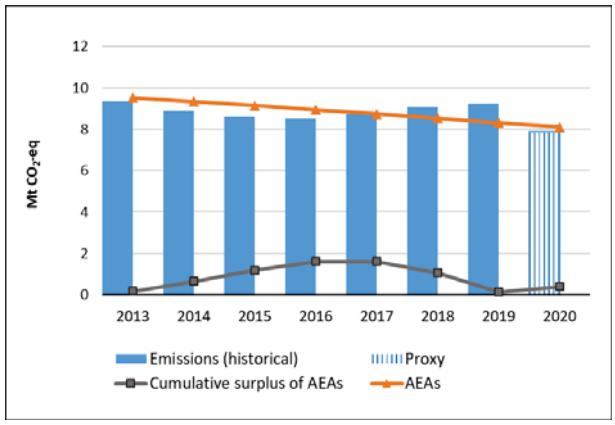


Figure 33: Emissions, annual emission allocations (AEAs) and accumulated surplus/deficit of AEAs under the Effort Sharing Decision in Luxembourg, 2013-2020



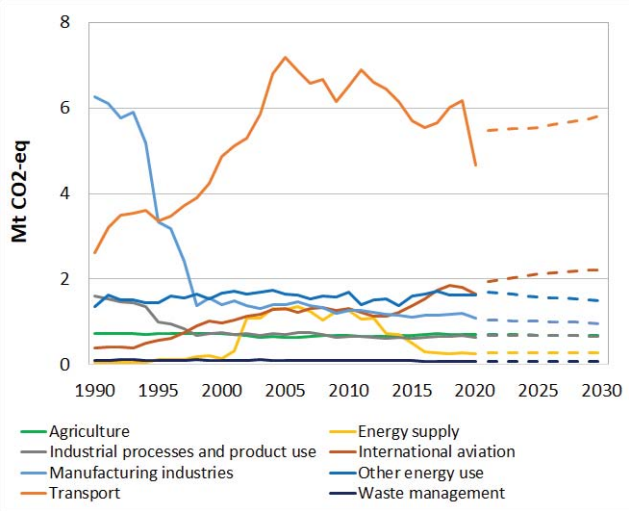
Key sectoral developments

In road transport, the GHG intensity of vehicle fuels in Luxembourg decreased by 3.4% from 2010 to 2019. The country needs to act swiftly to meet its reduction target. There are several types of action that Member States can take in this regard, for example: (i) further improving public transport, expanding the use of electricity in road transport; (ii) supporting the use of biofuels, and advanced biofuels in particular; (iii) incentivising the development and deployment of renewable fuels of non-biological origin; and (iv) reducing upstream emissions before refining processes.

Road-transport emissions, which represented 48% of total greenhouse-gas emissions in Luxembourg in 2019, have decreased by 15% compared to 2005. Transport is the biggest emitting sector, notably driven by a high demand for transportation fuels, including from transiting road transport. There is a strong reliance on individual transport that has also increased traffic congestion.

[123] Regulation (EU) 2018/842
[124] Effort sharing 2021-2030: targets and flexibilities (europa.eu)

Figure 34: Greenhouse-gas emissions by sector in Luxembourg[125] (historical emissions for 1990-2020, projections for 2021-2030[126])

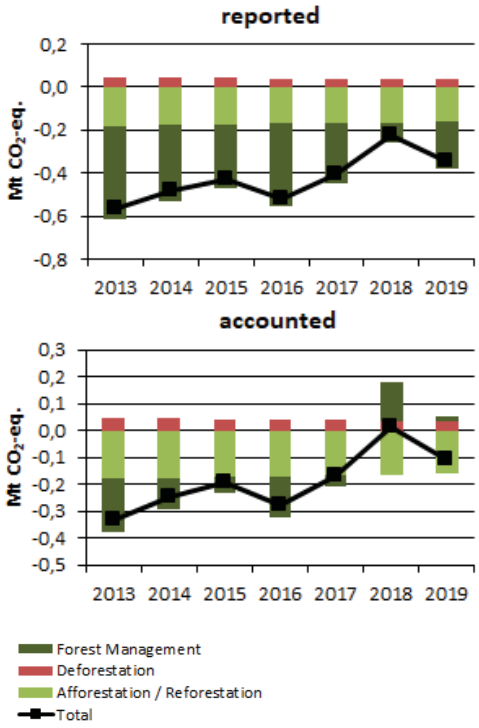


Luxembourg's NECP provides many measures to further reduce emissions of buildings. Luxembourg aims to renovate all existing houses to net-zero-emission buildings by 2050.

Emissions in agriculture have increased since 2005.

In the LULUCF sector, Luxembourg projects a small increase in net removals by 2030. Reporting under the Kyoto Protocol for the LULUCF sector in Luxembourg shows average net removals of -0.4 Mt CO_2-eq for 2013-2019. Luxembourg contributes 0.1% to the EU-27's annual average sink of -344.9 Mt CO_2-eq. Accounting for the same period depicts average net credits of -0.2 Mt CO_2-eq, which corresponds to 0.2% of the EU-27 accounted sink of -115.0 Mt CO_2-eq. Reported net removals and accounted net credits show a declining trend with moderate fluctuations; for 2018, the accounts show very small net debits. Luxembourg is one of 14 EU Member States that show net debits for at least one year in this preliminary accounting procedure.

Figure 35: Reported and accounted emissions and removals by the LULUCF sector in Luxembourg[127]



Use of revenues from the auctioning of EU ETS allowances

Total revenues from the auctioning of emission allowances under the EU ETS in 2012-2021 were EUR 90.1 million. In Luxembourg, revenues are not earmarked; example projects have been reported up to 100% of revenues each year.

2022 priority actions

- Tackle growing traffic congestion, that is a major challenge in Luxembourg with economic, social, climate and environmental consequences

  Further invest in public transport networks and infrastructures

- Take national measures to support road-transport electrification, incentivise the purchase of electric vehicles and accelerate the deployment of recharging/refuelling (hydrogen) infrastructure. Reducing sales of fuel for traniting road transport and

[125] The sectors in the figure correspond to the following Intergovernmental Panel on Climate Change sectors: energy supply: 1A1, 1B and 1C; energy use in manufacturing industries: 1A2; industrial processes and product use: 2; transport: 1A3; other energy use: 1A4; 1A5 and 6; agriculture: 3; waste: 5; international aviation: 1.D.1.a.

[126] European Environment Agency, *Total GHG trends and projections*.

[127] The differences between reported and accounted emissions by the LULUCF sector under the Kyoto Protocol are described in *LULUCF – accounted and reported quantities under the Kyoto protocol: explanatory note for country fact sheets*.

shifting towards electrification of the transport system could have a significant budgetary impact on Luxembourg.

Part II: Enabling framework: implementation tools

5. Financing

Environmental investment needs in the EU

Financing environmental measures is essential for their success. Although most financing comes from national sources, various EU funds contribute significantly, helping to close the financing gaps.
Post-2020, environmental implementation will also be supported by the EU's COVID-19 Recovery Fund (via the RRF) and the 'do no significant harm' principle which runs across the EU budget. The renewed commitments made at COP26 (Glasgow, October-November 2021) and the Biodiversity Convention (April-May 2022)[128] will also be reflected in the EU budget.

Overall environmental investment gaps (EU-27)

The EU's investment needs for the green transition cover a range of interlinked areas. The additional investment needs over the baselines (i.e. the gap between what is needed and what is forecast to be invested if no additional action is taken) for climate, energy and transport were estimated at EUR 390 billion a year (EU-27)[129] with a further EUR 130 billion a year to deliver the EU's core environmental objectives[130]. The costs of climate-change adaptation can also be significant, and are estimated to reach a total of EUR 35-62 billion (narrower scope) or EUR 158-518 billion (wider scope) per year[131]. Those investment needs reflect the implementation objectives to 2020 and to 2030 (except for climate-change adaptation, the costs of which are expected to last over a longer time horizon).

A preliminary update of the EU's core environmental investment gap is provided in Table 1[132]. Almost 40% of the environmental investment needs relate to dealing with pollution, which accounts for nearly two thirds of the investment gap if combined with water management. The investment gap in circular economy and waste is estimated to be between EUR 13 billion and EUR 28 billion a year, depending on the level of circularity implemented. The annual biodiversity financing gap is estimated at around EUR 20 billion.

Table 1: Estimated breakdown of the EU-27's environmental investment gaps, by environmental objective, 2021-2030[133]

Environmental objective	Estimated investment gap (EU-27, per year)	
	EUR million	%
Pollution prevention and control	42.8	39%
Water management and industries	26.6	24%
Circular economy and waste	13.0	12%
Biodiversity and ecosystems[134]	21.5	20%
Research, development, innovation and other	6.2	6%
Total	**110.1**	**100%**

[128] https://www.cbd.int/convention/; https://www.iucn.org/theme/global-policy/our-work/convention-biological-diversity-cbd/post-2020-global-biodiversity-framework

[129] SWD (2021)621, accompanying proposal COM (2021) 557 to amend the REDII Directive (EU) 2018/2001.

[130] SWD(2020) 98 final/2

[131] SWD(2018)292. impact assessment accompanying the proposal for the LIFE Regulation (COM(2018) 385 final).

[132] With decreases due to Brexit and some reconciliation among the objectives. Source: European Commission, Directorate-General for Environment, *Study supporting EU green investment needs analysis*, ongoing (2021-2023), and European Commission, Directorate-General for Environment, internal analysis *Environmental investment needs and financing in the EU's green transition*, July 2020.

[133] European Commission, Directorate-General Environment, *Study supporting EU green investment needs analysis*, ongoing (2021-2023), and European Commission, Directorate-General for Environment, internal analysis *Environmental Investment needs and financing in the EU's green transition*, July 2020.

[134] To meet the needs of the biodiversity strategy for 2030 (Natura 2000, green infrastructure), at least EUR 20 billion a year should be unlocked for nature (COM(2020) 380 final), while to fully cover the strategy (including restoration) EUR 30-35 billion may be needed, indicating a gap of EUR 10-20 billion a year compared to current baseline expenditure.

Environmental investment needs in Luxembourg

There is a clear shift of investment priorities in Luxembourg towards support for climate policies, as shown in the RRP[135]. The country focuses on reducing greenhouse-gas emissions in the transport and building sectors. Under the RRP, EUR 57 million will be spent on climate investment priorities to address the needs or investment gaps in a wide set of economic sectors such as energy renovation of housing, sustainable transport, and 'Naturpakt' (providing financial support for measures to protect nature and prevent biodiversity loss).

Below are the environmental investment needs that have been identified for each of the below sectors.

Pollution prevention and control

The EU's first Clean Air Outlook[136] under the clean air programme estimated that the total air-pollution-control costs for Luxembourg to reach the NEC Directive's emission-reduction requirements[137] by 2030 amount to EUR 259 million per year. This includes EUR 118 million for capital investment (assuming that the 2030 climate and energy targets are achieved).

The EU's second Clean Air Outlook[138] suggests that the EU would largely achieve the reductions of air-pollutant emissions that correspond to the obligations under the NEC Directive for 2030 if: (i) all relevant legislation adopted up to 2018 delivered its full benefits (including all air-pollution legislation and the 2030 climate and energy targets set in 2018) ; and (ii) Member States also implemented the measures announced in their national air-pollution-control programmes. The only exception is for ammonia for 15 Member States, including Luxembourg.

Water management

According to the Organisation for Economic Co-operation and Development (OECD) study '*Financing a Water Secure Future*' (2022)[139], water coverage and treatment compliance remain high in Luxembourg. However, future flood events present a serious risk. In Luxembourg, a distinctive feature is the large share of the workforce that lives in neighbouring countries and commutes daily. This non-resident population uses significant volumes of water and generates waste water, affecting per-person ratios in Luxembourg. The value of assets at risk is projected to grow substantially. EU funding provided a significant share of public funding over the past decade[140]. It is estimated that Luxembourg will need to invest a cumulative additional EUR 218 million over baselines in drinking water and sanitation by 2030. This corresponds to an investment need (capital expenditure) of around EUR 22 million per year, with over 90% of that related to waste water[141]. Moreover, the recent 6th WFD and Floods Directive Implementation Report[142] and the financial - economic study[143] accompanying it, are also a relevant source of information in this domain.

Waste and circular economy

According to a Commission study[144], to meet the recycling targets for municipal waste and packaging waste, Luxembourg still needs to invest an additional EUR 32 million (around EUR 4.6 million per year) over baselines in collection, recycling reprocessors, biowaste treatment, waste sorting facilities and waste registry digitalisation in 2021-2027. This does not include the investment necessary for other key waste streams (plastics, textile, furniture) or to unlock a higher uptake of circularity and waste prevention across the economy.

Biodiversity and ecosystems

The recently submitted prioritised action framework (PAF) for Luxembourg shows that nature-protection costs (including Natura 2000) are EUR 59.4 million per year in 2021-2027, including EUR 43.8 million of annual one-off costs[145]. The cost for Natura 2000 site-related

[135] *Luxembourg's recovery and resilience plan*, 2021.
[136] International Institute for Applied Systems Analysis (IIASA), *Progress towards the achievement of the EU's air quality and emissions objectives*, 2018.
[137] Covering the reductions of and the emission ceilings for 5 atmospheric pollutants, SO_x, NO_x, $PM_{2.5}$, NH_3 and VOC by 2030, compared to 2005. Source: *Progress towards the achievement of the EU's air quality and emissions objectives*, IIASA 2018. (page 29). Requirements are based on Directive (EU) 2016/2284.
[138] COM(2021) 3 final. *Support to the development of the Second Clean Air Outlook*, 2020 and Annex.
[139] OECD, *Financing a Water Secure Future*, 2022.
[140] OECD, *Financing a Water Secure Future*, 2022.
[141] OECD, Luxembourg- Country fact sheet- Financing Water Supply, Sanitation and Flood Protection.
[142] WFD and FD Implementation Reports – DG Environment – European Commission.
[143] European Commission, Directorate-General for Environment, *Economic data related to the implementation of the WFD and the FD and the financing of measures*, Final report. Publications Office, 2021.
[144] European Commision, *Study on investment needs in the waste sector and on the financing of municipal waste management in Member States*, 2019.
[145] The N2K Group, *Strengthening investments in Natura 2000 and improving synergies with EU funding instruments report to the European Commission*, 2021.

maintenance and restoration measures for species and habitats amounts to EUR 31 589 408 per year. The three main areas (representing 88% of the total investment in Natura 2000 sites) are freshwater habitats (EUR 14 379 100 per year), woodlands and forest (EUR 6 835 698 per year) and grasslands (EUR 6 806 105 per year). This excludes additional costs to implement the EU biodiversity strategy for 2030, including on increased protection and restoration.

The four freshwater habitats of Annex I to the Habitats Directive have an unfavourable status, as well as the amphibians. Measures aim to create additional water bodies to protect current ones by creating buffer areas large enough to significantly reduce the impact of fertilisers, pesticides, and vegetation clearing followed by mud removal from ponds.

In addition to measures put in place under the WFD (e.g. installing or modernising water-treatment plants), action taken included installing buffer zones, renaturing river streams and installing fish passages.

Luxembourg hosts seven forest habitats of Annex I to the Habitats Directive, of which three have a favourable status, three have an unfavourable status and one has a very unfavourable status. Although many species hosted in these forests show more or less positive or stable trends, some are showing unfavourable or bad conservation status. Restoration measures concern improvement of forest edges, conversion of conifer plantations into Annex-I habitats, and reduction of pressure from game. Restoration of hydrological conditions relies on: (i) creating buffer zones for wooded bogs to reduce the supply of nutrients; and (ii) removing unsuitable/exotic tree species. Substantial work on river banks will be needed to increase the surface area of alluvial forest (for example converting coniferous plantations and enabling rivers' natural dynamic). Securing suitable surfaces by purchasing them is another measure considered important.

Luxembourg hosts six grasslands of Annex I to the Habitats Directive, One has a favourable conservation status (6110), the five others have bad conservation status U2 (6210, 6230, 6410, 6430 and 6510). Improving megaphlorbiae will require: (i) the creation of closed bands alongwatercourses with suitable mowing; and (ii) the management of IAS. To halt the decrease of lowland 6510, it will be important to conclude more contracts to develop extensive grasslands. This also applies to the Molinia meadows, to improve their quality by adapting management and to avoid falling. For species-rich Nardus grasslands 6230, the measures in place will be continued to extend the total area and improve its quality. Clearing of semi-natural dry grassland 6210 to remove scrub and brushwood will be followed by suitable management, such as itinerant grazing.

EU environmental funding in 2014-2020

The multiannual financial framework (MFF) for 2014-2020 allocated almost EUR 960 billion (in commitments, 2011 prices)[146] for the EU to spend over this period. The commitment in this 2014-2020 MFF to the green transition included a target to spend at least 20% on climate action. It also included funding opportunities for the environment, in particular under the European Structural and Investment (ESI) Funds[147]. The 2014-2020 MFF budget was subsequently topped up with over EUR 50 billion (in current prices) from the REACT-EU programme for cohesion-policy action to support the recovery from COVID-19[148].

Luxembourg received EUR 313.8 million from the ESI Funds in 2014-2020 to invest in job creation and a sustainable and healthy EU economy and environment. The planned direct environmental investment amounted to EUR 0.5 million, with a further EUR 3.5 million identified as indirect environmental investment value, totalling EUR 4.0 million. Figure 37 shows an overview of (planned) individual ESI Funds earmarked for Luxembourg (EU amounts, without national amounts).

[146] Council Regulation (EU, Euratom) No 1311/2013 (OJ L 347, 20.12.2013, p. 884).

[147] The European Structural and Investment (ESI) Funds include the European Regional Development Fund (ERDF), the Cohesion Fund (CF), the European Social Fund (ESF) with the Youth Employment Initiative (YEI), the European Agricultural Fund for Rural Development (EAFRD) and the European Maritime and Fisheries Fund (EMFF).

[148] Regulation (EU) 2020/2221 (OJ L 437, 28.12.2020, p. 30).

Figure 36: ESI Funds allocated to Luxembourg, including environmental investments, 2014-2020[149]

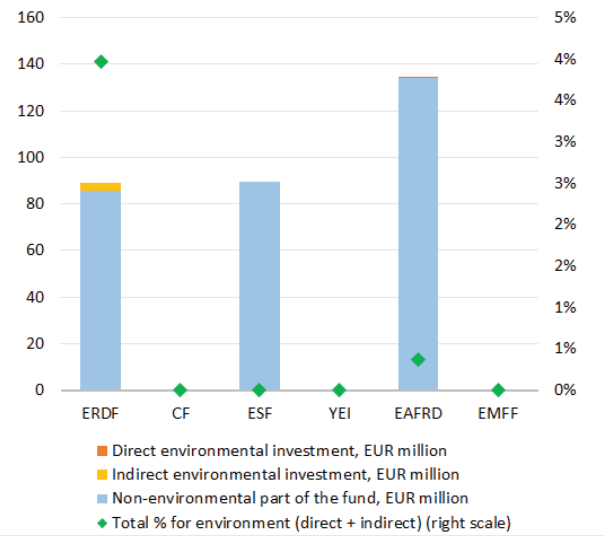


Table 2: Direct and indirect environmental investments under the ESI Funds in Luxembourg, 2014-2020[150]

Instrument	Allocations for the environment (EUR million)
Under cohesion policy (ERDF)	**3.5**
Indirect environmental investments	3.5
renewable energy	0.7
energy efficiency	1.4
sustainable transport	1.2
business development, research and innovation	0.1
Under EAFRD/rural development	**0.5**
Direct environmental investments	0.5
climate and risk management	0.5
Under EMFF	**0**
Under ESI Funds total	**4.0**
Direct environmental investments	0.5
Indirect environmental investments	3.5

Funding for the environment from the ESI Funds has also been supplemented by other EU funding programmes available to all Member States such as the LIFE programme or Horizon 2020. For Luxembourg, this additional EU environmental financinf added up to around EUR 11 million in 2014-2020.

The LIFE programme[151] is entirely dedicated to environmental and climate objectives. It finances demonstration and best-practice actions for green solutions to be deployed. In 2014-2020, Luxembourg received EUR 3.6 million from the LIFE programme for one nature project (out of 1 028 EU-27 LIFE projects with a total EU contribution of EUR 1.74 billion)[152].

In 2014-2020, Horizon 2020 allocated about EUR 2.9 million (about 1.5% of its total allocation) to Luxembourg, in particular for the circular economy, including raw materials and climate action[153]. Luxembourg's allocation under the European Fund for Strategic Investments (EFSI) of EUR 20 million did not include any environmental funding[154]. Luxembourg's European Investment Bank (EIB) loans (EUR 684.3 million) did not include any environmental support either[155]. The country ranks 26th in size in total EIB lending.

In 2020, the EIB provided EUR 24.2 billion in funding across Europe to fight climate change, 37% of its total financing. It also provided EUR 1.8 billion (3% of its financing) for broader environmental lending[156] [157].

EU environmental funding 2021-2027

The 2020 European Green Deal investment plan calls for EUR 1 trillion in green investments (public and private) to be made across the EU by 2030. The 2021-2027 MFF and

[149] European Commission, Directorate-General for Environment, data analysis; European Commission, Directorate-General for Environment, analysis based on ESI Funds Open Data Portal (cohesiondata.ec.europa.eu); COWI, *Integration of environmental concerns in Cohesion Policy Funds*, 2017; Regulation (EU) No 1303/2013; Regulation (EU) 2021/1060; and Implementing Regulation (EU) No 215/2014. Cut-off date for data: December 2021. Environmental investment is calculated by combining intervention fields and coefficients under Regulation (EU) No 1303/2013 and Regulation (EU) 2021/1060 enabling a more precise identification and valuation of relevant environmental investment. Indirect environmental investment is valued using environmental coefficients from Annex I to Regulation (EU) 2021/1060 (as opposed to full value).

[150] European Commission, Directorate-General for Environment, data analysis. The values of environmental investment identified in specific environmental areas may differ from the tracking values at cohesiondata.ec.europa.eu, e.g. for clean air or biodiversity. This is due to two factors: the set of environmental coefficients used and the range of funds assessed. The Directorate-General for Environment's analysis covered the full range of ESI Funds. See also the previous footnote.

[151] European Commission, LIFE Programme.

[152] Source: CINEA

[153] Source: EASME, https://sc5.easme-web.eu/, accessed: 15-12-2021.

[154] Approved and signed EFSI financing - EIB, 2015-2020: Source: https://www.eib.org/en/products/mandates-partnerships/efsi/index.htm.

[155] EIB loans in EU countries in 2014-2020. Source: EIB Open Data Portal: https://www.eib.org/en/infocentre/eib-open-data.htm

[156] The EIB Group works together with the Commission to implement several programmes that finance environmental implementation: InvestEU, the successor of EFSI, Pillars II and III of the Just Transition Mechanism. The EIB Group is a key implementing partner for InvestEU. It is responsible for managing 75% of the overall budgetary capacity of the mandate.

[157] EIB 2021 Activity Report.

the NextGenerationEU spending programme will provide EUR 2.018 trillion (in current prices) to support the recovery from COVID-19 and the EU's long-term priorities, including environmental protection[158]. Following the EU Green Deal's[159] pledge to 'do no harm' and the Interinstitutional Agreement on the 2021-2027 MFF[160], 30% of the EU budget in 2021-2027 will support climate efforts, while biodiversity will receive 7.5% of the EU budget as of 2024 and 10% as of 2026. To reach these targets, more financial resources will need to be allocated to biodiversity, specifically under 2021-2027 cohesion policy and 2023-2027 CAP.

Sustainable finance significantly increases transparency on environmental sustainability (a goal promoted by the EU Taxonomy)[161]. It also strengthens non-financial reporting requirements and facilitates the issuance of green bonds (by developing the EU green bond standard[162]). Reinforced by the renewed sustainable finance strategy (2020)[163], sustainable finance will increase investment flows to climate and the environment. The new strategy on adaptation to climate change[164] can help tp close the insurance-protection gap, which currently leaves many risks from climate-related events uninsured[165]. The EIB will align 50% of its lending for climate and environment projects by 2025[166], with a EUR 250 billion contribution to the Green Deal investment plan by 2027.

Table 3 gives an overview of EU funding earmarked specifically for Luxembourg for 2021-2027. This funding is supplemented by other EU funding programmes available to all Member States.

Table 3: Key 2021-2027 EU funding allocated to Luxembourg (current prices)

Instrument	Country funding allocation (EUR million)
Cohesion policy	**Total: 58.7[167]**
ERDF	14.9
European Social Fund Plus	14.8
European Territorial Cooperation (ETC) (under the ERDF)	29[168]
Just Transition Fund	**9.3[169]**
EAFRD/rural development under 2020-2027 CAP strategic plans[170]	**61.6[171]**
European Maritime, Fisheries and Aquaculture Fund	**none**
Recovery and Resilience Facility (RRF) 2021 – 2026[172]	**93.4[173] (grants)**

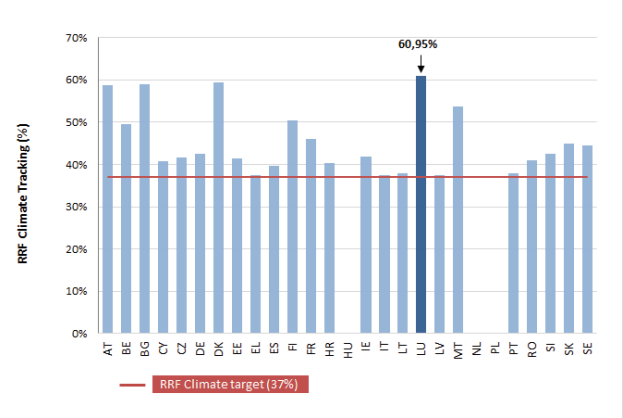
In Luxembourg, programming of most EU funds (cohesion-policy funds and EAFRD) is ongoing. However, the negotiations under the RRF have been concluded.

Luxembourg's RRP (which is needed to access RRF funding) responds to the urgent need to foster a strong recovery and make Luxembourg future-ready. The reforms and investments in the plan will help Luxembourg become more sustainable, resilient and better prepared for the challenges and opportunities of the green and digital transitions. To this end, the plan consists of 12 investments and 8 reforms. Luxembourg requested EUR 93 million in grants. Out of the RRP total amount, 60.95% will will support climate objectives (see Figure 38). This exceeds the RRF's 37% climate target and puts Luxembourg among the top Member States as regards climate commitment. In terms of green transition, the plan reflects Luxembourg's climate pledge by supporting the electrification of road transport, including:

[158] European Commission, *2021-2027 long-term EU budget & NextGenerationEU*.
[159] COM/2019/640 final.
[160] Interinstitutional Agreement, OJ L 433I.
[161] https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/eu-taxonomy-sustainable-activities_en
[162] EU Green Bond Standard - 2021/0191 (COD).
[163] European Commission, *Strategy for Financing the Transition to a Sustainable Economy*, COM(2021) 390 final.
[164] COM(2021) 82 final.
[165] The strategy would support improved insurance-gap coverage including through the natural catastrophe markets as reflected in the dashboard on insurance protection gap for natural catastrophes of the Association for European Insurance and Occupational Pension Authorities. See https://www.eiopa.europa.eu/document-library/feedback-request/pilot-dashboard-insurance-protection-gap-natural-catastrophes_en.
[166] *EIB Climate Bank Roadmap 2021-2025*, November 2020.
[167] European Commission, *2021-2027 Cohesion policy EU budget allocations*.
[168] Interreg initial allocations per MS including ETC transnational and ETC cross-border co-operation.
[169] The transfer to the Connecting Europe Facility (Transport) is not included.
[170] European Commission, *CAP strategic plans*.
[171] European Commission, *2021-2027 Cohesion policy EU budget allocations*.
[172] The reforms and investments under the RRF have to be implemented by 31 December 2026.
[173] Council Implementing Decision on the approval of the assessment of the recovery and resilience plan for Luxembourg.

- investment to promote charging points (EUR 30.5 million);
- investment to build a new housing district with heat and electricity produced from renewable energy sources (EUR 24 million); and
- investment to concude a 'Naturpakt' with municipalities to provide financial support for measures to protect nature and prevent biodiversity loss[174].

Figure 37: Climate expenditure in RRPs, 2021-2026[175]



Under NextGenerationEU, the Commission will issue up to EUR 250 billion of EU green bonds (one third of all bonds issued under NextGenerationEU) until 2026 that will comply with the general spirit of the do no significant harm' principle. However, this EUR 250 billion in green bonds will not be subject to the currently developed delegated acts related to the EU Taxonomy and will not fully align with the proposed EU standard for green bonds.

In addition to EU funds earmarked specifically for Luxembourg in 2021-2027, there are also funding programmes that can be accessed at the EU level and which are open to all Member States. These include the LIFE programme [176] (EUR 5.4 billion), Horizon Europe (EUR 95.5 billion)[177], the Connecting Europe Facility[178] (EUR 33.7 billion)[179] or the funds to be provided via the InvestEU[180] programme. These other sources of funding will also support the green transition, including through research and innovation activities for environmental protection (Horizon Europe)[181], clean transport and energy (the Connecting Europe Facility)[182] or sustainable infrastructure (InvestEU)[183].

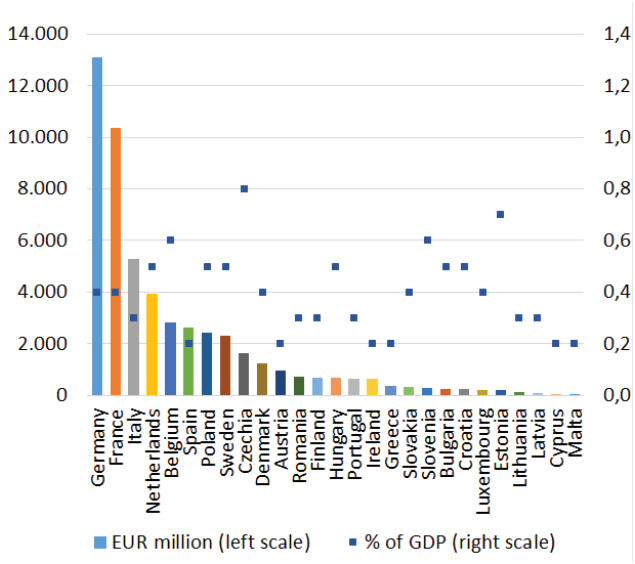
National environmental protection expenditure

Total national expenditure environmental protection (including all relevant current and capital expenditure)[184] in the EU-27 was EUR 272.6 billion in 2020, representing 2% of EU-27 GDP. This percentage has remained quite stable over time. Although the largest absolute amounts of expenditure are concentrated in a few countries, most countries spend 1-2% of their GDP on environmental protection, with Luxembourg dedicating 1%.

Of this spending, the EU-27's capital expenditure on environmental protection (i.e. investment) amounted to EUR 56.3 billion in 2018, falling to EUR 54.5 billion in 2020, representing around 0.4% of EU-27 GDP. Most Member States invested 0.2-0.5% of their GDP in environmental protection, including Luxembourg (0.4%). In 2014-2020, this totalled around EUR 376 billion of environmental investment in the EU-27, and EUR 1.18 billion in Luxembourg.

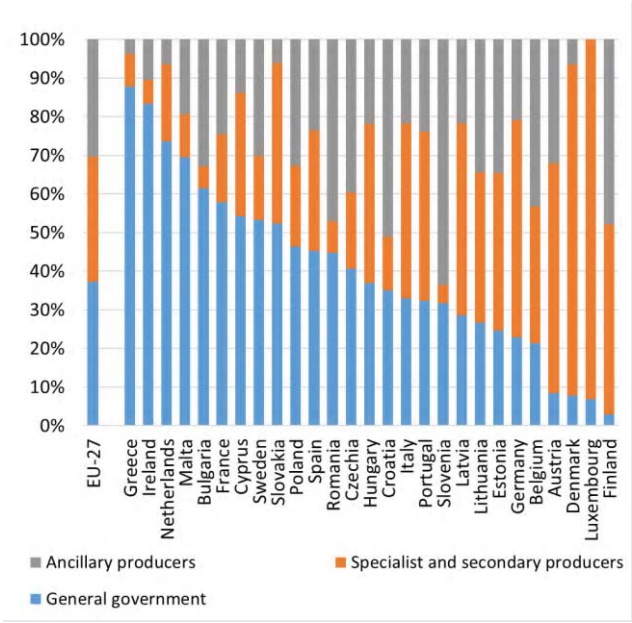
[174] European Commission, *Luxembourg's recovery and resilience plan*.
[175] European Commission. The contributions to climate objectives have been calculated using Annex VI of the RRF Regulation (EU) 2021/241.
[176] European Commission, *LIFE Programme*.
[177] European Commission, *Multiannual financial framework 2021-2027 (in commitments) - Current prices*.
[178] The Connecting Europe Facility (Transport) includes also EUR 11.3 billion transferred from the Cohesion Fund. 30% of the transferred amount will be made available, on a competitive basis, to all Member States eligible for the Cohesion Fund. The remaining 70% will be made available respecting national allocations until 31 December 2023. National allocations that are not spent by this date will support all Member States eligible for the Cohesion Fund.
[179] Regulation (EU) 2021/1153.
[180] The InvestEU Fund is expected to provide over EUR 372 billion of investment using an EU budget guarantee of EUR 26.2 billion to back the investment of financial partners such as the EIB Group.
[181] European Commission, *Horizon Europe*.
[182] European Commission, *Connecting Europe Facility*.
[183] European Union, *InvestEU*.
[184] At economy level, including final consumption, intermediate consumption and capital expenditure of households, corporations and governments related to environmental-protection goods and services. It excludes EU funds, but may include some international expenditure (beyond domestic). Source: Environmental Protection Expenditure Accounts (EPEA), Eurostat. EPEA accounts are based on the CEPA 2000 classification, excluding climate, energy and circular economy.

Figure 38: Direct and indirect environmental protection investment in the EU-27, 2018[185]



By institutional sector, only around 7% of Luxembourg's environmental protection investment (capital expenditure) came from the general government. Most of it (93%) was incurred by specialist producers (of environmental protection services, e.g. waste and water companies). At the EU level, 37% comes from governments, 33% from specialist producers and 30% from industry (businesses).

Figure 39: Environmental protection investments in the EU-27 (capital expenditure) by institutional sector (total economy = 100%), 2018[186]



A breakdown of investment by environmental topic is partially available, at the level of institutional sectors only (rather than at economy level), due to different reporting patterns. At Luxembourg's general-government level, the priorities were biodiversity (43%), waste management (31%) and air protection (23%) in 2018. The country's specialist producers focused on waste water, with 94% of environmental investments. On industry (businesses), there was no official data available.

In 2020, the total annual issuance of European green bonds (including some non-EU countries)[187] was USD 156 billion (EUR 137 billion[188]), up from USD 117 billion (EUR 105 billion) in 2019. Looking only at EU-27 Member States, green-bond issuance in 2020 was EUR 124 billion. In 2014-2020, 83% of the green bonds issued by European countries served objectives in energy, buildings or transport, while 8% supported water and waste, with a further 6% supporting sustainable land use, with links to ecosystem conservation and restoration. These data are based on the climate bonds taxonomy, which is broadly similar to the EU Taxonomy[189]. Of this 2020 annual

[185] Eurostat, *Environmental Protection Expenditure Accounts*, 2021.

[186] Eurostat, *Environmental Protection Expenditure Accounts*.

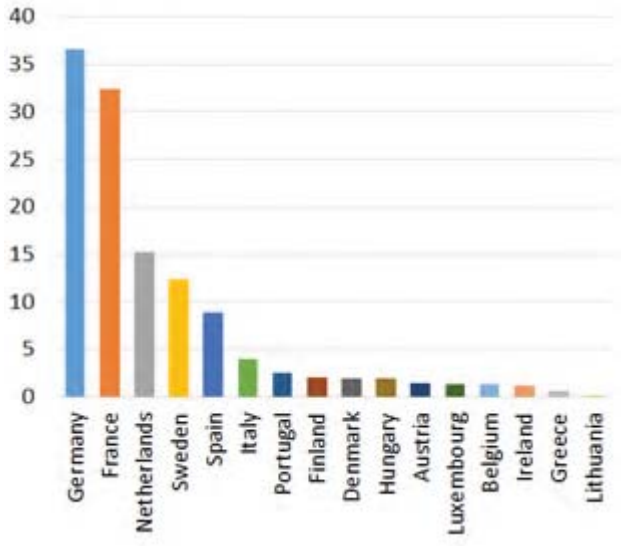
[187] Green bonds were created to fund projects that have environmental and/or climate benefits. Most green bonds issued are green 'use of proceeds' or asset-linked bonds. The very first green bond was issued in 2007. It was an AAA-rated issuance from multilateral institutions, the EIB and the World Bank.

[188] At Eurostat's annual average EUR/USD exchange rates.

[189] Interactive Data Platform at www.climatebonds.net. Further information on climate-bonds taxonomy: https://www.climatebonds.net/standard/taxonomy

issuance of EU green bonds, Luxembourg's issuance amounted to around EUR 1 billion (data available for 16 EU Member States, see Figure 41).

Figure 40: Annual issuance of EU green bonds, 2020 (EUR billion)[190]

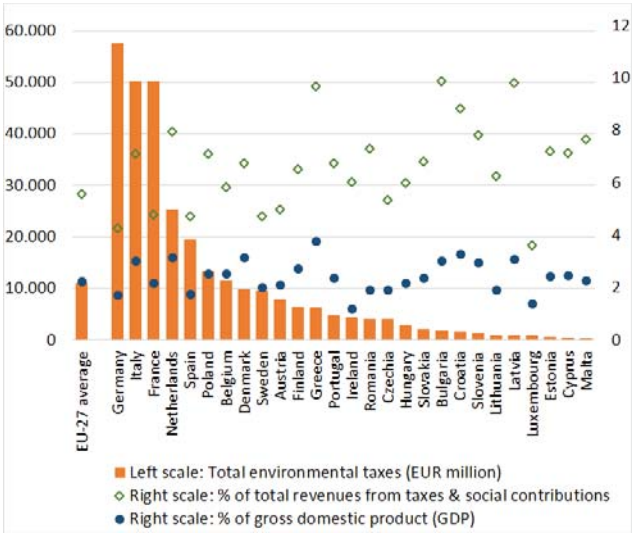


Green budget tools

Green taxation and reform

With environmental taxes standing at 1.39% of GDP in 2020, Luxembourg's revenue from these taxes is among the lowest of all Member States, well below the EU-27 average: of 2.24%, as shown in Figure 42. Energy taxes have the highest share in this with 1.27% of GDP (below the EU average of 1.74%). Transport taxation represented 0.11% in 2020 (well below the EU average of 0.42%), while pollution and resource taxes are almost negligible (0.01%). In 2020, environmental taxes represented to 3.62% of total revenues from taxes and social-security contributions (below the EU average of 5.57%).

Figure 41: Environmental taxes in the EU-27, 2020[191]



The 2019 European Green Deal underlines that well-designed tax reforms can boost economic growth and resilience, foster a fairer society, and promote a just transition. Tax reforms can contribute this by sending the right price signals and incentives to economic actors. The Green Deal creates the context for broad-based tax reforms, the removal of fossil-fuel subsidies, and a shift in the tax burden from labour to pollution. It achieves this while simultaneously taking account of social considerations[192]. The Green Deal promotes the 'polluter-pays principle'[193], which stipulates that polluters should bear the cost of measures to prevent, control and remedy pollution. The polluter-pays principle is facilitated by the Commission's Technical Support Instrument (TSI) flagship project[194] on greening taxes.

According to a Commission study on green taxation and other economic instruments (2021), Luxembourg applies polluter-pays economic instruments on waste (with a municipal waste management tax) and on nature and natural-resource protection (with biodiversity offsetting and an eco-points regime)[195].

There is no measure on green taxes in the Luxembourgish RRP. There is potential to increase environmental taxation in Luxembourg. For instance, the introduction of

[190] Climate Bonds Initiative, 2022.

[191] Eurostat, *Environmental taxes accounts*.

[192] European Commission, *The European Green Deal*, COM (2019/640 final), p.17.

[193] Article 191(2) of the Treaty on the Functioning of the European Union states: 'Union policy on the environment … shall be based on the precautionary principle and on the principles that preventive action should be taken, that environmental damage should as a priority be rectified at source and that the polluter should pay'.

[194] European Commission, *Greening taxes - applying polluter pays principle in practice*, green budgeting TSI participation.

[195] European Commission, *Green taxation and other economic instruments*, 2021.

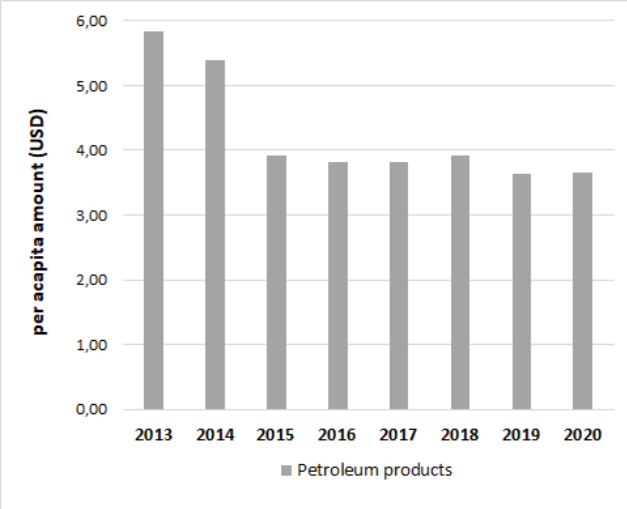
a pesticide tax could improve water quality. Modelling suggests that much higher rates based on pesticide-load indicators could strongly reduce the pesticide load in Luxembourg without impact on GDP or employment[196]. Also, as highlighted in the 2019 European Semester Country Report, there is potential to increase taxation in the transport sector. Luxembourg's tax rates on transport fuels are considerably lower than in neighbouring countries, inducing cross-border fuel purchasing. This enables the country to raise sizeable tax revenues despite very low rates[197].

Environmentally-harmful subsidies

Addressing and removing environmentally-harmful subsidies (EHS) is a further step towards wider fiscal reforms.

Fossil-fuel subsidies are costly for public budgets, and make it difficult to achieve the Green Deal objectives (on climate neutrality, air quality, zero pollution and health impacts). In many cases, these subsidies also counteract incentives for investment in green technologies. Annual fossil-fuel subsidies have been around EUR 55 billion in the EU since 2015. They rose by 4% between 2015 and 2019, although some countries (such as Latvia, Lithuania, Sweden, Greece and Ireland) managed to decrease them in this period. In the EU, subsidies for petroleum products in sectors such as transport and agriculture continued to increase in 2015-2019. However, subsidies for coal and lignite decreased, largely owing to the diminishing role of solid fuels in electricity generation. As a share of GDP, fossil-fuel subsidies ranged from 1.2% in Hungary to less than 0.03% in Malta in 2019 (with an EU average of 0.4%). In Luxembourg, total fossil-fuel subsidies represented 0.05% of GDP in 2019. In 2020, the EU-27's total fossil-fuel subsidies decreased to EUR 52 billion (due to falling consumption trends amid the COVID-19-related restrictions). Without Member State actions, these subsidies are likely to rebound as economic activity picked up from 2020[198].

Figure 42: Trends in petroleum-product subsidies in Luxembourg[199]



In terms of bad practices, Luxembourg does not have a duty on air travel. There is no fuel tax and value added tax on aviation (while road transport, such tax is levied). Therefore, airlines do not pay fuel tax when they fill up their planes. This is an example of an indirect environmentally harmful subsidy that damages air quality and the climate by encouraging air transport, which is very carbon intensive and causes a large amount of air pollution.

Current green-budgeting practices

'Green budgeting' encompasses various climate and environmental tagging[200] and tracking practices in budgets. Some EU Member States already use certain green-budgeting practices[201]. Green budgeting helps identify and track green expenditure and green revenues to increase transparency on how green budgetary policies are. This is aimed at improving policy coherence and supporting green policies (including climate and environmental objectives)[202].

The Commission has also drawn up climate-proofing and sustainability-proofing guidance as tools to assess project eligibility and a project's compliance with environmental

[196] European Commission, *Ensuring that polluters pay - Luxembourg*.
[197] European Commission, *Country report Luxembourg 2019*, SWD(2019) 1015 final, p. 22.
[198] See table on EU FFS data in 2019 which is based on (for info) COM(2021) 950 and Annex.

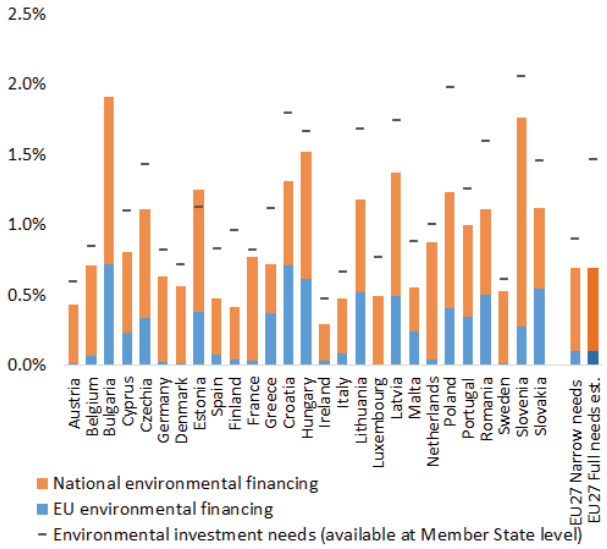
[199] OECD, Fossil Fuel Subsidy Tracker.
[200] Tagging is explained in European Commission, *Green budgeting practices in the EU: a first review* , 2021 (p.7).
[201] European Commission, *Green Budgeting Practices in the EU: A First Review*, 2021, *Green Budgeting Reference Framework* and OECD, Public Governance Directorate, *Climate Change and Long-term Fiscal Sustainability - Scoping Paper*, February 2021.
[202] OECD Paris Collaborative on Green Budgeting initiative, 2017.

legislation and criteria[203]. The Commission developed a green-budgeting reference framework[204] and launched a TSI flagship projects on green budgeting in 2021 to help Member States develop national green-budgeting frameworks to improve policy coherence and support the green transition. Luxembourg participates in this project.

Overall financing compared to the needs

The EU's overall financing for environmental investment is estimated to have been 0.6-0.7% of GDP a year in 2014-2020, comprising both major EU funds and national financing. This ranged from 0.3% (Ireland) to 1.91% (Bulgaria), depending on the level of environmental challenges in different Member States. In 2021-2027 period, it is estimated that the EU's environmental investment needs will range between 0.9% and 1.5% of forecast GDP, suggesting a potential environmental financing gap of 0.6-0.8% of GDP, compared to previous financing levels[205].

Figure 43: Total environmental financing baseline (2014-2020) and estimated needs (2020-2030) in the EU-27 (% of GDP)[206]



Luxembourg's financing for environmental investment amounted to 0.49% of GDP in 2014-2020 (under the EU average). The country relied on national sources for 99% of the financing. In 2021-2027, the country's environmental investment needs are estimated to reach over 0.77% of GDP, suggesting an environmental financing gap of at least 0.27% of GDP. This gap is likely to be larger when factoring in needs that are currently only estimated at EU level (e.g. water protection, circularity, biodiversity strategy, etc.). This needs to be addressed by additional environmental financing measures and by raising financial resources.

In the 2019 EIR, Luxembourg received one priority action, namely to provide adequate funding to tackle the main environmental challenges affecting the country, including through the mobilisation of investments and the use of EU funds. There has been some progress on this (for example the issuance of a green bond worth EUR 1 billion in 2020), while for other areas, the recommendation is reiterated.

2022 priority actions

- Draw up an environmental financing strategy to maximise opportunities for closing environmental implementation gaps, including by increasing environmental taxes.

[203] European Commission, *Technical guidance on sustainability proofing for the InvestEU Fund*.

[204] European Commission, European Commission Green Budgeting Reference Framework.

[205] Source: European Commission, Directorate-General for Environment, data analysis. EU financing sources covered: ESI Funds (ERDF, CF, ESF, YEI, EAFRD, EMFF), Horizon 2020, LIFE, EFSI (EU amount), EIB loans. National financing: total national environmental-protection capital expenditure (investment) – source: Eurostat EPEA dataset. Cut-off date for data: end-2021. Total financing may be higher, in particular because of further indirect investments. This requires further analysis in the future.

[206] Eurostat, ESI Funds Open Data, 2021.

- Tackle the country's main environmental challenges by providing appropriate funding, including by raising investment and using EU funds.

6. Environmental governance

Information, public participation and access to justice

Citizens can more effectively protect the environment if they can rely on the three 'pillars' of the Aarhus Convention:
(i) access to information;
(ii) public participation in decision making;
(iii) access to justice in environmental matters.
It is of crucial importance to public authorities, the public and businesses that environmental information is shared efficiently and effectively[207]. Public participation allows authorities to make decisions that take public concerns into account. Access to justice is a set of guarantees that allows citizens and NGOs to use national courts to protect the environment[208]. It includes the right to bring legal challenges ('legal standing')[209].

Environmental information

This section focuses on Luxembourg's implementation of the INSPIRE Directive. The INSPIRE Directive aims to set up a European spatial data infrastructure for: (i) sharing environmental spatial information between public authorities across the EU; (ii) assisting in policy-making across boundaries; and (iii) facilitating public access to this information. Geographic information is needed for good governance at all levels and should be readily and transparently available.

Luxembourg's implementation of the INSPIRE Directive is good. Luxembourg's performance has been reviewed based on its 2021 country fiche[210]. Data identification and documentation have made good progress, and implementation levels are good.

Table 4: Country dashboard on the implementation of the INSPIRE Directive, 2016-2020[211]

	2016	2020	Legend
Effective coordination and data sharing			■ Implementation of this requirement is well advanced or (nearly) completed. Outstanding issues are minor and can be addressed easily. Percentage: >89% ■ Implementation of this requirement has started and has some or substantial progress but is still not close to being completed. Percentage: 31-89% ■ Implementation of this requirement is falling significantly behind. Serious action is necessary to close the implementation gap. Percentage: <31%
Ensure effective coordination	■	■	
Data sharing without obstacle	■	■	
INSPIRE performance indicators			
i. Conformity of metadata	■	■	
ii. Conformity of spatial data sets[212]	■	■	
iii. Accessibility of spatial data sets through view and download services	■	■	
iv. Conformity of network services	■	■	

Public participation

Environmental impact assessments (EIAs) are published in daily newspapers, referring to the website on which detailed information is available and mentioning the deadline for submissions of observations by the public. Projects that are subject to ongoing or finalised EIAs are available on the environmental portal. Observations can be submitted electronically either via the online form available on the webpage of the specific project or via email.

For strategic environmental assessments (SEAs), the publication procedure is the same as the onefor EIAs. However, contrary to the EIA, a centralised database

[207] Together, the Aarhus Convention, the Access to Environmental Information Directive (Directive 2003/4/EC) and the INSPIRE Directive (Directive 2007/2/EC) create a legal foundation for the sharing of environmental information between public authorities and with the public. This EIR focuses on the INSPIRE Directive's implementation.
[208] These guarantees are explained in the Commission Notice on access to justice in environmental matters (OJ L 275, 18.8.2017) and in a related citizen's guide.
[209] This EIR focuses on the means implemented by Member States to guarantee rights of access to justice and legal standing and to overcome other major barriers to bringing cases on nature and air pollution.
[210] https://inspire.ec.europa.eu/INSPIRE-in-your-Country/LU

[211] INSPIRE knowledge base
[212] In 2016, the deadlines for implementing spatial-data interoperability were still in the future: 23.11.2017 for Annex-I data and 21.10.2020 for Annex-II and -III data. In many cases, this conformity indicator will never reach 100% as most countries provide as-is data sets in addition to the INSPIRE harmonised data sets.

gathering all the ongoing and finalised SEAs could not be found. Access to ongoing SEAs is possible via the portal on public consultations that was set up recently, but it is difficult to search by type of procedure. The Luxembourgish portal on public consultations set up in January 2021 shows relatively low levels of public participation in decision-making. Luxembourg is invited: (i) to continue the good practice of providing accessible online information on EIA and SEA procedures, to facilitate public participation; and (ii) to consider making the information on public consultations on the online portal searchable by type of procedure.

Access to justice

Standing rules are consistent before all courts. However, Article 63 of the Law on the protection of nature and natural resources has set specific rules for environmental associations. In Luxembourg, courts assess litigants' standing. Standing rules are applicable throughout the environmental procedure, from administrative appeal to judicial review.

Generally, standing is subject to a prior-participation requirement in all kinds of environmental matters for all kinds of participants, and this requirement seems to be difficult to fulfil. The requirements for standing do not change according to the type of remedy sought. The Council of State has confirmed that case-law allowing NGOs to bring a judicial review against individual administrative decisions did not need to be included in a new law on nature and natural-resources protection as judges must be able to use their discretionary power. There are no difficulties in challenging SEA decisions (either the plan or programme or the environmental report, or both). The administrative tribunal judges the procedural and substantive legality of the administrative decision as it judges the merits of the case. Judges will verify factual and technical criteria and all relevant documents. There is a system of regular and substantive oversight of legally binding acts, and it is accessible to the members of the public and NGOs.

Information on access to justice in environmental matters is accessible via government sites[213].

In the 2019 EIR, Luxembourg received three priority actions. There is no information available on the first action, on improving access to spatial data and services by making stronger linkages between the country INSPIRE portals. The action on legal standing for environmental NGOs to bring legal challenges on environmental issues, where relevant without facing prohibitive costs, has been fullly implemented, as detailed above. On better informing the public about their access to justice rights, it can be concluded that limited progress has been made.

2022 priority actions

- Ensure that standing is not conditional on prior participation in environmental cases.
- Better inform the public about public consultations and access to justice rights, in particular by referring to judicial and administrative portals and to the Commission's eJustice fact sheets on access to justice in environmental matters[214].

Compliance assurance

Environmental compliance assurance covers all the work undertaken by public authorities to ensure that industries, farmers and others fulfil their obligations to protect water, air and nature, and manage waste[215].
It includes support measures provided by the authorities such as:
(i) compliance promotion[216];
(ii) inspections and other checks that they carry out, i.e. compliance monitoring[217];
(iii) the steps that they take to stop breaches, impose sanctions and require damage to be remedied, i.e. enforcement[218].
Citizen science and complaints enable authorities to focus their efforts better. Environmental liability[219] ensures that the polluter pays to remedy any damage.

Compliance promotion and monitoring

Full and detailed information is provided on Luxembourg's national environmental portal on the Natura 2000 sites and species. Furthermore, the national environmental portal includes national and European

213 www.emwelt.lu; www.developpement-durable-infrastructures.public.lu/fr/index.html

214 https://e-justice.europa.eu/content_access_to_justice_in_environmental_matters-300-en.do

215 The concept is explained in detail in the Commission Communication on EU actions to improve environmental compliance and governance (COM(2018) 10) and the related Commission Staff Working Document (SWD(2018) 10).

216 This EIR focuses on the help given to farmers to comply with nature legislation and nitrates legislation.

217 This EIR focuses on inspections of major industrial installations.

218 This EIR focuses on the availability of enforcement data and on coordination between authorities to tackle environmental crime.

219 The Environmental Liability Directive (Directive 2004/35/CE) creates the framework .

action plans in favour of certain species and habitats. Finally, the same website provides biodiversity guides for farmers containing information on the protection of nature through sustainable agricultural practices.

Information on the implementation of the Nitrates Directive is available on the website of the Ministry of Agriculture. This website has contains a dedicated section providing assistance and advice to farmers on fertiliser application limits based on the size, the type of crop or the period during which the application of fertilisers is not allowed. Luxembourg has also set up agricultural advisory centres.

Detailed information on the planning of inspections of industrial installations is provided in the national law implementing the IED[220]. After each inspection (planned or unplanned), the Environmental Administration drafts a report setting out the findings on the conformity of the installation and the action to be taken. The report is notified to the operator within 2 months and is made available to the public within 4 months. No environmental statistics or annual activity reports linked to environmental inspections are available.

Complaint handling and citizen science

Detailed information on the way the public can file environmental complaints with one of the three competent authorities is available on the website of the Luxembourgish government. Standardised complaint forms for each competent authority are also available on the website of the Luxembourgish government. This facilitates the submission of environmental complaints.

Complaints on the management of the administration can be filed with the ombudsman. Information on the conditions for filing such a complaint and applicable procedure is available on the websites of the government and the ombudsman.

Poeple submitting environmental complaints are informed about the receipt of their request and can decide to be informed about the outcome of their complaint. Reception of a complaint leads to an investigation of the alleged infringement by the competent authority, and the applicants must be granted the right to be heard on the observations submitted. No information is available on the number of environmental complaints received by the authorities or their outcomes.

No initiatives to raise the public's awareness of the possibility to alert or inform authorities about facts likely to cause environmental damage have been identified.

[220] Directive 2010/75/EU (OJ L 334, 17.12.2010, p. 17).

Enforcement

No centralised database or statistics on environmental crimes and their outcomes are available. The website of the national police provides some statistics on crimes against the environment. However, it does not specify the type of crimes. A specialised police investigation team carries out investigations into environmental crimes. However, Luxembourg's fight against environmental crime has been criticised for lacking a strategic approach[221].

Various authorities are authorised to confirm the existence of environmental damage and adopt temporary safeguard measures before such measures are validated by the prosecutor.

The Environment Agency, the police and the customs and the Excise Agency cooperate formally and exchange information on waste transport and trade inspections. Enforcement authorities also cooperate on hazardous-waste management.

Environmental Liability Directive

Ministerial redress measures on environmental damage are published electronically, but there does not appear to be a central database recording such Environmental Liability Directive (ELD) cases or other serious environmental damage.

In the 2019 EIR, Luxembourg received four priority actions. There are reiterated below as there has only been limited progress.

2022 priority actions

- Better inform the public about compliance promotion, monitoring and enforcement.
- Ensure more information on how professionals dealing with environmental crime work together.
- Improve financial security for environmental liabilities and/or ELD guidance and/or the collection and publication of information on environmental damage.
- Publish information on the outcomes of enforcement action and on the follow-up to detected cross-compliance breaches on nitrates and nature.

[221] Council of the European Union, *Eighth round of mutual evaluations on the practical implementation and operation of European policies on preventing and combating environmental crime – Report on Luxembourg*, 7947/1/19, p. 16.

Effectiveness of environmental administrations

Those involved in implementing environmental legislation at EU, national, regional and local levels need to have the knowledge, tools and capacity to ensure that the legislation and the governance of the enforcement process bring about the intended benefits.

Administrative capacity and quality

Overall, implementation of EU environmental law improved across sectors during the last decade. For instance, implementation of environmental assessments progressed. A recent legislative package aimed to speed up licencing of projects of national interest raised some doubts, but no serious problems have been identified after its implementation.

Luxembourg ranks second out of 180 in the 2020 Environmental Performance Index[222]. Yet, Luxembourg scores below the EU average when it comes to overall environmental-governance performance (2019 governance study ot the Commission's Directorate-General for Environment). In terms of transparency, some environmental information is either not publicly available or difficult to access. On e-governance, Luxembourg has attempted to develop tools to improve public access to information, and some success has been achieved. On access to justice, all environmental associations have a "sufficient interest" to request administrative jurisdictions to take actions under the ELD. However, no different rules exist in Luxembourg for environmental procedures against the state compared to other areas. Environmental claims against the state are treated the same way as other administrative claims. There is no distinction between various environmental issues. Lastly, impact assessments are required when new laws or programmes are developed, but these impact assessments do not require environmental issues to be addressed directly and are linked primarily to administrative burden and enforcement costs.

In the 2019 EIR, Luxembourg received one priority action in this area, namely to improve environmental governance (such as transparency, citizen engagement, compliance and enforcement, as well as administrative capacity and coordination). There has been limited progress. Therefore, the action is reiterated.

[222] https://epi.yale.edu/epi-results/2020/component/epi

2022 priority action

- Continue to improve environmental governance, in particular administrative capacity and coordination at the national level.

Coordination and integration

As mentioned in the 2019 EIR, the transposition of the revised EIA Directive[223] provides an opportunity to streamline the regulatory framework on environmental assessments. Luxembourg has transposed the revised EIA Directive.

The Commission encourages the streamlining of the environmental assessments to reduce duplication and avoid overlaps in environmental assessments applicable to projects. Moreover, streamlining helps reduce unnecessary administrative burden and accelerates decision-making without compromising the quality of the environmental-assessment procedure[224]. Luxembourg already streamlined the environmental assessments under the EIA and Habitats Directives before the revision of the EIA Directive. Joint procedures have been developed for the EIA Directive, the WFD and the IED.

Reforms through the Commission's technical support instrument (TSI)

The Commission has provided expertise to help design more than 1 200 reform projects in 27 Member States since 2017, first through the Structural Reform Support Programme, and since 2021 through the TSI, its successor programme.

The TSI's main objective is to promote the EU's economic, social and territorial cohesion by supporting Member States' action on implementing the necessary reforms to achieve economic and social recovery, resilience and upward economic and social convergence[225].

[223] Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment.
[224] The Commission issued a guidance document in 2016 regarding the setting up of coordinated and/or joint procedures that are simultaneously subject to assessments under the EIA Directive, Habitats Directive, Water Framework Directive, and the Industrial Emissions Directive, OJ C 273, 27.7.2016, p. 1.
[225] European Commission, *Technical Support Instrument: 2021 country factsheet*.

However, Luxembourg has not yet submitted TSI projects in the environmental sector[226]. The Commission encourages Luxembourg to use this tool in the coming years.

TAIEX EIR peer to peer projects

The Commission launched the Taiex EIR peer-to-peer tool to facilitate peer-to-peer learning between environmental authorities. During the reporting period, Luxembourg participated in workshops on ammonia-reducing technology and measures (November 2021) and on zero pollution (February 2022).

[226] European Commission, *Supporting reforms in Luxembourg*, 2021.