

# 5 Biodiversity

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Chapter 5 describes the main trends concerning biological diversity and natural habitats in Luxembourg, and the related policy objectives. It examines the country's progress over the past 15 years and the main challenges that need to be addressed. It covers such areas as species at risk, habitat, climate change, ecosystem services and protected areas.

Chapter 5 also examines institutional co-operation and governance, as well as instruments to protect natural areas and threatened species. It highlights the need for accelerating policy action and better integrating biodiversity issues into sectoral policies, as well as Luxembourg's contribution to the protection of regional and international biodiversity.

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## 5.1. Introduction

Biodiversity has been declining in Luxembourg for more than 40 years. The causes range from rapid economic growth, urbanisation, intensified farming to habitat loss and degradation, landscape fragmentation, invasive alien species and climate change. The country has made some progress in key areas, but needs to step up its actions.

Luxembourg has not achieved its ambitious objectives to halt biodiversity set out in the first National Plan for Nature Conservation (2007-11). The final assessment of the second plan (2017-21) will likely also fall short. It needs to prepare its third plan without delay with special attention to the potential impact of the impact of climate change and biodiversity decline on ecosystem services. Biodiversity concerns must be fully integrated into agricultural, land-use planning and other sectoral policies (climate, housing, transport, etc.). This will demand better co-ordination between the national and local levels, as well as a strong commitment from municipalities.

## 5.2. Status, trends and pressures on biodiversity

### **Status and trends**

Despite its limited size, Luxembourg has a range of biodiversity and different types of landscapes owing to a substantial degree of geological and microclimate diversity. Maintaining species diversity and genetic diversity is vital for ecosystems to deliver ecosystem services that foster resilience to climate change. Yet, biodiversity has been in decline for more than 40 years in terms of species, habitats and ecosystems. Luxembourg is one of the European countries where the number of common species in decline is at its highest. The fall in the number of insects, which are at the bottom of the food chain and are vital to ecosystem survival, is worrying. Luxembourg's strong economic and demographic growth has led to urban developments that contribute to the fragmentation of landscapes and habitats. What is more, intensified farming is putting heavy pressure on biodiversity. Hence, natural ecosystems are threatened.

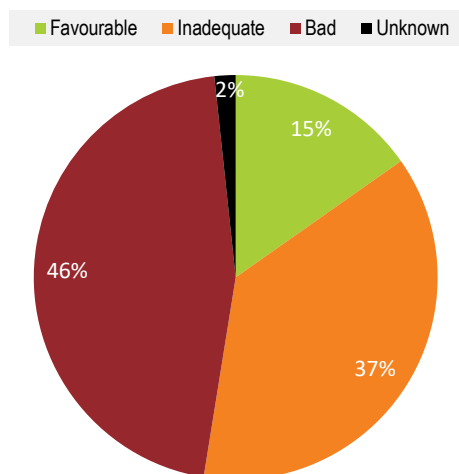
#### *Species*

The share of species of European Community interest whose conservation status is regarded as favourable is 15% (compared to 18% in 2013), while the share whose status is considered as unfavourable is 83% (compared to 63% in 2013) (Figure 5.1). This decline is nothing new. At the last OECD review, the situation of threatened species was just as worrying: all reptiles and a quarter of birds, fish, amphibians and vascular plants were threatened.

The International Union for Conservation of Nature (IUCN) Red List of Threatened Species of breeding birds (2020) gives the following figures:

- 13 species are regarded as extinct, including the whinchat (*Saxicola rubetra*), a species still widely found 30 years ago
- 26 species are in critical conservation status
- 24 species have been placed on the alert list for increased surveillance.

**Figure 5.1. The conservation status of species is alarming**



Note: These figures show the percentage of biogeographic assessments in each conservation status category for species.

Source: AEE (2019), "Conservation status and trends", *State of Nature in the EU: Article 17 national summary dashboards*.

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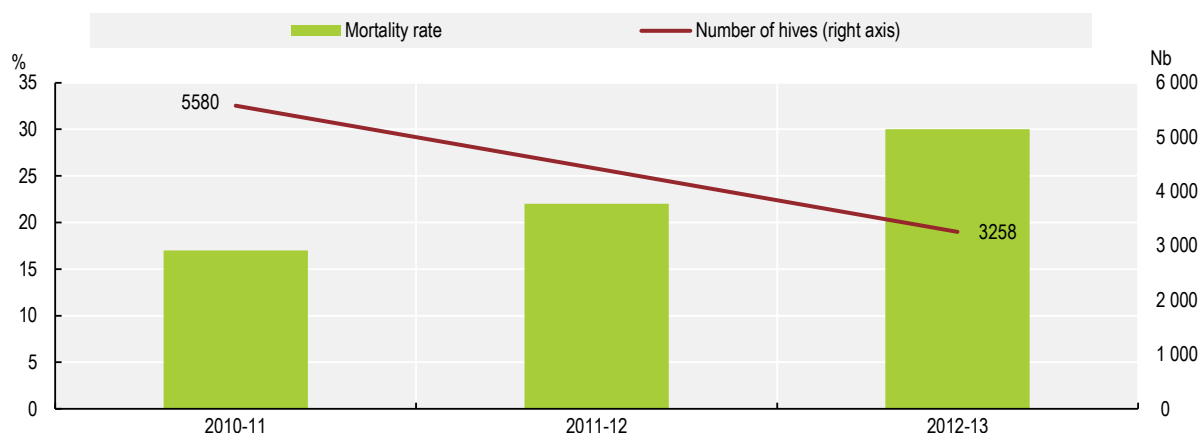
### Pollinating insects

The decline in numbers of insects recorded in north-west Europe over the past four decades is alarming. In Germany, close to Luxembourg, insect biomass in protected areas has decreased by 75% in 27 years (Hallmann et al., 2017). This accelerated tumble exceeds worldwide losses of vertebrates, which stand at 58% over the past 42 years. There are two important points regarding this study. First, it examines the disappearance of all populations of flying insects rather than just rare species of insects. Second, it was carried out in areas designated to protect biodiversity. The study thus casts doubt on whether such areas can adequately protect biodiversity. Intensified farming (for example, pesticide use, year-round ploughing, increased use of fertilisers) and the frequency of agronomic measures may be plausible causes. In 2017, Luxembourg had only 4 528 ha of land under organic farming (4.17%).

In Belgium, the abundance, size and diversity of bumblebee populations have changed drastically. Between 68-88% of bumblebee species have declined over the past century; four species have disappeared completely (RTBF, 2018). The same trend is visible in domestic bee populations in Luxembourg (Figure 5.2). Only a few species tend to increase their relative abundance and dominate others. As a result, bumblebee communities have become homogenised. Between 1990-2009 and 2010-16, nearly two-thirds of butterfly populations in Luxembourg also declined in the area they occupy. This finding is valid both for butterfly species in grassland habitats comprising species described as "common" and for "specialist" species of butterflies in meadowlands.

The dizzying decline in insect numbers is very worrying. They are a food source for 60% of birds, while 80% of wild plants depend on them for pollination (Hallmann et al., 2017). The downturn in insect populations inevitably impacts many populations of birds, amphibians, reptiles, fish and small mammals and, of course, the ability of ecosystems to deliver their vital services. At the end of 2019, the government initiated the preparation of a specific action programme with stronger measures to protect pollinating insects on Luxembourg territory.

Figure 5.2. Honey bee mortality is growing



Source: MDDI (2015), *Fifth national report of Luxembourg to the Convention on Biological Diversity*.

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### Birds

Although 19% of the conservation status of birds is unknown, the negative trend in this group of species is no different from that affecting all species of European Community interest in the country. Only one-third of birds enjoy a stable, improved status, while the status of half of them is degraded and unstable.

Various species of rural birds have been in decline over the past four decades in Luxembourg. These include the lapwing, the skylark, Cretzschmar's bunting and the great grey shrike, one of the species for priority action in the first National Plan for Nature Conservation 2007-11 (PNPN1). These species are following the same trends as birds in open environments at the European level, declining by 50-100% since 1980.

The fall in numbers among these indicator species for open environments is largely due to the intensification of farming, especially in grasslands, which is leading to fewer areas available for habitats and to a lower quality of such areas.

Some rare and iconic species are growing in numbers, thanks partly to targeted measures. These include the peregrine falcon (*Falco peregrinus*), the eagle owl (*Bubo bubo*), the little owl (*Athene noctua*), the two species of kites (*Milvus milvus* and *Milvus migrans*), the black stork (*Ciconia nigra*) and the reappearance of the white stork (*Ciconia ciconia*) as a nesting bird.

### Mammals

The populations of several mammal species in Luxembourg are rather stable. The wild cat is relatively well distributed throughout the country, with an increased presence of hybrid individuals in certain regions, such as the Upper Alzette. Like the wild cat, the marten lives in most regions, and has been a stable occupant for several years. The western polecat, which is difficult to observe, has been spotted during March and April near watering places. The dormouse, a species whose distribution was unrecognised before the surveillance programme was established, has turned out to be fairly uniformly present throughout the country. However, the European otter is no longer seen.

### Amphibians

Knowledge of the distribution and numbers of amphibian species has improved. Among the 13 amphibian species assessed, 3 species are severely threatened (*Hyla arborea*, *Epidalea calamita* and *Bombina variegata*), one species is on the alert list (*Alytes obstetricans*), one species is reported as extinct (*Pelobates fuscus*) and 8 species are regarded as not threatened.

## Vascular plants

Little information is available about the status of plants in Luxembourg. The continental population of some plants is greatest in the territory of the Grand Duchy. Other populations are known only from a single site at the national level, which thus deserves special attention. A recent study puts the rate of disappearance of plants at three times that of animal species since 1900 (Humphreys et al., 2019).

## Invasive alien species

An assessment of 55 alien vascular plant species, published in 2013, reveals that nine species have a considerable ecological impact; they have been placed on the black list of species that require action to reduce their distribution and impact. Ten species with an average impact are on the surveillance list. Eight species not yet present in Luxembourg have been placed on the alert list to watch out for any appearance. The ecological impact of the other 28 species is slight, and they have not been listed.

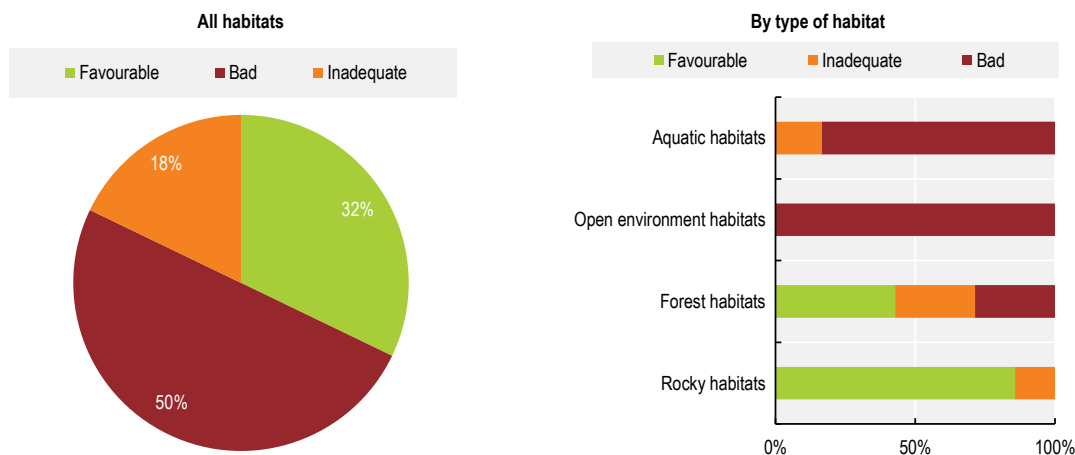
An assessment of 25 alien vertebrate species in 2014 reveals that 3 species present a high risk and have been blacklisted; 5 species with an average impact are on the surveillance list; 2 species have been placed on the alert list. Fifteen species are not on any list, as their impact was considered to be slight. The study used the Invasive Species Environmental Impact Assessment (ISEIA) protocol.

An assessment of 52 alien invertebrate species using the ISEIA protocol was carried out in 2016. It found that eight species present a high risk; they have been blacklisted. Five species with an average impact are on the surveillance list; 6 species have been placed on the alert list. Thirty-three species are not on any list, as their impact was considered to be low. (MDDI, 2017a).

## Habitats

Habitat degradation in Luxembourg is a cause for concern: habitat quality has declined over 1962-2007 by an estimated 78%. According to the latest report (2018) on the conservation status of species and habitats covered by the EU Habitat Directive, 32% of the biogeographical assessments of habitats are favourable (25% in 2013); 18% are unfavourable-inadequate (29% in 2013); and 50% are unfavourable-bad (46% in 2013) (Figure 5.3). The rise in the overall quality of habitats is a positive development that needs to be maintained.

**Figure 5.3. The conservation status of habitats raises concerns**



Source: AEE (2019), "Conservation status and trends", *State of Nature in the EU: Article 17 national summary dashboards*.

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## Habitat loss and degradation

The main factors in the deterioration of the natural environment in Luxembourg are habitat loss and degradation, landscape fragmentation, invasive alien species and climate change. The combined effects of climate change are likely to accentuate that negative trend, with unpredictable repercussions on the functioning of land and water ecosystems.

Accessible environments, like open or aquatic environments, are the most affected, while rocky and forest environments, being less accessible, are better preserved (Figure 5.3). Habitats rich in diversity, such as wetlands, dry grasslands and extensively used orchards, have shrunk seriously over the past 30 years, demonstrating the ongoing homogenisation of the landscapes. Open-environment habitat, such as rough hayfields and heather moorland, accounts for the greatest surface area; it is receding yearly at an alarming rate. Another habitat where the conservation status is “unfavourable” is the *Stellario-Carpinetum* oak stands. Their structures and functions are degrading due to a lack of regeneration of the oaks and the pressure on them from herbivorous game, as well as changes in humidity levels or in water tables.

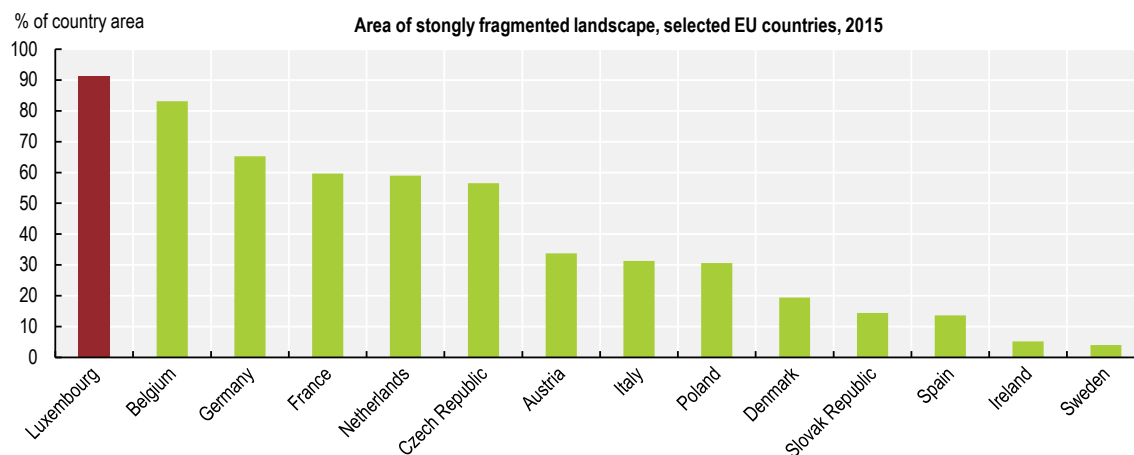
Only 2% of surface water bodies are in a good ecological condition. This low percentage results from the depletion of the biological diversity of water courses and changes in their hydromorphology. The chemical status of water courses is poor due to the presence of polycyclic aromatic hydrocarbons, heavy metals and pesticides. The situation is no better for groundwater bodies; two-thirds are classified as being in poor chemical condition, especially because of the presence of nitrates and pesticides (MDDI, 2015).

## Landscape fragmentation

Landscape fragmentation in Luxembourg is the highest in Europe, with 93% of the country classified as highly fragmented (Figure 5.4). The density of the transportation and urban infrastructure web stands at 136 meshes/100 km<sup>2</sup>. One-quarter of this fragmentation is in densely concentrated population areas, while two-thirds are in more sparsely populated areas (EEA, 2019a). The fragmentation is caused by rising population numbers, economic growth and increasing development of transportation infrastructure.

Fragmentation is seen as one of the main causes of the degradation of biodiversity and ecosystems. However, there is less fragmentation inside Natura 2000 areas than outside. Smaller habitats and less connectivity between them reduces the living space for fauna and flora. This, in turn, lessens their potential for reproduction.

**Figure 5.4. Luxembourg is the most fragmented country in Europe**



Note: Measured by areas with more than 50 landscape elements per 1 000 km<sup>2</sup> that are considered very strongly fragmented (based on a statistical distribution).  
Source: EEA (2019), "Landscape fragmentation pressure and trends in Europe", *Indicator Assessment*.

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### *Climate change*

Climate change may lead regionally to the disappearance of certain species and the appearance of new ones. The climate is continuously exposed to a range of natural or human-made factors that cause variations at different speeds and for different lengths of time. The effects of climate change are likely to become more pronounced in future and bring about major changes in the phenology and areas of distribution of species. Such changes are already affecting biodiversity and ecosystem services in Luxembourg. For example, at the end of July 2018, cyanobacteria or blue-green algae proliferated across the whole Upper-Sûre Lake, leading to an early ban on swimming. At the same time, the Water Management Agency issued a notice against taking surface water from the lake to avoid compromising the survival of aquatic organisms.

The hydrological regime can be seriously affected by climate change, leading to overabundance of water and floods. It can also be considerably reduced in times of drought, which usually leads to higher temperatures. The habitat for several species of aquatic organisms can thereby be put at risk. Climate change is a major cause of decline in biodiversity, added to the effects of other trends that work against ecosystem conservation.

### *Ecosystem services*

Four types of ecosystem services are recognised: supply, regulation, support and cultural services. In Luxembourg, ecosystem degradation and biodiversity loss, coupled with the effects of climate change, have reduced the ability of ecosystems to supply certain vital socio-economic goods and services: water supply, flood prevention, temperature regulation and pollination.

During heatwaves, demand rises for water for consumption or swimming. At the same time, restrictions are imposed to avoid contamination due to the impact of effluents from sewage treatment plants on surface water quality or to maintain the quantity of water for aquatic fauna. The lack of wooded spaces, particularly in the urban environment, raises the ambient temperature. This especially affects the health of children and the elderly. In contrast, when rainfall is heavier than usual, the poor quality of aquatic and wetland habitats is detrimental to the regulation of water flows, which leads to more serious flooding. Lastly, the decline in pollinating insects may be harmful to agriculture and lead to serious economic effects.

Expanding knowledge of the status of ecosystems and the services they deliver in Luxembourg is important. It should be supported by a campaign to raise awareness among national and municipal decision makers of the need to protect ecosystems for their vital socio-economic services, and by concrete interventions to restore degraded ecosystems so they can provide those services.

### ***Protected areas***

Protected areas in Luxembourg cover nearly 50% of the territory. However, these are often small in size and multifunctional. Their potential for conserving biodiversity and delivering ecosystem services is thus limited. It can be enhanced by implementing various measures such as restoration, reintroduction of species and eradication of invasive alien species or by increasing ecological connectivity with neighbouring protected areas. Several protected areas enjoy more than one protection status because they contribute to various conservation objectives. A Natura 2000 site, for example, may also be a Ramsar site in its capacity as a wetland environment of international value. In such cases, the area has to meet the conservation requirements of each of the statuses.

### *Protected natural areas of national interest*

Luxembourg has made important strides to create protected natural areas of national interest in the decade between 2008-18. Such areas benefit from the highest level of protection for biodiversity in Luxembourg

since they prohibit several types of human activity. Protection may take the form of a protected landscape. As such, it may be subject to easements and encumbrances designed to safeguard conserve habitats and species, safeguard the countryside, or people's well-being. At the last OECD review, 3 734 ha had been designated for these protected natural areas (OECD, 2010). They now cover more than 8 000 ha, which is a remarkable progress. The latest such area, created in 2018, encompasses a large forest massif and supplies 6% of the Luxembourg population with water – an irreplaceable ecosystem service.

### *Natura 2000*

The Natura 2000 network occupies 27% of the national territory compared to an EU average of 18%. Luxembourg has 66 Natura 2000 sites, among which 18 special protection areas under the Birds Directive covering 16% (EU average: 12%), and 48 sites of Community importance (SCI) under the Habitats Directive covering 16% (EU average: 13.8%). (MECDD, n.d.).

Luxembourg completed the establishment of the Natura 2000 network in 2018. In 2008, the network covered 45 260 ha; it now has nearly 70 000 ha, representing a 55% increase. The management plans are almost complete, and most of the steering committees for the various sites have been set up. It should be stressed that the designation of an area as a Natura 2000 site is only the first stage in a process that aims to add to the conservation effort by adding an area. The potential of the site for biodiversity has to be enhanced by restoring it, by limiting certain activities, by establishing connectivity with other protected areas or by engaging in specific activities that are compatible with the environmental characteristics of the site. The late date of completion of the management plans is not conducive to maximising the potential of these sites for conserving biodiversity or halt its decline.

### *Nature parks*

Areas covered by nature parks in Luxembourg have increased substantially since the last review, and will continue to grow. Building on its first two nature parks (Upper-Sûre and the Our), Luxembourg created a third nature park, Mullerthal, in 2016. Mullerthal Nature Park brings together 12 municipalities and covers an area of 256 km<sup>2</sup> with a population of 23 000 inhabitants. Like the other two nature parks, Mullerthal is not a closed area like a national park. Instead, it is a region for the promotion of sustainable development. The area covered by nature parks is now 785 km<sup>2</sup>, an increase of 69% since the last OECD review in 2010. A fourth park, the Three Borders Nature Park straddling the border with Germany, is still in the planning stage. The nature parks are managed by joint syndicates made up of representatives of the municipalities and the state based on ten-year contracts. The Upper-Sûre and the Our parks are managed in co-operation with nature parks in Belgium and Germany.

### *Ramsar wetlands*

Luxembourg has two wetlands of international importance on the Ramsar list: Haff Remich in the municipality of Schengen (Box 5.2) and the Upper-Sûre Valley, a transfrontier zone. There has been no change since the last review (OECD, 2010).

## **Effectiveness of protected areas**

Biodiversity in Luxembourg has been in decline for more than 40 years (MDDI, 2017b). The conservation status for species and habitats are 68% and 80% unfavourable, respectively (Figure 5.1; Figure 5.3). These assessments apply to the whole country.

The aim of protected areas is to provide the various species with a refuge. They also act as a biodiversity reservoir for the colonisation of neighbouring ecosystems and even of remote ecosystems for the benefit of migratory species. However, they have obviously not succeeded in halting the decline in biodiversity.



Ascertaining the reasons for this lack of success may help point the way towards solutions or to prioritise actions that may have a domino effect from which biodiversity would benefit.

Luxembourg has not assessed the effectiveness and impact of individual protected areas nor of the network as regards threatened species and biodiversity in general. The country has few closed areas corresponding to the IUCN's strict conservation categories I and II. Despite its intensive land use, Luxembourg should make major efforts to establish strict conservation zones, first in agricultural environments and then in forests.

Biodiversity protection rests mainly on the Natura 2000 network, completed in 2018. The network groups multi-purpose areas where biodiversity protection has to coexist with socio-economic activities. It is therefore important to optimise these sites through (i) the implementation by the steering committees of management plans adapted to each of these sites and including precise objectives and targets, (ii) a system of accountability to local stakeholders, and (iii) regular assessments of the effectiveness of the measures implemented at each site. The management plans may also include steps to restore degraded sites and reintroduce species. Where appropriate, the plans could also include light infrastructure to enable the public to connect with nature and to better appreciate its value and importance.

This network of paramount importance to the country, will however only be able to make a tangible contribution to conservation if the biological connectivity between the different sites is ensured. This connectivity must be completed by setting up terrestrial and aquatic biological corridors. It must also provide passages to facilitate the crossing of transport infrastructure. In addition, for connectivity to be optimal, it must be based on sites of ecological quality, and where appropriate include sites restored in the case of biological degradation.

### ***Available information and data***

Biodiversity management and conservation must be based on information and data that incorporate multiple parameters. The establishment of a biodiversity surveillance system co-ordinated by the Luxembourg Institute of Science and Technology (LIST) in 2008 was a considerable step forward (Box 5.1). Its main purpose is to meet the reporting requirements of the Birds and Habitats Directives, under Article 17 of the Habitats Directive.

It is essential that the various geographical databases are integrated and interoperable to ensure data can be accessed directly and are continuously updated. This is especially true for data from the Ministry responsible for environmental matters, the National Museum of Natural History (MNHN), the Nature and Forest Agency (ANF), Water Management Agency (AGE), the Administration of Technical Agricultural Services (ASTA), the Department of Spatial Planning and Development, and the Land Registry and Topography Administration.

The MNHN and its "Recorder" database are recognised as the central databank for species observations. For the aquatic environment, the AGE centralises information concerning surface water, groundwater, chemical and biophysical characteristics, and aquatic fauna and flora.

The ANF has a centralised database for the many players involved in managing natural areas, such as municipalities, consultancies, non-governmental organisations (NGOs), etc. All data that are essential for managing protected areas, including information about "biodiversity" programmes, agreements with private individuals, practical maintenance operations, grants, and management units are available for consultation. They may even be encoded by the various site managers.

### Box 5.1. The Luxembourg Institute of Science and Technology

The Luxembourg Institute of Science and Technology (LIST), set up in 2014, is a research and technology body active in the fields of materials, the environment and information technology. LIST reports to the Ministry of Higher Education and Research. It houses the Observatory for Climate and Environment that compiles data on the environment for research and management of development projects, and to comply with the country's legal obligations, particularly those of the European Union regarding water management, the climate, air quality and biodiversity.

The Observatory runs a dense network of hydroclimatological measures in co-operation with the Water Management Administration and the Administration of Technical Agricultural Services. To that end, it operates several stations to measure hydrological and climate changes that might affect the country. The Observatory participates in the international classification of soils through the World Reference Base. It also carries out spectral laboratory profiles in the field (soil, vegetation, artificial surfaces) and undertakes small- and large-scale airborne thermal mapping (back-up for scientific projects in precision farming, vegetation stress and disease detection). In the field of air quality, the Observatory carries out applied research and provides services to better understand air pollution and thermal stress for public health.

On behalf of the Ministry of Environment, Climate and Sustainable Development, the Observatory implements and maintains a programme of biodiversity surveillance in Luxembourg that focuses on species of European interest. This includes preparations for the drafting of European reports on species conservation status and the production of habitat quality models. The Observatory also works on drawing up new protocols for species surveillance, species distribution modelling, diagnosis and the designing of conservation strategies. Lastly, the Institute has set up various means to communicate the results of its research, inventories and analyses to stakeholders.

Source: <https://www.list.lu/fr/>.

With regard to the compensation pools, Luxembourg has developed an online application for preparing ecological balance sheets based on the quantification system mentioned above. This application provides a single, compulsory tool for preparing such balances for compensation and development projects. It is made available to all the players concerned (ANF, biological stations, consultancies). In addition, a computer registry of compensation measures will be developed.

### 5.3. Policy objectives, institutional co-operation, governance and integration

The national objectives set in the second National Plan for Nature Conservation (PNPN2) are geared to the objectives of the European Union's 2020 biodiversity strategy that aims, in particular, to halt the decline in biodiversity by 2020. These objectives also match the Aichi targets of the Convention on Biological Diversity for 2020. In addition, the country has committed to put in place the requisite measures to help attain the UN Sustainable Development Goals (2015-30), particularly goals 14 and 15 on marine and terrestrial ecosystems.

## ***Institutional, legislative, financial and strategic framework for the conservation and reasonable use of biodiversity and the management of protected areas***

### *Institutional framework*

The Ministry of Environment, Climate and Sustainable Development (MECDD) fulfils a political and administrative role. This involves drawing up, implementing, co-ordinating and overseeing decisions related to the natural environment. It also plays a pivotal role in all endeavours aimed at incorporating nature protection principles in other fields and sectors, especially as the direct interface with the ministries and administrations concerned. Putting policy decisions and guidelines on nature protection into practice is mainly the task of the ANF and AGE. They work in collaboration with the MNHN, municipality associations, NGOs and foundations working in the field of nature protection, universities, research centres and the ASTA. The wide range of players involved ensures that certain projects and studies are decentralised, in particular at the municipal level.

Since 1965, the ANF has been responsible for nature protection. The agency is also responsible for the management of forests covered by the forestry scheme (state, municipalities, public institutions), assistance for and surveillance of private forests, and hunting. It is under the authority of the MECDD. The AGE, also under MECDD authority, is responsible for nature protection in respect of water courses (renaturation, ecological continuity, restoration of banks), protection of aquatic species and fisheries.

The advisory bodies are the Nature and Natural Resources Protection Board (CSPN) and, to a lesser extent, the Hunting Board (CSC) and the Fisheries Board (CSP). A number of municipalities have set up advisory committees on the environment.

The Natural Environment Observatory, set up in 2005, monitors, assesses and guides national policy. It consists of representatives of the MECDD, ANF, AGE, MNHN, municipalities and municipal unions, as well as associations in the field of protection of nature and of the environment. The Observatory helps the environment minister and its partners, especially municipalities and municipal unions, to define the guidelines and content of nature protection policy and assess the conservation status of the natural environment in Luxembourg. It plays a key part in the PNP by monitoring its implementation. To carry out these duties, the Observatory depends on a scientific analysis of the data managed by the MNHN, the ANF and the AGE. The LIST is also contributing to this exercise.

### *Legislative framework*

Protecting nature is a long-standing concern in Luxembourg. The first law, adopted in 1885, aimed at regulating hunting and game management. A number of laws and regulations were subsequently adopted. These include the law on nature protection (1965) and the law on protection of nature and natural resources (2004). The latter provides for the minister to establish a national plan for nature conservation and revise it every five years (Articles 51 and 52). In 2018, Luxembourg approved a major amendment to the above-mentioned 2004 law. It specifies the terms and conditions for authorising construction and for granting compensation where protected biotopes, habitats of Community interest and habitats of species of Community interest assessed as unfavourable are reduced or destroyed. This compensation system is based on a calculation of ecopoints deriving from an ecological review. This system is akin to the polluter-pays principle.

### *Financial framework*

The Environmental Protection Fund (FPE) is financed by annual budget allocations and revenue from ecopoints. To protect the natural environment, the FPE provides aid to municipalities and public service associations for development work, study costs and land acquisitions to set up the network of protected

areas and to ensure the ecological coherence of the network. The Water Management Fund can finance up to 100% of the costs of watercourse renaturation.

The MECDD initiates "biodiversity" contracts that promote biodiversity in agricultural areas on top of the agri-environmental measures financed by the Ministry of Agriculture. The MECDD also offers support to preserve biodiversity in forested areas and to improve the natural environment.

A Game Fund, financed primarily by a levy on hunting permits, is intended to increase game stocks. But the fund has not paid out any grants for several years. A Special Hunting Fund, also financed by a levy on hunting permits, is intended to provide compensation for harvests damaged by game. Its annual outlays are around EUR 300 000. A Fisheries Fund, financed by a tax on fishing permits, supports the re-stocking and development of fish habitats.

The major Community financial instruments such as the European Regional Development Fund (ERDF) and the European Agricultural Fund for Rural Development (EAFRD), as well as the LIFE+ programme, are available and contribute to various projects. Luxembourg has received EAFRD funding of EUR 0.1 billion for 2014-20.

### *Strategic framework*

The PNP2, adopted by the government for 2017-21, includes the National Biodiversity Strategy. The PNP2 puts forward detailed measures in the fields of biodiversity and natural resources. It sets out the objectives of the strategy and the planned measures. The national strategy keeps with the EU's strategy on biodiversity. It thus aims to set up green infrastructure; restore ecosystems and their services; and bring about a favourable conservation status for protected species and habitats. It is also the main implementing instrument for Agenda 2030, particularly objectives 14 and 15.

The aims of the PNP2 are to:

- Fully implement the legislation on biodiversity protection
- Preserve and re-establish ecosystems and the services they deliver
- Considerably reduce land consumption and landscape fragmentation
- Strengthen the contribution of agriculture and forestry to maintaining and improving biodiversity
- Combat invasive alien species
- Raise public awareness
- Contribute to halt biodiversity loss throughout the world.

According to the 2012 assessment of the PNP1, the threats and pressures weighing on biodiversity and the ecosystems were extending widely to cover the whole country. This was occurring despite proven efforts and measures put into effect, although they were often localised and limited in scope. The PNP1 aimed to halt biodiversity loss by 2010.

As a consequence, measures under the second plan aim to increase considerably the effectiveness of the PNP1 on the ground and to produce a greater degree of accomplishment and success. Compared to the first plan, the second has the advantage of having seven objectives and 27 actions. It includes measurement indicators that are more precise over time, making it easier to assess results.

### ***Opportunities to harmonise national and municipal policies for the management of threatened species***

Effective governance over environmental legislation and policies, including policies on biodiversity in the EU and in the country, calls for several measures. These comprise a proper institutional framework; consistency and co-ordination of policies; the application of legal and non-legal instruments; and a

commitment to non-governmental stakeholders. Successful implementation also depends on central and municipal administrations carrying through legislative and administrative tasks. These include adoption of sound implementing provisions and co-ordinated action to live up to biodiversity conservation objectives.

The Act of 3 August 2005 on the partnership between municipal unions and the state provides a legal framework for decentralising nature conservation at the municipal level and for state cofinancing of projects carried out by municipal associations for nature conservation. Thus, municipalities promote at the local level, the preservation of biodiversity, the conservation and restoration of natural landscapes, and the ecological coherence. They help raise public awareness in favour of nature conservation, and can delegate this mission to an association of municipalities.

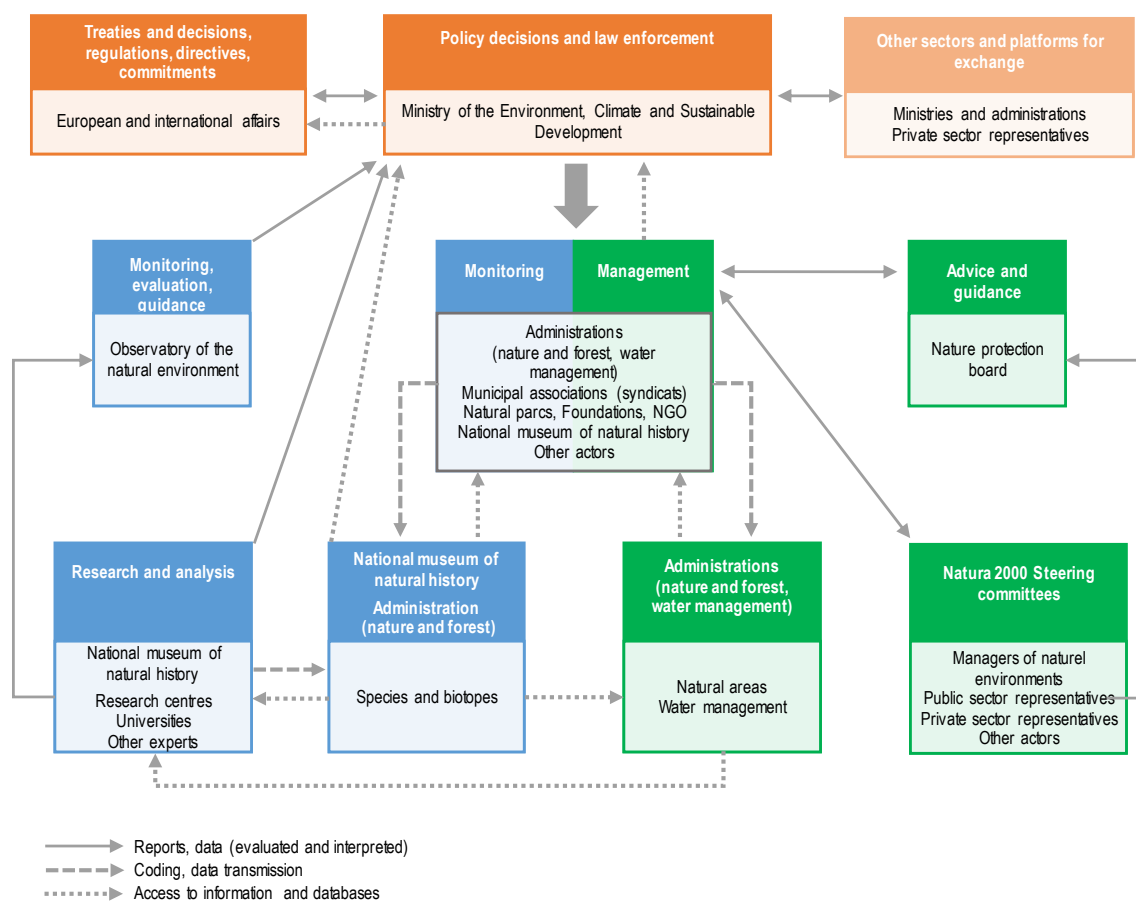
Action laid down in the PNP1 to speed up the adherence of municipalities to biological stations has been a great success. There are six biological stations, which transpose nature conservation plans into the partner municipalities. Biological stations cover approximately 75% of the national territory, and the area covered increased from 1 400 to 1 900 km<sup>2</sup> between 2011 and 2016. The municipalities are grouped together in intermunicipal associations in the form of biological stations (Sicona West, Sicona Centre, SIAS, Upper Sûre Nature Park, Our Nature Park and Mullerthal Nature Park). These operate in the field of nature conservation through contracts with the ministry responsible for nature conservation. A seventh station (Biological Station East) is being set up. By 2021, all municipalities under contract, which are not members of an intermunicipal association, will have to be affiliated to an intermunicipal association working in the field of nature conservation to benefit from the same subsidies as municipalities that are members of an association.

### ***Institutional capacities and vertical and horizontal co-ordination mechanisms***

The Nature and Natural Resources Protection Board (CSPN) is the government's advisory body for all large-scale projects relating to nature conservation. Primarily it advises on draft Natura 2000 management plans and applications for the classification of protected areas of national interest, and oversees their implementation. On the ground, many actors are involved in nature protection with often complementary activities and multiple data flows and exchanges. (Figure 5.5).

The pivotal element in horizontal and vertical co-ordination is the steering committee. The Natura 2000 steering committees aim mainly to establish a dynamic and proactive regional platform. Such platforms engage local, municipal and regional players more effectively in maintaining biodiversity while considering environmental, economic, social, and cultural and regional requirements. A Natura 2000 steering committee enables more effective co-ordination of actions taken by local players with those of national administrations, and facilitates the implementation of contractual measures. For example, the Oesling steering committee is made up of representatives of ministries and regional departments of national administrations, the 14 municipalities concerned, the Our Nature Park, farmers and farming advisers of the Chamber of Agriculture and of CONVIS s.c. (an agricultural co-operative); the foresters' group; the Our Electricity Company; the regional section of Nature&Environment and the Ecological Movement; the not-for-profit association *Frënn vun der Schlënnner*; and the Regional Tourist Office for the Luxembourg Ardennes.

Figure 5.5. Nature conservation involves many actors and information flows



Source: <https://environnement.public.lu/dam-assets/documents/natur/general/pnpr2.pdf>.

### **Integration of biodiversity into sectors of the economy**

As policies for the protection and management of water resources are closely linked to biodiversity protection and conservation and to climate change adaptation, the different actors are consulted when drawing up of plans and strategies. Development of the management plan for hydrographic districts and the flood risk management plan, for example, involved consultations with the ANF, the AGE and the MECDD. Similarly, measures included in water management plans have been integrated into the PNP2, as well as into the Natura 2000 management plans. The strategy for adapting to the effects of climate change also refers to the water and nature management plans. Lastly, every watercourse renaturation project, essential to achieve water and biodiversity objectives, is drawn up in close collaboration with the ANF, the AGE and the MECDD. Such projects are essential for achieving both water and biodiversity objectives. Regular meetings of the “renaturation group” are held to co-ordinate the measures.

Notwithstanding these consultation efforts, biodiversity and ecosystem conservation is still too often considered in isolation and seen as being in direct conflict with other areas of activity. Consequently, various measures have been put forward in five sectors where the integration of biodiversity principles is a priority: urban planning and transportation, land-use planning, farming and rural development, forestry and water management.

## ***Role of NGOs and the private sector in the management and financing of programmes relating to biodiversity in and outside protected areas***

NGOs play an important role in the programmes relating to biodiversity conservation. Through the CSPN, they are involved during the planning of major policy orientations such as the drafting of the PNP2. In addition, they are involved in the implementation of the resulting management plans, such as the Natura 2000 management plans through the steering committees. NGO representatives are also on the “managing committee”, with responsibilities in the area of compensation measures. Stakeholder delegates are also members of the Natural Environment Observatory.

Stakeholders further take part in the Sustainable Development Board (CSDD), a forum for discussion of sustainable development. The CSDD proposes research and studies in all fields related to sustainable development, and sets up links with similar committees in EU member countries. In addition, it fosters the widest possible involvement by public and private bodies and citizens in the achievement of these objectives.

### **5.4. Instruments for the protection of natural areas and threatened species and for the sustainable use of biodiversity**

#### ***Assessing the contribution of economic methods and instruments to biodiversity conservation***

Economic instruments such as taxes, subsidies, licences, tax charges and economic compensations are not often used in Luxembourg. Environmental tax receipts were at 5% of total receipts from taxes and social security contributions, while the average for OECD Europe was more than 6% (Chapter 3). Such instruments can be effective and efficient, but often need information and awareness-raising campaigns to be accepted by the public or the groups concerned. The PNP2 provides for new economic instruments, but the delay in setting them up has meant they have not yet lived up to their promise.

##### *Biodiversity contracts*

Luxembourg uses the biodiversity contract as one economic instrument to bring about a favourable or improved status for two-thirds of natural habitats and thus respond to the EU’s “nature” directives. This contract system aims at the conservation and ecological management of land that hosts species or habitats of particular environmental interest. The instrument was put in place in 2002, has a budget of EUR 10.5 million (2017-21) and applies to more than 5 000 ha with a growing trend.

A programme of aid for the forest environment, covering half of the country, is available. In tandem with it, major efforts are being put into raising awareness and providing technical training. The aim is also to improve biodiversity and re-establish the ecosystem services that forests deliver.

##### *Acquisition of land*

The acquisition of land for nature conservation by public bodies such as the state, municipalities or public-interest foundations is often the only way of securing permanent protection for a rare biotope or one under long-term threat. From a financial point of view, the acquisition of stocks is, despite the high price of land, often more advantageous than paying long-term compensation. The PNP2 aims at acquiring 50% of the land included in the protected areas and 100% of the land in their core areas. It also seeks to encourage such acquisitions and to support municipalities and foundations in implementing their action plans. In its assessment of the PNP1, the Natural Environment Observatory emphasised that scant use was made of this measure. For the period covered by the PNP2, the budget for this measure is EUR 4.8 million.

Given the high price of land, Luxembourg could consider increasing that budget. It could levy a “biodiversity - ecosystem service” tax on real-estate transactions in conjunction with corporate sponsorship for the funding of such acquisitions.

### *Compensation pools*

The Natural Environment Observatory has devised a system to quantify the environmental value of biotopes and habitats (ecopoints). The system is a way of assessing compensation for losses from the setting up of a project likely to affect natural heritage. Compensation pools at the national and regional levels act as land reserves with high potential for environmental improvement. This enables compensation for projects that have led to deterioration of the natural heritage. A list has been set up to record the measures carried out in the compensation pools and to manage the allocation of these measures for future projects. Municipalities or municipal associations set up and manage the regional compensation pools. The estimate for purchases and management of land to constitute compensation pools stands at EUR 25 million (2017-21).

Luxembourg should take steps to prevent biodiversity loss caused by undue compensation by following best practice (OECD, 2016). It should ensure that compensation is not considered until after the crucial avoidance and reduction stages have been completed. One way to maximize the benefits of offsets would be to allocate them to affected ecosystems. Luxembourg could also co-operate with neighbouring countries and promote the application of a compensation system in other countries.

### ***Integrating protected areas and threatened species in the process of assessing impact on the environment and in land-use planning***

Environmental impact assessment (EIA) is an important tool for incorporating biodiversity conservation concerns into decision-making on development policies and programmes. EIA is applied during project planning to determine potential impacts and to make changes that eliminate those impacts or make them acceptable.

This approach is also a way of applying the precautionary principle to the environment. This principle, governed by a European directive adopted in 1985 and frequently amended, was transposed into national legislation by the 2018 Environmental Impact Assessment Act. This transposition came late compared with other countries; swifter transposition might have prevented any negative impact on biodiversity such as the fragmentation or degradation of important biotopes.

EIA incorporates the requirements of the Habitats and Birds Directives. Thus, any project likely to have a significant impact on a protected area or on a species of Community interest or threatened (Natura 2000 network) is subject to special assessment. This focuses on the conservation objectives defined for the protected area of Community interest concerned. The MECDD will take care, through its various opinions and advice to the project owner, to ensure the best possible co-ordination between the “Natura 2000” assessment and the EIA.

### ***Integrating biodiversity in other sectors and policies***

#### *Agriculture and forestry*

Intensive farming and land abandonment are two key factors in the decrease of biodiversity in Luxembourg. Agriculture, which manages 54% of the national territory, has the highest potential for nature conservation and protection through changes in agricultural practices, including use of fewer inputs.

The PNP2 sets out to extend the cultivated areas in fields and meadows, arable land and permanent crops covered by biodiversity conservation measures to at least 10% by 2020. Most of the diffuse pollution



in Luxembourg consists of nutrients and pesticides from farming and from public and private domains. The PNPN2 also seeks to eliminate subsidies harmful to biodiversity by 2020. Intensive farming still has a negative effect on the natural environment, which is primarily owing to the difficulty of eliminating subsidies harmful to the environment. The lack of available land for establishing green and blue belts limits the success of the measures in the plan.

Since 2009, Luxembourg promotes organic farming through a dedicated national plan. In 2017, there were 132 producers (4.8% of Luxembourg farmers) engaged in organic farming, occupying 5 446 ha, or 4.15% of farm land in the country. The aim is to increase the area to 20% by 2025 (MAVDR, 2020; MAVPC, 2019). Since 2007, the Institute for Organic Agriculture Luxembourg has been working to improve and provide support for organic farming through research, advice and knowledge transfer. The Institute helps farmers transition to organic or biodynamic farming.

Luxembourg differs from most other EU member states in having a twofold aid system. It encompasses on the one hand, agri-environmental measures (AEMs) cofinanced by the EU's ERDF fund, and on the other hand a national aid scheme supports biodiversity. AEMs aim to reduce environmental impact in the broad sense (reduction of inputs, reduction of emissions, etc.) through extensification of farming practices. The national biodiversity aid scheme is aimed at the conservation and environmental management of land that hosts species or habitats of special environmental interest.

The area of agricultural land under contract is the highest in the EU, although this is due to the high participation (89% of agricultural land) in the landscape maintenance premium. This premium, which is part of the AEMs, is aimed at basic extensification but without having an impact on biodiversity. Luxembourg does not implement any LIFE integrated projects.

Approximately 90 000 ha, or more than one-third of the territory of the Grand Duchy, is under forest; private forests account for 54% of Luxembourg's forests. Forests, the ecosystem least affected by economic development, host a considerable number of species and habitats and provide citizens with the greatest number of ecosystem services. However, their state of health has steadily deteriorated over the past 30 years. They are being fragmented by channels of communication and urbanisation; they are affected by air pollution and climate change; and, lastly, they are old.

To meet the objective of sustainable forest management, the government has launched a review of forestry law. It aims to draw up, by 2020, sustainable forest management plans for all publicly owned forests and for privately owned forests exceeding 10 ha. It has set up a financial aid system that promotes the improvement and strengthening of forest ecosystems. A cluster innovation programme for woods set up in 2016 contributes to the more effective local and regional upgrading of woods and acts as a model of the circular economy.

Economic development has put enormous pressure on aquatic ecosystems through high demand for drinking water and diffuse pollution of watercourses. Action to restore sound environmental status is underway; these efforts will, nevertheless, have to be stepped up. Close collaboration between the water management sector and nature conservation is crucial to incorporate all the objectives into the various types of management plans, especially for river basins.

### *Urbanisation and infrastructure*

Economic and population growth in the country have led to a huge expansion of urbanisation and infrastructure development at the expense of biodiversity. Most jobs are in the territory of the capital city and the surrounding municipalities. Meanwhile, housing has been displaced to the periphery of urban conglomerations and to rural areas following the boom in housing prices. Moreover, nearly 200 000 workers come from surrounding countries and cross the borders every day. Non-built-up areas, such as farmland and woodlands, shrank by 1 386 ha at the national level between 1999 and 2007.

Various policies have to be articulated to reverse this trend, including those relating to housing, public transport, land management and land-use planning, construction and taxation. Governance is a major challenge, particularly in a country where space is in short supply and where the preservation of ecosystems is important because of their vital services. The PNP2 provides for integrating biodiversity objectives and promoting green infrastructure that can deliver different services to urban areas and their inhabitants.

### ***Assessing the application of regulations on biodiversity protection***

Responsibility for detecting environmental infringements lies with the Grand-Ducal Police, as well as with officers of the ANF, AGE and the Customs and Excise Agency.

The low number of infringement proceedings and complaints or petitions seems to reflect an effective approach to the protection of human health and the environment. The resources allocated to compliance assurance are however modest. Directives are generally transposed in good time; compliance checks normally identify only minor problems. Cases of improper implementation are rare (Chapter 2).

The PNP2 provides for a Grand-Ducal regulation to determine the implementing rules and set out a catalogue of infringements according to the various amounts of tax to be levied. A working group will draw up a strategy paper and a training programme for the prosecution of environmental infringements. It will consider whether agencies that detect infringements and courts that conduct prosecutions have adequate powers. If appropriate, the working group will recommend deterrence and consistent prosecution for infringements to ensure adherence to environmental standards.

### ***Investment in environmental infrastructure and the rehabilitation of degraded ecosystems***

Luxembourg is the most fragmented country in Europe; the built surface doubled between 1960 and the present day. The PNP2 sets out to protect, conserve and rebuild land and water-borne migration corridors that are affected by urbanisation and habitat fragmentation. It also includes programmes for the rehabilitation of 15% of wetland areas, semi-open countryside and dry grasslands, among other things.

There is green infrastructure on a local scale: it includes green areas alongside transport infrastructure and in public squares, parks, streams, woods to provide wildlife crossings and fish ladders. On the regional or national scale, green infrastructure consists of river basins, of forests of high natural value such as the protected areas network and of all components important for ecological connectivity.

The PNP2 has detailed plans for restoration, renaturation work, acquisitions and defragmentation of habitats. Efforts to rehabilitate and restore habitats are planned as long-term back-up for conservation. The restoration of a gravel pit in the alluvial soils of the Moselle is a striking example of the successful rehabilitation of degraded terrain. The zone concerned is now a Ramsar zone, a wetland of international importance (Box 5.2).

Efforts began in 2017 to incorporate biodiversity into public-sector construction and to rehabilitate the Alzette. These projects, although coming late, are also becoming increasingly important in the context of climate change adaptation strategies.

### Box 5.2. Haff Réimech: Rehabilitation of a site for biodiversity and for the people of Luxembourg

Haff Réimech is an eloquent example of how the restoration of a degraded site can help protect and even increase biodiversity.

For nearly 20 years, sand and gravel have been extracted from the alluvial soil of the Moselle near Remerschen. These operations left depressions of an average depth of 5 m. These were gradually filled with water from underground springs and runoff from the vineyards and other surrounding areas. As with all gravel pits, the water that accumulates is stagnant and has little attraction for fauna and flora. It is often loaded with plant protection residues and agricultural fertilisers, and the absence of abundant aquatic vegetation often prevents the degradation of these pollutants. In addition, the banks are steep and do not provide a good habitat for fish and amphibians.

The partial closure of the sand pits at the end of the 1960s triggered the preparation of a project to turn the ponds into a 100-hectare natural area and recreational zone, the “*Haff Réimech*”. Work has been undertaken to reduce the slope of the banks, replant the perimeter of the ponds, reduce their depth at certain points and reforest some sections. The biotope is made up of about forty ponds often bordered by reed beds and marshland. A welcome centre (the *Biodiversum*), a discovery trail and many observation points are available for visitors.

The natural area *Haff Réimech* was classified as a national nature reserve in 1998. It is part of the European Natura 2000 network, and on the list of areas of international importance protected under the Ramsar Convention. It is the most species-rich wetland in Luxembourg: on 0.1% of the total surface area of the country, 76% of the bird species spotted in Luxembourg have been observed there. It is an important stop-over point for many protected bird species as they migrate.

The *Biodiversum* was opened in 2016; it describes the development of the Moselle valley and the importance of biodiversity through the ages. The centre is heated using geothermal energy. Its architecture is remarkable: made entirely of wood, it has the shape of an upside-down boat hull. Is the message that by informing people, biodiversity will be preserved, as with Noah’s Ark? The use of wood, a renewable material that captures carbon from the atmosphere, also conveys another message: to consider using wood for construction in the fight against climate change.

The welcome centre plays its role well in raising awareness of biodiversity conservation and of the problems that society faces. It is also proof that efforts to restore the environment can be successful. The *Biodiversum* is part of a network of five nature and forest centres, all located in protected areas and home to species that are often threatened.

Source: [https://environnement.public.lu/fr/natur-erlieuwen/centres-d\\_accueil/biodiversum.html](https://environnement.public.lu/fr/natur-erlieuwen/centres-d_accueil/biodiversum.html).

### **Assessment of the effectiveness and efficiency of policy instruments**

The PNP1 (2007-11) included two strategic objectives:

- to eradicate biodiversity loss, particularly by maintaining and re-establishing favourable conservation status for threatened species and habitats of international or Community interest
- to preserve and re-establish ecosystem services and processes at the countryside and national levels.

An assessment by the Natural Environment Observatory and submitted in 2017 (PNP2) concluded that a number of measures, even some considered as priorities, had not been carried out in full, or even begun. Biodiversity decline had not been successfully halted; the conservation status of a certain part of the threatened species and habitats was far from favourable. The Observatory identified both strong and weak points.

**Strong points:**

- Notable progress had been made in the legislative framework.
- Monitoring of species and habitats had been initiated in 2009.
- A biotope register had been set up.
- Action plans had been drawn up.
- The threshold of 5 000 ha managed under biodiversity contracts had been reached.

**Weak points:**

- The amount of land acquired for nature conservation was negligible.
- Work on the renaturation of watercourses had been delayed.
- There was reluctance to launch the premium for landscape maintenance.
- Procedures for designating national protected areas were slow.
- There was little sign of progress in establishing total coverage of the territory by biological stations.

The PNPN2 was based on the Observatory's findings, consultation with stakeholders and the objectives of the European Union's Biodiversity 2020 strategy covering 2011-20. It was officially adopted in 2017, i.e. six years after the end of the PNPN1. One would have expected a plan to be adopted at the end of the PNPN1 as the law provides. Moreover, the PNPN1 assessment might better have been carried out before the plan ended to avoid interrupting the positive actions and to correct the less effective ones.

In 2018, a group of NGOs assessed implementation of the Birds and Habitats Directives in 18 EU countries (BirdLife International et al., 2018). put forward the following observations:

**Strong points:**

- management of the protected sites
- species protection
- avoidance of site deterioration and species disturbance; implementation of appropriate assessments
- landscape connectivity
- financing and resources
- surveillance of habitats and species
- non-native species
- stakeholder commitment, public involvement and communication.

BirdLife International et al. (2018) also stressed the need to implement the directives in practical terms.

A report to the European Commission under Article 17 of the Habitats Directive and Article 12 of the Birds Directive was submitted in 2019 (EEA, 2019b).

### ***International co-operation and development aid granted for biodiversity conservation***

Luxembourg has signed and ratified nearly all the Multilateral Environmental Agreements, including the Convention on Biological Diversity; the Ramsar Convention on Wetlands (Luxembourg has designated two wetlands of international importance); the Bonn Convention on the Conservation of Migratory Species of Wild Animals; the Agreement on the Conservation of African-Eurasian Migratory Waterbirds; the Agreement on the Conservation of Populations of European Bats; the Convention on International Trade in Endangered Species of Wild Fauna and Flora; the International Whaling Commission; the Berne Convention; and the OSPAR Convention.

In the PNP2, Luxembourg has committed to increase funding of projects beneficial to world biodiversity. This involves assessing the environmental impact of action likely to have a major impact on biodiversity internationally. In addition, biodiversity conservation will be factored into trade negotiations and discussions with third countries.

### ***Budgetary resources allocated to biodiversity conservation***

FPE-funded projects include the multiannual planning of expenditure on the PNP2. In 2018, the ANF's budget was EUR 42.8 million (0.28% of the ministry's budget). A substantial increase of EUR 94.6 million was made for implementation of the PNP2 (2017-21), including the compensation pools. Furthermore, incorporating nature conservation principles into sectors for which other ministries are responsible also entails cross-sector budget integration, thereby supporting budgets specifically targeting nature conservation.

**Table 5.1. Investment projects**

Year	Projects	Amounts (EUR)
2011	10	1 013 914
2012	17	3 264 042
2013	6	653 918
2014	40	4 130 742
2015	19	2 262 440
2016	59	3 184 857
2017	108	7 342 404
2018	273	21 769 920

Source: Ministry of the Environment, Climate and Sustainable Development (MECDD).

State participation in the funding of agreed projects relating to management and maintenance of the natural environment by the municipal sector stands at EUR 2.5 million.

## **5.5. Research, development and innovation**

The PNP2 aims to set up surveillance and monitoring to help fill a gap in the time series data on biodiversity. This task, entrusted to the LIST, fulfils reporting requirements to the EC under the Birds and Habitats Directives. In 2019, Luxembourg was to send EU authorities the latest observations from 2013-18. LIST also conducts research into natural resources, which includes natural disasters.

The MNHN also plays an important part in maintaining scientific collections and databases. It conducts research into all areas of the natural heritage as a contribution to its conservation. As Luxembourg's national node, it participates in the Global Biodiversity Information Facility, an international data structure that makes the data available on a single portal. The museum is also a partner of the Barcode of Life project, a database containing sequences of DNA references for every species on earth.

The Natural Environment Observatory monitors the PNP2. It conducts research into various aspects of biodiversity conservation. Every two years, it draws up a detailed report on environmental policy and implementation of that policy at the governmental and municipal levels.

The PNP2 provides for a major research project to expand knowledge of the status of ecosystems (particularly the Natura 2000 network) and of the services they deliver. This new knowledge will be used to upgrade the socio-economic value of ecosystem services by 2020.

Luxembourg has made remarkable progress on research into the natural environment since the 2008 review. There was a need to catch up, and the projects run by the various research institutions need to be continued. However, in a global context in which ecosystems are increasingly linked and threatened by systemic risks such as climate change and biodiversity loss, it would be appropriate to undertake research in a different direction. These new research threads would analyse how the effect of climate change, combined with the accelerated decline in biodiversity (Chapter 1), may affect the environment, society and economy of Luxembourg. Such studies would make it possible to develop approaches to strengthen the country's resilience in the face of these systemic challenges. It would also enable the setting up of green infrastructure to adapt the natural environment to compensate for the deficiencies of an environment increasingly transformed by our mode of development. This forward-looking approach is a vital component of better risk management in the face of these systemic challenges.

## 5.6. Performance outlook

Luxembourg pursues an active nature protection and conservation policy and has made progress in implementing the recommendations of the latest OECD review. In particular, it has made progress in protecting specific sites including through the Natura 2000 network, as well as in the observation and restoration of ecosystems.

But despite an appropriate institutional, legislative, financial and strategic framework, progress has been slow. Concrete implementation on the ground or in the restoration of ecosystems has been delayed, and positive returns from Luxembourg's efforts have been slow to materialise. Pressures on biodiversity are high, with high degrees of soil artificialisation and habitat fragmentation. The objective set out in the PNPN1 (2007-11) to halt biodiversity decline was ambitious; it has not been achieved. The final assessment of the PNPN2 (2017-21) should produce the same result. The conservation status of species is mostly unfavourable. There has also been continuous degradation over the past four decades of biodiversity-rich habitats. Added to this are new issues: climate change and the appearance of invasive alien species that lead to a loss of natural capital and a reduction in its dividends – ecosystem services essential to the quality of human life.

To improve its performance, Luxembourg needs to implement interventions at a faster rate than the decline in biodiversity. It must complete implementation of the management plans for Natura 2000 sites and threatened species. It needs to make steering committees function effectively and provide them with adequate resources before the end of the PNPN2. It also needs to initiate preparation of the PNPN3 without delay. This third plan should be based on evaluations of the nature directives submitted to the EC in 2019 and on prospective scenarios of the impact of climate change and biodiversity decline on ecosystem services. It will also be necessary to integrate biodiversity issues fully into agricultural, land-use planning and other sectoral policies (climate, housing, transport, etc.) with good co-ordination between the national and local levels and a strong commitment from municipalities. This will have to go hand in hand with a review of the costs and benefits of the different economic instruments used both in biodiversity management and in sectoral activities with an impact on biodiversity (biodiversity contracts, ecopoints, agricultural support, etc.).

## Recommendations on biodiversity

### Accelerate the implementation of biodiversity conservation and natural habitat protection policies

- Promptly initiate the preparation of the National Plan for Nature Conservation for 2022-27 (PNPN3):
  - Maintain the objective of halting biodiversity decline, while specifying the indicators for species, habitat and ecosystem services.
  - For each objective, present targets that are measurable in real time, the necessary financial and human resources, and the timetable of steps and actions to be taken; make this information permanently accessible on the Internet page of the MECDD.
  - Ensure the effective collaboration of the ministries in charge of agriculture, infrastructure and transport, and stakeholder consultation.
- Set up a programme to improve the standing and appreciation of ecosystem services among the population, the farming and forestry sector, and the ministries concerned:
  - Ascertain the socio-economic motivations of the population with respect to ecosystem services, and evaluate the economic costs of the degradation of those services.
  - Include initiatives to raise awareness in urban and rural areas of the importance of easily perceptible ecosystem services such as preventing heat islands through green spaces, protecting water quality, pollination by insects, carbon dioxide fixation by forests, and reducing the scale of floods through marshes and natural aquatic environments in good ecological state.
  - Set up a “Biodiversity – Ecosystem Services Pact” modelled on the “Climate Pact” and include that measure, if appropriate, in the PNPN3.
  - Introduce a premium for ecosystem services provided by forest environments in favour of private forest owners.
- Complete implementation of the management plans for Natura 2000 sites and threatened species, and assign specific and measurable objectives to them:
  - Indicate what conservation measures or measures to rehabilitate degraded sites are required and prioritise interventions to increase biodiversity.
  - Increase the portion of Natura 2000 areas that are state-owned and develop long-term (25 years +) agreements with landowners or assign conservation easements; consider levying a “Biodiversity – Ecosystem Services” tax on land transactions and associate corporate sponsorship to finance these acquisitions and consider in exchange exemption from the payment of the property tax in Natura 2000 zones.
  - Prioritise new ecological connectivity corridors to be put in place and complete the corridors of primary importance before the end of the PNPN2.
- Increase the human and financial resources budget for implementing the PNPN2, developing the PNPN3 and, in particular, for accelerating implementation on the ground of the actions foreseen in these plans so as to balance strategic planning efforts with concrete achievements.

### Integration of biodiversity issues into sectoral policies

- Limit urban sprawl and habitat fragmentation by ensuring that land-use planning takes into account biodiversity, ecosystem services and the quality of life of citizens.

- Actively support the transition to organic farming and agroecology:
  - Value the products and behaviours of organic farmers, and establish a system of financial support for the production of ecosystem services, for the use of mechanical pest control to replace pesticide use and for crop rotation.
  - Continue the measures accompanying farmers in this transition (eco-counsellors).
  - Promote the establishment of organic farms near cities to reduce the harmful effect of pesticides on the population and increase accessibility to organic farming products.

### Contribution to the protection of regional and international biodiversity

- Increase Luxembourg's contribution to the protection of biodiversity at international level:
  - Co-operate with neighbouring countries and promote the application of an ecological compensation model in other countries.
  - Contribute to the protection of wintering habitats of bird species nesting in Luxembourg, which migrate to other countries for part of the year.
  - Further integrate the biodiversity component into development co-operation and make it a strategic focus.

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**From:**  
**OECD Environmental Performance Reviews:  
Luxembourg 2020**

**Access the complete publication at:**

<https://doi.org/10.1787/fd9f43e6-en>

**Please cite this chapter as:**

OECD (2021), "Biodiversity", in *OECD Environmental Performance Reviews: Luxembourg 2020*, OECD Publishing, Paris.

DOI: <https://doi.org/10.1787/004ba6db-en>

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