

4. Main threats to biodiversity

A summary of the main threats to biodiversity in Belgium is followed by a more in depth review of some of these threats, indicators at hand.

4.1. Overview

Proximate causes of biodiversity loss are mostly man-induced. **Land conversion** -whether for urban and industrial expansion, agriculture, infrastructure or tourism- is undoubtedly the main cause in our country. It results in the loss, degradation or fragmentation of habitats, and currently affects all habitat types.

In Flanders, Brussels and the marine area, changes in environmental quality due to **eutrophication** also impose a heavy pressure on the fauna and flora. This problem is probably less acute in Wallonia, but **pollution** (including eutrophication) is nevertheless considered as the second threat to biodiversity in the region.

The urban nature of the Brussels-Capital Region leads to specific problems, such as a very **high recreation pressure** on green areas. Cities are also important introduction points for alien species.

There is a growing attention to the issue of **invasive alien species**, especially given the rapid expansion of some introduced plants, fish, amphibians, reptiles, birds, and of invertebrates such as insects, crayfish, mussels, land slugs, etc.

Climate change is a growing concern. It already has a perceptible impact on biodiversity and notably on the geographical range, phenology and behaviour of organisms such as migrating birds and insects. It also exacerbates other threats to biodiversity, such as habitat fragmentation and biological invasions.

4.2. Loss, degradation and fragmentation of habitats

4.2.1. Flemish Region

Fragmentation of the territory

Because of increasing development and construction in Flanders, open space has become fragmented into small areas enclosed by other functions, such as business domains, roads and residential areas. To estimate this fragmentation, the number and size of open space fragments per square kilometer in Flanders is measured.

Less fragmented areas consist of a small number of fragments with a large average surface. Highly fragmented areas are characterized by a large number of fragments with a small average surface. The less fragmented areas in Flanders are located in the regions of the Westhoek, the Meetjesland and the Scheldt Polders. High fragmentation occurs mainly in and around cities, but also in the Flemish Diamond (densely populated and constructed area including the agglomerations around Brussels, Ghent, Antwerp and Leuven) and in the region between Roeselare and Kortrijk.

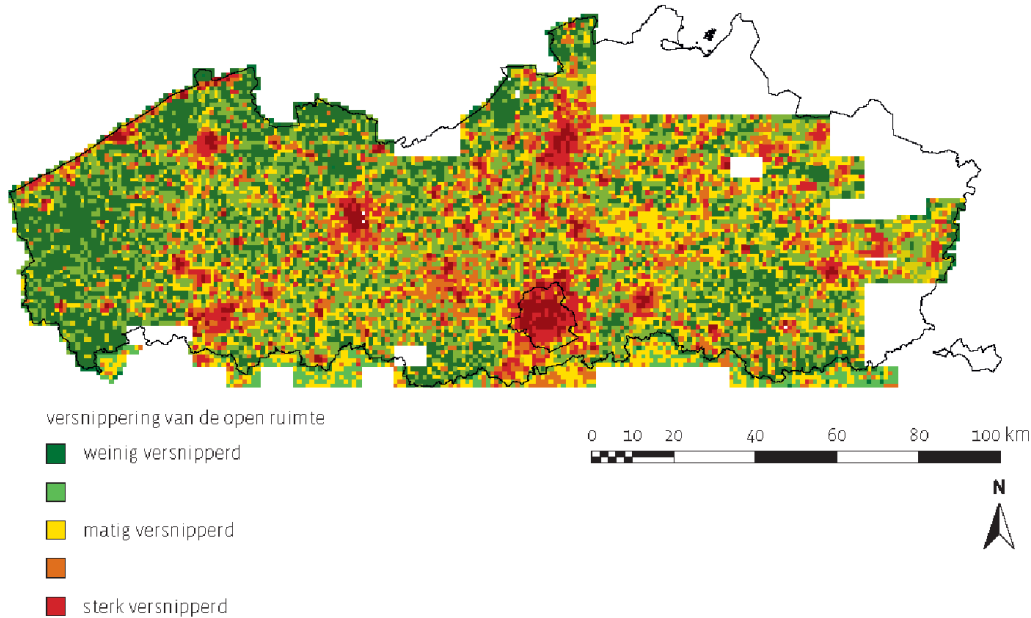


Figure 15. Fragmentation of the Flemish territory (Source: Environment Report based on data provided by the National Geographical Institute), <http://www.milieurapport.be/nl/feitencijfers/MIRA-T/milieuthemas/versnippering/versnippering-van-de-open-ruimte/versnippering-van-de-open-ruimte/>.

4.2.2. Walloon Region

Fragmentation of the territory

Land fragmentation contributes to the loss of biodiversity with:

- demographic consequences linked to the lack of habitat and/or food and confining species to restricted spaces, thereby limiting their chances of survival;
- genetic consequences linked to the isolation of populations and the subsequent genetic impoverishment that can eventually lead to the disappearance of certain species.

A recent study has provided an estimate of the level of land fragmentation in Wallonia based on an 'effective mesh size' (EMS) indicator. When taking all possible ecological obstacles into account, the sandy-loamy and loamy regions appear to be most fragmented, whereas the regions to the south of Condroz are less affected. Only 28% of the loamy region has an EMS greater than 10 ha, compared with more than 90% for Famenne, Belgian Lorraine and the Ardennes. This situation is basically a result of greater urban, economic and agricultural pressure to the north of the Sambre and Meuse river line.

LAND TAKE AND FRAGMENTATION OF HABITATS DIRECTLY CONDUCTIVE TO BIODIVERSITY

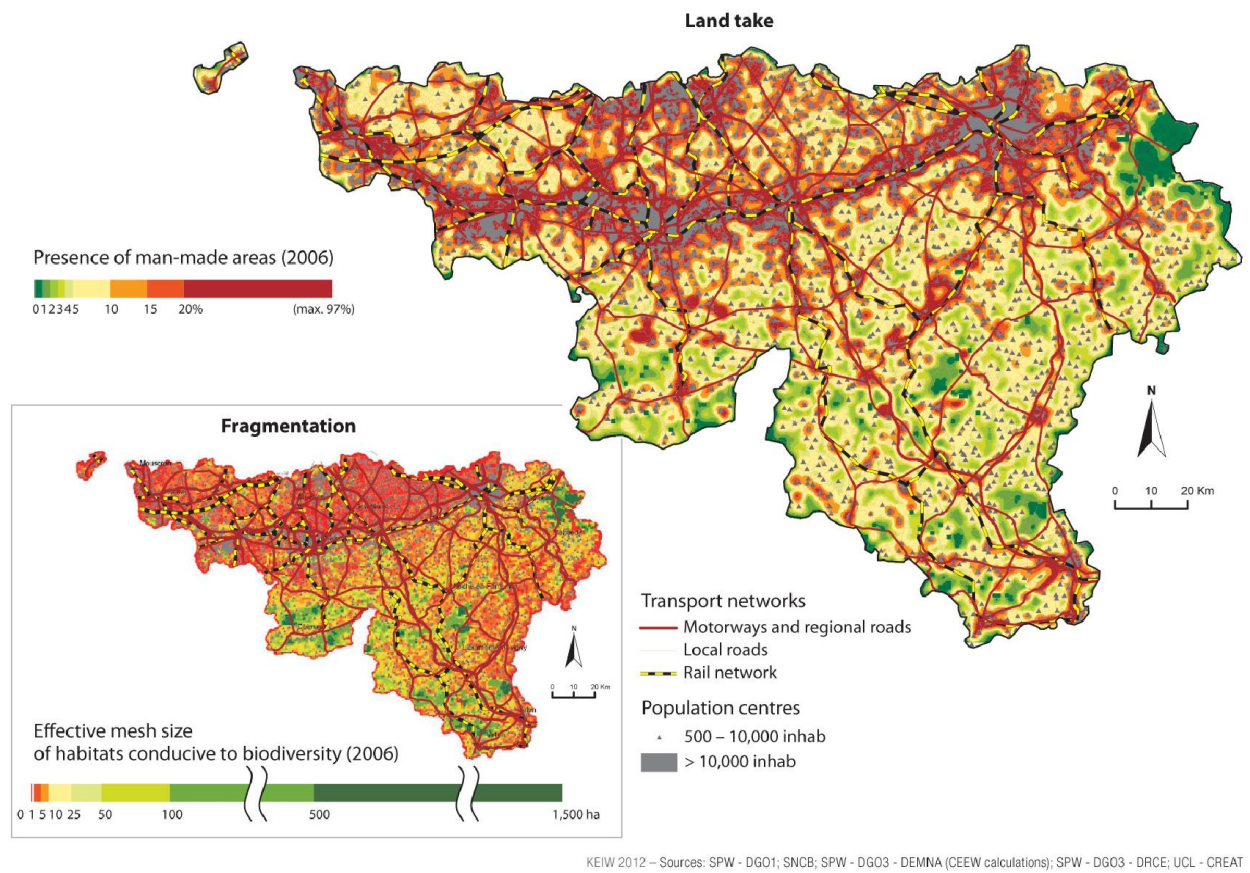


Figure 16. Fragmentation of the Walloon territory (Source: UCL-CREAT, DGO3 - DRCE (COSW 2006), Calculs CEEW), http://etat.environnement.wallonie.be/index.php?mact=tbe,m588bb,default,1&m588bbalias=Land-fragmentation_1&m588bbreturnid=46&page=46.

4.2.3. Brussels-Capital Region

Loss and fragmentation of open spaces

Brussels has a long extension history at the expense of the surrounding green spaces. In a first phase this extension resulted mainly in a shift of the soil affectation, for example the conversion of forests into agricultural zones. Urbanisation followed during a second phase. Towards the exterior, Brussels extended along the Senne and the canal Brussels-Charleroi. Towards the interior, Brussels was characterised by a second densification phase starting from the habitation centers. Both processes resulted in the loss of numerous natural and semi-natural green spaces. Another consequence of the urbanisation is the loss of the continuity and the disappearance of the connections between the enclosed green spaces. Patches of forests, grasslands and bogs are isolated due to the loss of the natural matrix. In an urban context, this fragmentation of habitats submits the fauna and flora to strong pressures. The presence of species in the landscape depends upon the availability of habitats with an adequate size and quality and upon the possibility to move from one zone to another following their needs (search for food, reproduction, migration, etc.).

The description of the green spaces in Brussels shows that the green spots are close to one another in the periphery. About 70% of the woodlands of at least 0.5 ha are situated less than 10 metres from each other. For open environments of the grassland type, this figure is somewhat inferior to 20%, but locally more pronounced such as in Neerpede where it reaches 50% for grasslands and fields. Initiatives to reduce the fragmentation are thus part of a realistic objective. Fig. 17 illustrates the fragmentation of the habitats by the dense network of roads and constructions. The green spaces are not very distant from one another but the road network limits significantly the dispersion of less mobile and of easily disturbed species.

CARTE III.1.2.1

Fragmentation des espaces verts par le bâti et le réseau de voiries



Source: Van de Voorde et al. (2010)

→ Exemple à hauteur du Campus de la Plaine à Auderghem

Figure 17. Example of fragmentation in the Brussels-Capital Region (Source: http://documentation.bruxellesenvironnement.be/documents/NARABRU_20120910_FR_150dpi.pdf).

Running and standing water elements in Brussels also suffer from fragmentation. One of the main problems of the aquatic network is the overarching of water courses as well as their connection to the sewage system, making the development of aquatic life impossible and creating impassable barriers for numerous species such as the amur bitterling, a Natura 2000-species.

The challenge will be to maintain the existing connections and to apply measures to reduce fragmentation in locations where these measures will be the most efficient.

4.2.4. Belgian part of the North Sea

Fragmentation of and activities in the seascape

The Belgian part of the North Sea welcomes an extraordinary biodiversity thanks to its location along migration routes, the combination of sandbanks, diverse soil types, tides and a varied water composition. The species and habitats of European importance are the best example of this. The sea and its biodiversity also deliver various products and services that form the basis of important economic activities.

Nevertheless, our lively coastal waters are under considerable pressure (fig. 18). Not only is the southern North Sea the busiest navigated region in the world, there are numerous other activities as well, such as fisheries, sand extraction, dredging, wind power generation, military operations and leisure activities, that put the marine environment under pressure: disturbances, pollution, bycatch, alien species, etc. Most of these pressures have a negative impact on the state of marine species and habitats.

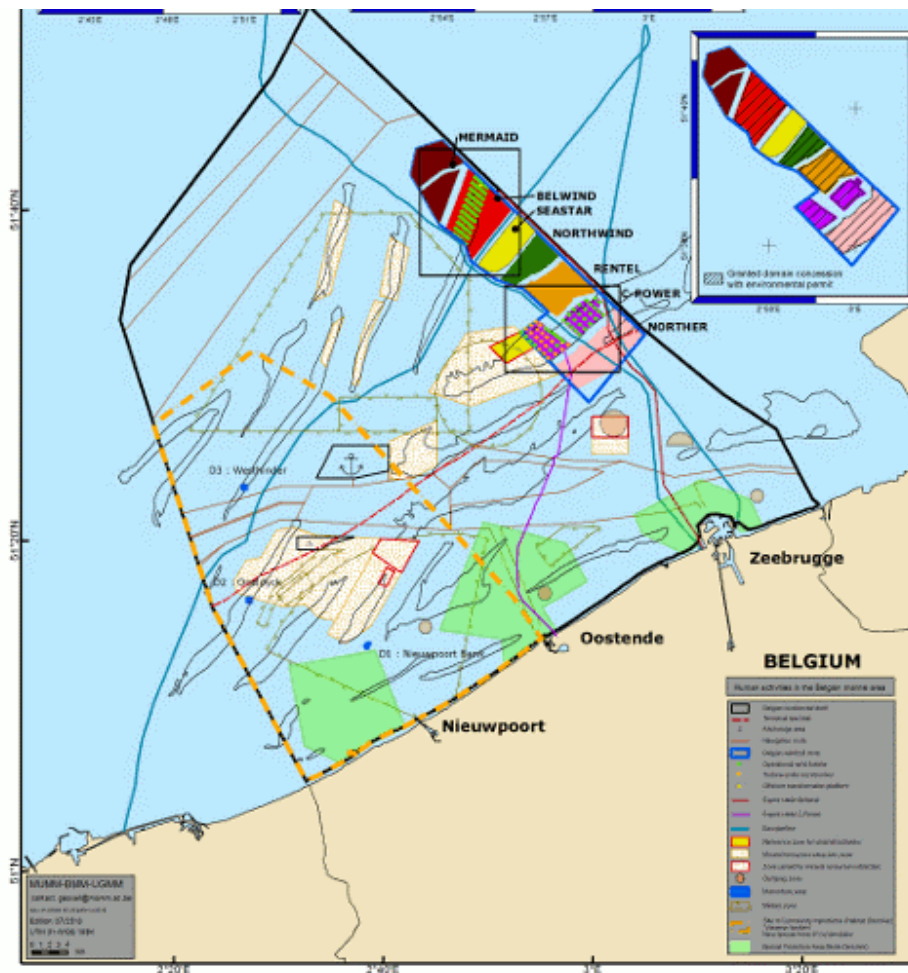


Figure 18. Numerous human activities take place in the Belgian part of the North Sea (Source: <http://www.mumm.ac.be/EN/Management/Atlas/map.php?HumanActivities>).

4.3. Pollution and eutrophication

4.3.1. Flemish Region

Exceedance of critical load for eutrophication

Eutrophication causes damage to natural vegetation. Nitrofilous plants are favoured and biodiversity is affected. Nitrate leaching can occur. For each type of vegetation, ‘critical loads’ for eutrophication are determined as the damage threshold for atmospheric nitrogen deposition. If these deposition limits are exceeded, it will lead to harmful effects on vegetation in the long term. According to the target in the MINA plan 4 (2011-2015), only 65% of the nature surface in Flanders may still exceed the limits by 2015.

In 2010, on 75% of the Flemish nature area (forest, heathland and species-rich grassland) the critical load for eutrophication was exceeded. For forest, the figure is 100%. For heathland and species-rich grassland, it is 99% and 15% respectively. In 2004, 47% of the nature in the EU-25 was exposed to nitrogen deposition levels higher than the critical load (fig. 19).

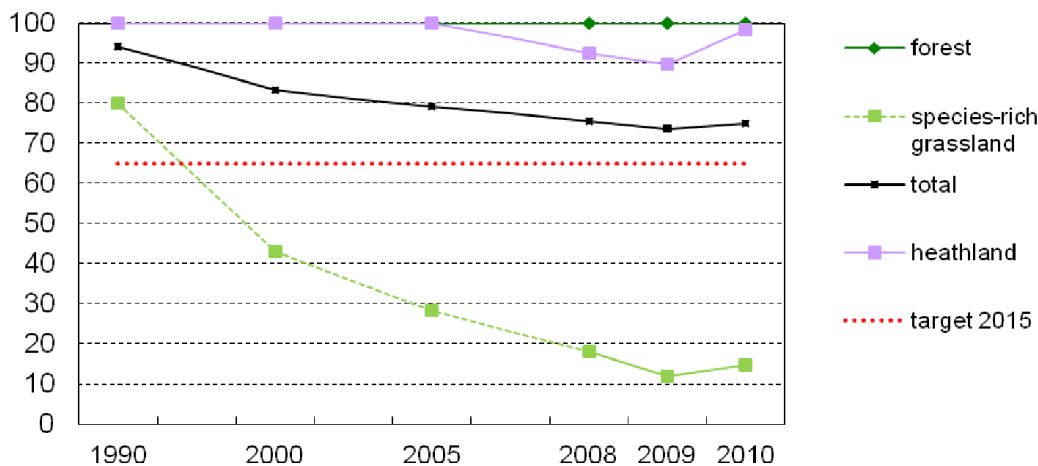


Figure 19. Nature area with exceedance of critical load for eutrophication (Flanders, 1990-2010).

The long-term objective is that there should be no nature area where the critical load is exceeded. The conversion from coniferous forest to broadleaf forest reduces the sensitivity to acidification. Moreover, the long-term effect of the critical load being exceeded leads to an accumulation of nitrogen in the soil, the effects of which are not yet well understood. This implies that eutrophication is a much greater threat to the conservation of biodiversity than acidification. The current deposition values pose a barrier to achieving the conservation objectives for Natura 2000 areas. Further emission reductions under international agreements are necessary. For Flanders this means that both NO_x and NH_3 emissions must be further reduced.

<http://www.milieurapport.be/nl/feitencijfers/mira-t/milieuthemas/vermesting/gevolgen-van-vermesting/oppervlakte-natuur-met-overschrijding-kritische-last-vermesting/>.

Exceedance of critical load for acidification

Acidification causes damage to vegetation. Biodiversity is affected. Forests suffer root damage. For each type of vegetation, ‘critical loads’ for acidification have been determined as the damage threshold for acidifying deposition. If these deposition limits are exceeded, this leads in the long term to harmful effects on the vegetation.

In 2010, the critical load for acidification was exceeded in 28% of the total area of terrestrial ecosystems (forest, heathland and species-rich grassland) in Flanders. This is a rather positive development since in 2008 critical loads were still being exceeded in 38% of the total area. Between 2009 and 2010 however the situation remained more or less constant. Forests remain the most sensitive, with the limits being exceeded in 42% of the area in 2010. Because the critical load is based on threshold values, even minor changes in deposition can, in some cases, lead to larger changes in nature area achieving compliance with the critical load for acidification.

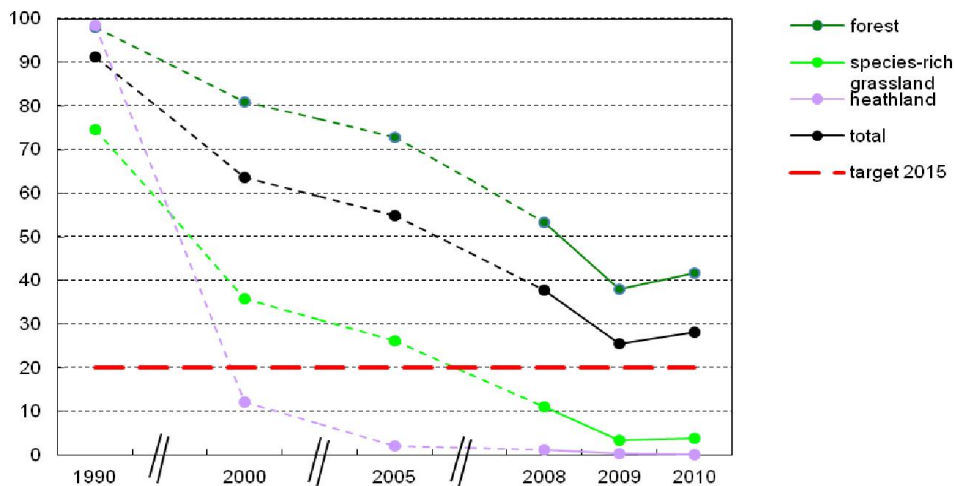


Figure 20. Nature area with exceedance of critical load for acidification (Flanders, 1990-2010).

Efforts are still needed to meet the objective of the MINA plan 4 (2011-2015), notably to reduce the percentage of nature area where limits are being exceeded to 20% by 2015. By comparison, the critical load was exceeded in the EU-25 in 2004 in 15% of the nature area. The European long-term objective is to ensure that the critical loads for acidification are not exceeded in any ecosystem. Additional efforts continue to be needed to reduce the emissions of acidifying substances into the air. Moreover, the decrease in the pressure on ecosystems in Flanders does not lead directly to a proportional recovery of the soil and biodiversity. This recovery is a very slow process, which depends, among other things, on the duration and the degree of the historic excess.

<http://www.milieurapport.be/nl/feitencijfers/mira-t/milieuthemas/verzuring/gevolgen-van-verzuring/oppervlakte-natuur-met-overschrijding-van-de-kritische-last-verzuring/>

4.3.2. Walloon Region

Exceedance of critical load for acidification and eutrophication

When present in excessive amounts, depositions of atmospheric acidifying and eutrophying pollutants (sulphur and nitrogen compounds) constitute one of the major causes for ecosystem degradation. They can in particular induce nutritional imbalances as well as the decline/disappearance of certain plant species.

In 2007, some 6% of forested areas and nearly all open habitats (heathland, marshes, bogs, etc.) in Wallonia were affected by nitrogen depositions exceeding the acceptable critical load of eutrophying nitrogen. In forested areas, the situation has greatly improved compared to 1990 as a result of a reduction in atmospheric nitrogen depositions. This is not the case for other (semi-)natural ecosystems (in particular oligotrophic ones) which remain extremely sensitive to this type of disturbance. As regards acidification, the current status is now much less of a problem, in the sense that the percentage of forested areas affected has dropped from 90% in 1990 to under 10% in 2007. This development reflects the positive effect of the measures introduced to reduce emissions of acidifying pollutants by 50-60% (between 1990 and 2010) at both Walloon and European levels.

<http://etat.environnement.wallonie.be/index.php?mact=tbe.m588bb.default.1&m588bbalias=Exceedance-of-critical-loads-of-acidifying-and-eutrophying-pollutants&m588bbreturnid=46&page=46>

Fig. 12-5 Areas affected by exceedances of the critical loads of nitrogen and sulphur in Wallonia*

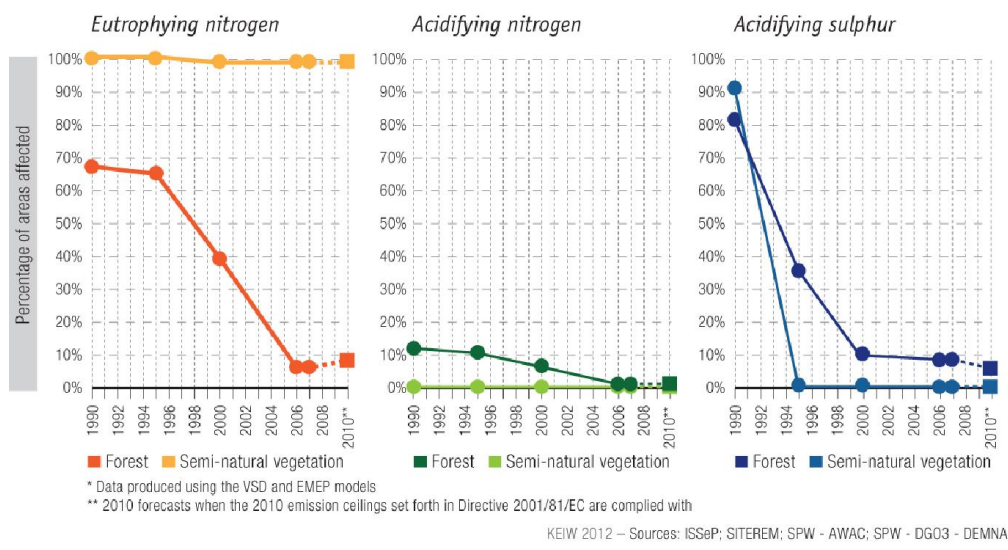


Figure 21. Areas affected by exceedance of critical loads of nitrogen and sulphur in the Walloon Region.

Eutrophication of watercourses

The most eutrophied water courses are found mainly in north Wallonia, in the Scheldt river basin with its large density of urban and industrial areas as well as a lot of agricultural plots. Improvements in water quality are cyclical, due to a combination of factors. While reduced industrial pollution, tertiary treatment of urban waste water, a ban on phosphates in detergents and the lower use of phosphorous fertilizers (decrease of 70% between 1995 and 2010) are improving the situation, various diffuse inflows, generally

higher after significant rainfall (run-off, erosion, etc.), the presence of polluted sediments and lower water flow rates

(in dry years) are increasing the concentration of phosphates. Greater improvement in water quality is expected following the introduction of additional measures proposed in the draft river basin management plans.

<http://etat.environnement.wallonie.be/index.php?mact=tbe,m588bb,default,1&m588bbalias=Eutrophication-of-water-courses&m588bbreturnid=46&page=46>

4.3.3. Brussels-Capital Region

Acidification and nutrient enrichment of soils through atmospheric depositions still constitute limiting factors for the qualitative development of habitats on nutrient-poor soils. Nutrient-poor grasslands such as grasslands with common *Agrostis*, recognized as natural habitat of regional interest, are also suffering from these two phenomena, while eutrophication is compromising the long term presence of acidophilic oak stands on poor and sandy soils (habitat of European interest).

In the past the chemical quality of the water elements in Brussels was strongly influenced by domestic and industrial wastewater as well as by diffuse pollutions. Until 2000 the wastewater running through the sewage system and the collectors were spilled out directly in the Senne, increasing even more the pollution load coming from upstream. The water treatment plants South (active since August 2000) and North (active since October 2006) now treat the organic and suspended matter. Thanks to this important treatment effort, the concentrations of nitrogen and phosphorus as well as the values of the biological oxygen demand and the chemical oxygen demand are decreasing while the concentration of dissolved oxygen in the water is increasing, allowing to respect the actual norms. During heavy rainfall, however, overflows from the sewage network into the surface waters can still be observed and the collection of wastewater is not covered for 100% (some wastewater is still reaching the Verrewinkelbeek, a water course running through and in the proximity of zones with a high biological value, but this will be addressed at the end of 2013 by the finalisation of a new collector). Another factor possibly contributing to the eutrophication of small water elements is the perseverance of the feeding of water birds and pigeons by citizens, despite the fact that this is forbidden. The set up of a sensibilisation campaign addressing this issue is therefore recommended.

http://documentation.bruxellesenvironnement.be/documents/NARABRU_20120910_FR_150dpi.pdf

4.3.4. Belgian part of the North Sea

Marine biodiversity is particularly threatened in our coastal zone and shelf sea, where direct and indirect disturbances are concentrated. There is also a trend towards more industrial activities at sea (sand and gravel extraction, mariculture, wind turbines, etc.). Marine pollution remains a concern: eutrophication of the marine environment caused by riverine input of nitrates and phosphates, input of hazardous substances from land based activities, pollution caused by accidents at sea. Heavy metal input into the Belgian part of the North Sea decreased substantially during the last 20 years. Organotin compounds (TBT) are still a major concern, particularly in sediment near harbors and shipping lanes, although the total ban of TBT clearly results in a sharp decrease of ambient concentrations. As far as other organic compounds are concerned (PAH, PCBs, etc.), these hazardous substances remain a concern, primarily as a result of historical inputs into the marine environment and the very low degradation rate. Perfluorinated Organic Compounds and Brominated Flame Retardants constitute a more recent problem, emerging contaminants are constantly sought after.

4.4. Invasive alien species

4.4.1. Flemish Region

Number of alien animal species

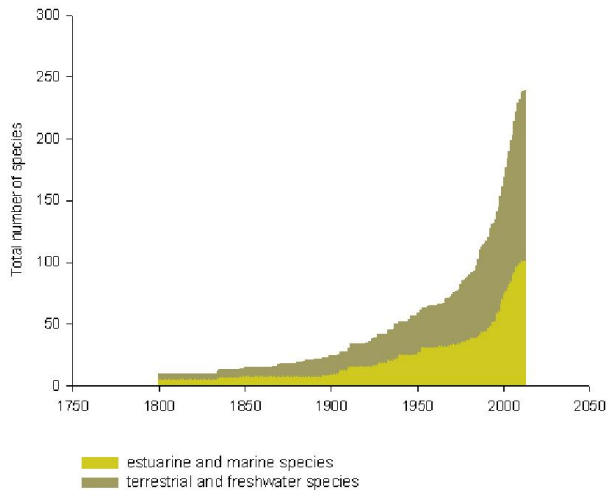


Figure 22. Number of alien animal species in Flanders (Source: Research Institute for Nature and Forest, VLIZ Alien Species Consortium).

This indicator evaluates the cumulative number of species that do not live in Flanders naturally, but were introduced through human activities. Between 1800 and 2012 about 250 alien species were found in Flanders. It is expected that the number of biological invasions will continue to rise if policy remains unchanged.

http://indicatoren.milieuinfo.be/indicatorenportal.cgi?lang=en&detail=654&id_structuur=19

Number of alien plant species

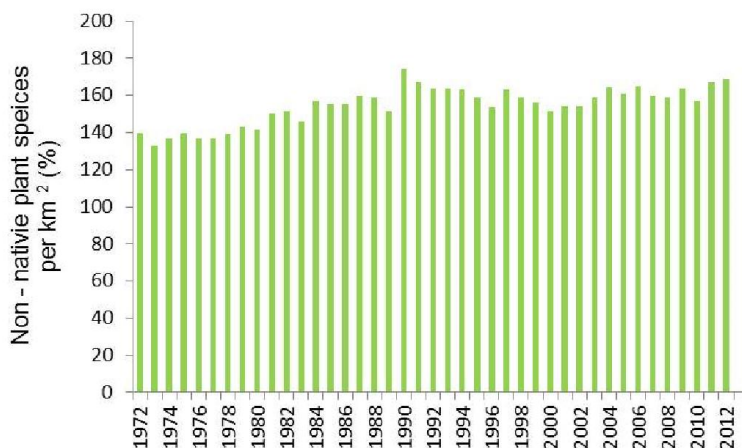


Figure 23. Alien plant species per km² in Flanders (Source: Research Institute for Nature and Forest, FLOWer vzw, National Botanical Garden).

The percentage of non-native species within the plant species assemblages in Flanders is increasing steadily, most probably because of globalisation of trade, transport and tourism. New invasions can be the result of either intentional (e.g. use of ornamental species in horticulture) or unintentional (e.g. contamination by transport of seeds) introductions. Only part of these introductions result in permanent establishment and only some of the naturalised species subsequently spread spontaneously. In light of the steady increase of many non-native plant species and the growing number of new arrivals, we expect a growing percentage of non-natives in the Flemish flora.

http://indicatoren.milieuinformatie.be/indicatorenportal.cgi?lang=en&detail=712&id_structuur=19

4.4.2. Walloon Region

Fig. 12-8 Naturalised alien species in Wallonia

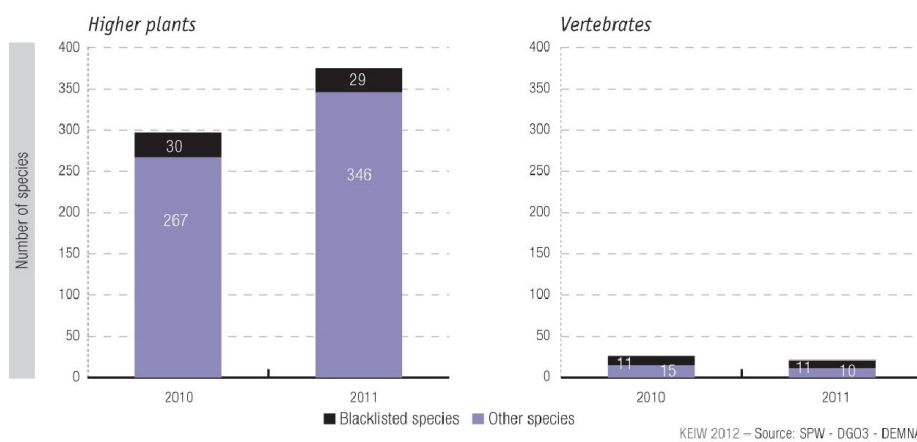


Figure 24. Number of naturalised alien species in the Walloon Region.

In Wallonia, 375 species of ornamental plants and 21 species of vertebrates of alien origin were naturalised in 2011. Among them, 29 plant species and 11 vertebrate species are known to cause major environmental damage and are therefore blacklisted. The number of naturalised species is steadily growing, with several species of mammals having gained a footing in Wallonia over the last few years. The changes observed in relation to previous estimates do not necessarily reflect the arrival or disappearance of invasive species on the territory; they can also reflect increased survey work on the ground or progress in scientific knowledge. On the initiative of the Walloon structure responsible for coordinating work on invasive species, different types of preventive tools are currently under development. In addition, a plan for fighting Giant Hogweed has been recently introduced with the collaboration of different River Contracts in Wallonia.

http://etat.environnement.wallonie.be/index.php?mact=tbe,m588bb,default,1&m588bbalias=Invasive-alien-species_1&m588bbreturnid=46&page=46

4.4.3. Brussels-Capital Region

Table 4. Number of species (within various groups) observed in the Brussels-Capital Region. Source : Bruxelles Environnement – IBGE : species database, January 2011.

	Total number of species in the Brussels-Capital Region	Number of exotic species	Percentage of exotic species in the total number of species
reptiles	7	3	42,9
higher plants	793	215	27,1
amphibians	9	0	0
birds	103	11	10,7
mammals	44	3	6,8
grasshoppers and crickets	26	1	3,8
butterflies	28	1	3,6
mushrooms	913	1	0,1

The majority of species groups count one or more exotic species. Table 4 shows the percentage of exotic species within different groups. The proportion of exotic species is particularly high within the reptiles, higher plants and birds. Within the reptiles, however, it only concerns subspecies which are not reproducing in nature in our regions (red-eared and yellow-eared slider) and the observations concern rather isolated cases of released or escaped individuals. Among the exotic plants observed in Brussels, several are invasive. Best known are the Japanese knotweed (*Fallopia japonica*), giant hogweed (*Heracleum mantegazzianum*) and black cherry (*Prunus serotina*). These three species are widely distributed in the Brussels-Capital Region.

Among the birds, the best known invasive species are the Egyptian goose, the Canada goose and three species of green parakeets. From 1992 to 2010, the population of the Alexandrine parakeet increased on average by 20% each year (Weiserbs & Derouaux, 2011). The increase of the population of the ring-necked parakeet during the same period was less spectacular (10% per year, in average), but the increasing trend does not seem to bend. In 2011, the number of parakeets counted in the three sleeping sites known in Brussels reached a maximum of 10,500 individuals (Alexandrine and ring-necked parakeets).

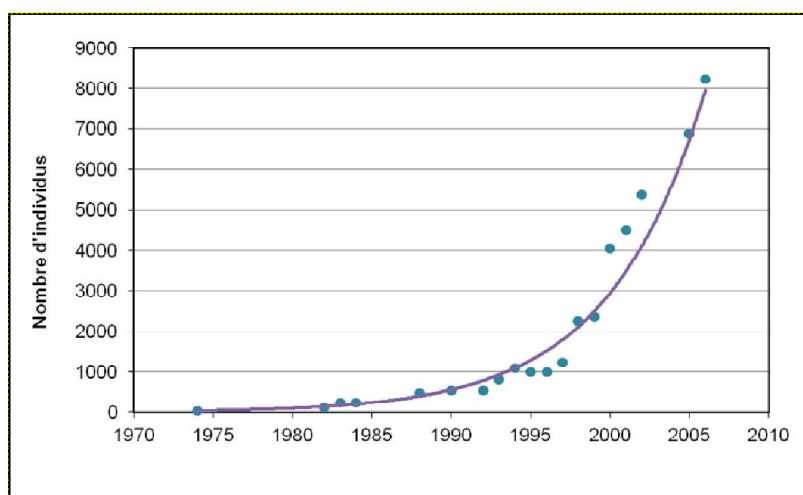


Figure 25. Evolution of the number of Alexandrine and ring-necked parakeets in the Brussels-Capital Region (Source: AVES).

From 2000 on, the lightning progression of the multicolored Asian lady beetle has received much attention. In 2003, only two years after its first observation in nature, this species was already the most common ladybird in our region. Since its larvae are predated the larvae of our indigenous species, with which they also compete for the same food sources, an ecological disaster could be feared. Meanwhile the species, sold as a biological control agent acting against aphids, has been withdrawn from the commerce. http://documentation.bruxellesenvironnement.be/documents/NARABRU_20120910_FR_150dpi.pdf

4.4.4. Belgian part of the North Sea

A study by Kerckhof *et al.* (2007) identified 61 alien species in the Belgian marine and brackish waters, eight of which are considered cryptogenic. The majority of these species have established self-sustaining populations, although for some species the establishment is uncertain or in need of verification. Four species, namely the American jack-knife clam *Ensis directus* (Conrad, 1843), the pacific oyster *Crassostrea gigas* (Thunberg, 1793), the New Zealand barnacle *Elminius modestus* Darwin, 1854 and the slipper limpet *Crepidula fornicata* (Linnaeus, 1758) now constitute a dominant part of the Belgian marine nearshore fauna. These species are invasive, competing with native species, changing the original habitat and significantly altering the overall biodiversity and biomass. Prime introduction vectors are shipping, including small recreational craft. The invasion rate has been increasing during the last two decades.

4.5. Impact of climate change on biodiversity

4.5.1. Flemish Region

Dragonflies

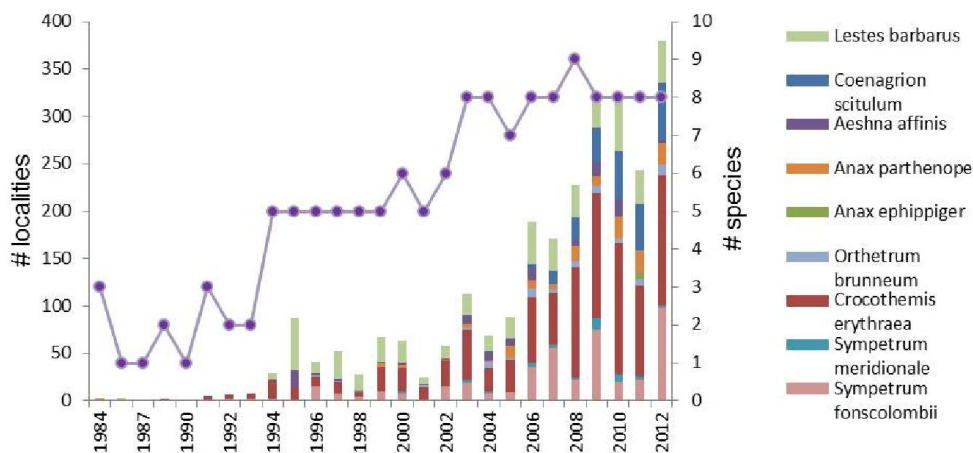


Figure 26. Evolution of the number of localities from Southern European dragonflies and the total number of observed species (Source: Flemish Dragonfly Society and the common database of Natuurpunt Studie vzw and the Flemish Dragonfly Society that were collected by <http://www.natuurindicatoren.be>).

During the last two decades, many Mediterranean dragonflies (Odonata) expanded their range northwards. Until 1980, populations of these were unknown in north-western Europe. Here we analysed the evolution of the number of localities since 1980 for each of the nine Mediterranean species and the total number of Mediterranean species observed. The figure shows that both the number of localities for each of those nine species as the number of species increased since 1980. A first clear increase can be noticed since 1994,

followed by a steep increase since 2006, both for the number of localities as for the number of species seen annually. Even if there are annual fluctuations, mostly due to weather conditions during the time of the flight season, this trend is clear and statistically significant. Never before were these species seen on so many localities in Flanders as in 2012. Species as the Broad Scarlet (*Crocothemis erythraea*) or the Dainty Bluet damselfly (*Coenagrion scitulum*) have already several years many flourishing populations in Flanders. http://indicatoren.milieuinfo.be/indicatorenportal.cgi?lang=en&detail=404&id_structuur=25

Migrating birds

The arrival date for 15 species has been monitored during the past 20 years. This arrival date has advanced by on average 7.63 days (or 0.45 days/year). The biggest change was recorded for Common Chiffchaff (total 20 days or 1.16 days/year), the smallest for Marsh Warbler (total 3 days or 0.17 days/year).

Since some species adapt better than others, there is a risk for changes in the food web and/or ecological cohesion of ecosystems. This is illustrated by the Pied Flycatcher. The arrival date of this migratory species advances more slowly than the period of occurrence of the main food for its young, the caterpillars of the Winter Moth. This is a possible cause of the decline of this forest woodland bird.

http://indicatoren.milieuinfo.be/indicatorenportal.cgi?lang=en&detail=406&id_structuur=25.

4.5.2. Walloon Region

Dragonflies

For the past decade, the frequency of southern dragonfly species has increased significantly. Seven species have recently settled down. If various colonisation trends have always been observed, they used to be limited in time (e.g. during warm summers). The new arrivals are more stable in time, and are interpreted as a consequence of climate change. Species with a more northern distribution also suffer from the rise in temperature as they have quite strict habitat requirements.

<http://environnement.wallonie.be/eew/rapportchapitre.aspx?id=ch12>

Birds

A recent study by BirdLife International predicted a movement in the ranges of European bird species of 550 km to the north east by 2100. This study is based on the "climate envelope" model for a probable rise of 3°C for the global average temperature. Wallonia would be the range limit for 60 species, 44 of which would be on the decline and 16 on the rise. There would be 19 new species, and the same number of species which would disappear.

<http://environnement.wallonie.be/eew/rapportProblematique.aspx?id=p105>

Butterflies

The climate's warming benefits certain southern species, which have posted the greatest expansions of their ranges. Still, the lack of relay habitats in Wallonia, e.g., "hot" habitats such as chalk grasslands for xerothermophilic species, is thought to limit the northward expansion of a series of other species that have more demanding habitat requirements and/or are less mobile.

<http://environnement.wallonie.be/eew/downloadfile.aspx?dwn=ffh.pdf&dir=tbe2005en>

4.5.3. Brussels-Capital Region

The recent changes of the flora of the Brussels-Capital Region show that it is adapting to a warmer mineral and ambient environment, typical for an urban setting. The species showing the most progression

in the periods 1991-1994 and 2003-2005 (such as the creeping woodsorrel and proso millet) are typical for dry, undep and rapidly warming substrates. Among them, numerous species are neophytes originating from warmer regions such as the Mediterranean basin (tomato, box elder, common fig). It is however too early to attribute these evolutions to climate change. Other factors are indeed contributing to these observations such as the progression of the regions' urbanisation as well as a more intense prospection of urban environments in more recent times.

4.5.4. Belgian part of the North Sea

Regional climate change scenarios predict an increase in air temperature of 2-3.5°C by the 2080s, with high summer temperatures becoming more frequent and very cold winters becoming increasingly rare. Water temperatures will also increase, but not as rapidly as temperature over land. Sea-level is expected to rise by 35-84 cm at 2100 compared to 1990.

Observed correlations strongly suggest that the North Sea ecosystem is vulnerable to variation in climatic conditions in general, and to anomalies in temperature and hydrodynamics in particular. Several processes within the North Sea food web appear to rely on temperature as a trigger, and further increases in temperature may disrupt the connectedness between species potentially leading to changes in community structures and possibly local extinctions. For many marine species, including commercially caught fish, the number of recruits mainly determines the year-to-year variation in the size of the adult stocks. If the annual sea-surface temperature increases further, efforts to maintain previous fishery yields from reduced stocks (due to northward movement and lowered recruitment levels) have the potential to significantly impact fisheries and have strong effects on the local ecosystem.

Because of the strong tidal regime and the effects of storm surges many of the coastal regions of the North Sea, especially in the south, are particularly susceptible to rising sea levels and to an increase in the frequency and severity of storms.