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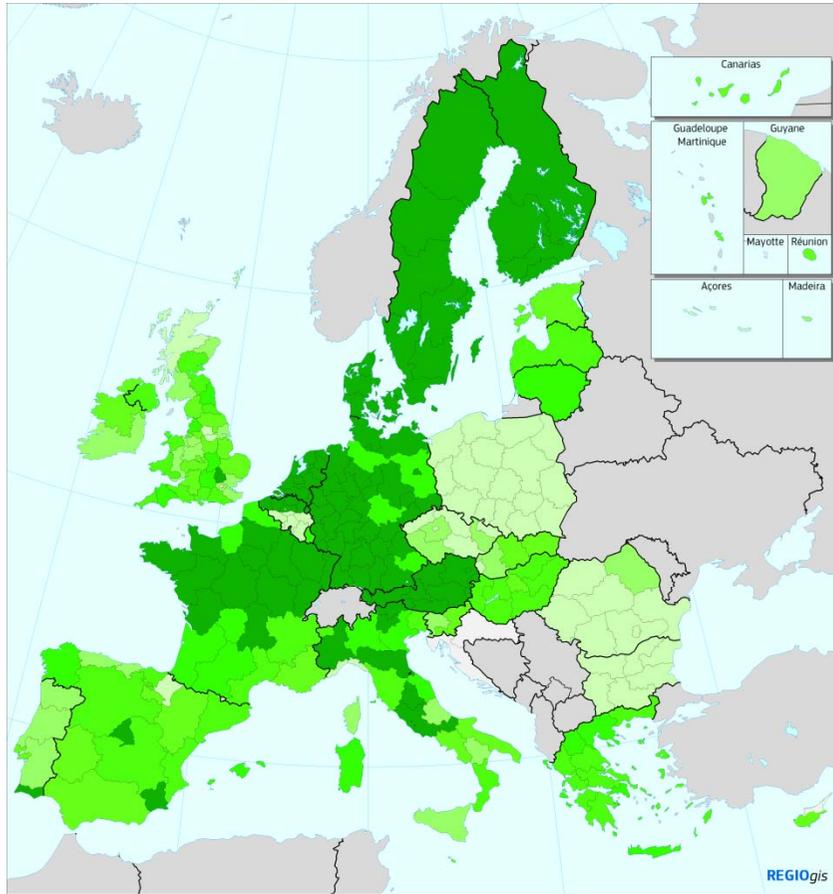
Sixth report on economic, social and territorial cohesion: Investing in Europe's Future

{ COM(2014) 473 final }

In general high compliance rates are seen in the older Member States, with frontrunners such as Austria, Germany and the Netherlands having largely implemented the Directive. However, there are still a few ‘older Member States’ facing serious compliance gaps, including Italy, Spain, Belgium and Luxembourg mainly in relation to non-appropriate treatment and consequently causing significant pollution pressures for the areas into which the concerned discharged waste waters drain. The picture is different for those Member States that joined the EU in 2004 and later, partially explained because they are still benefitting from transition periods agreed in the Accession Treaties. There are still regions where there is no or only partial collection of waste water. For instance in Member States such as Bulgaria, Cyprus, Estonia, Latvia and Slovenia less than 30% of the generated waste water is collected in a proper way (see Maps 11 and 12)¹. On average, in newer Member States about 40% of the waste water is subject to secondary treatment, with high rates above 80% seen in Czech Republic, Hungary, Lithuania and Slovakia. Only 14% of the waste water discharged in sensitive areas in the newer Member States is subject to the required tertiary treatment.

¹ See also Commission Report (COM(2013)574final ‘7th report on the Implementation of the Urban Waste Water Treatment Directive (91/271/EEC) – figures exclude Croatia.

Map 1: Urban wastewater with more stringent treatment, 2010



Urban wastewater with more stringent treatment, 2010

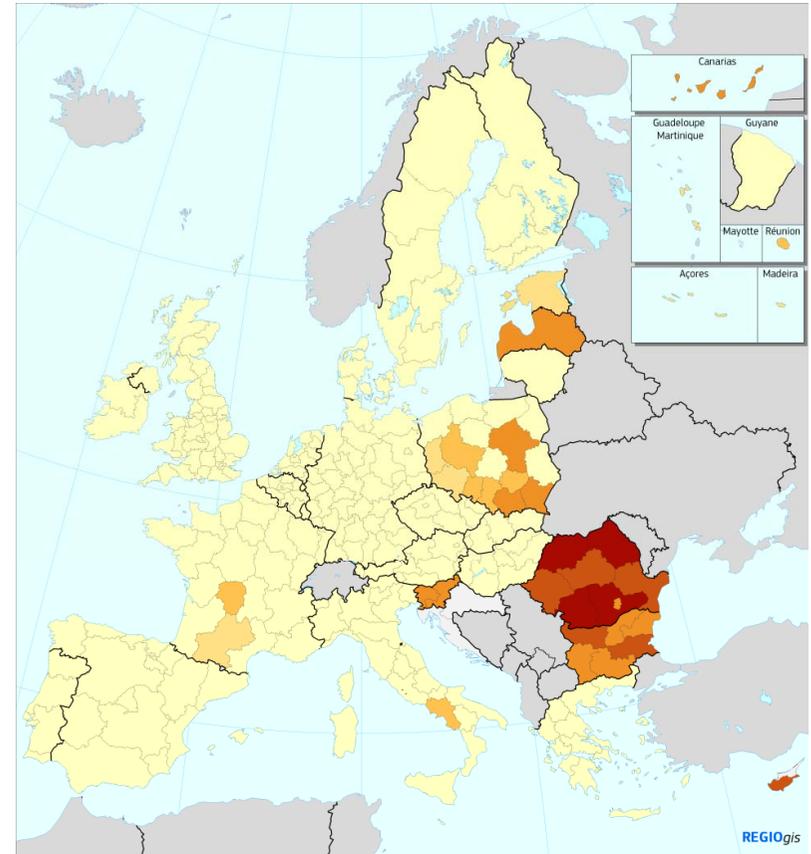
% of collected wastewater

< 10	75 - 90
10 - 25	> 90
25 - 50	no data
50 - 75	

EE, CY, LV, LT, HU, NL, PT, RO, SI, SK, FI: 2009
Source: EEA - REGIO-GIS

0 500 Km
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Map 2 Urban wastewater not collected, 2010



Urban wastewater not collected, 2010

% of generated load

< 2.5	25.0 - 50.0
2.5 - 5.0	> 50.0
5.0 - 10.0	no data
10.0 - 25.0	

EE, CY, LV, LT, HU, NL, PT, RO, SI, SK, FI: 2009
Not collected by collecting systems nor treated by individual or other appropriate systems.
Source: EEA - REGIO-GIS

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5.3. Solid waste management improving but there is still a long way to go in many EU regions

Solid waste affects human health and the environment as it generates emissions of polluting substances into the air, soil, surface water and groundwater. It also presents major management challenges as the quantity of waste produced per person has steadily increased over time. Recycling and exploiting the energy potential of waste have therefore become important.

In 2010, around 4.5 tonnes of waste per person were generated in the EU-28. Much of this is produced by construction and demolition, mining, quarrying and manufacturing. Households also generate a substantial amount of waste, on average 436 kg per person in 2010. Marine litter, escaping from waste management system, is growing concern.

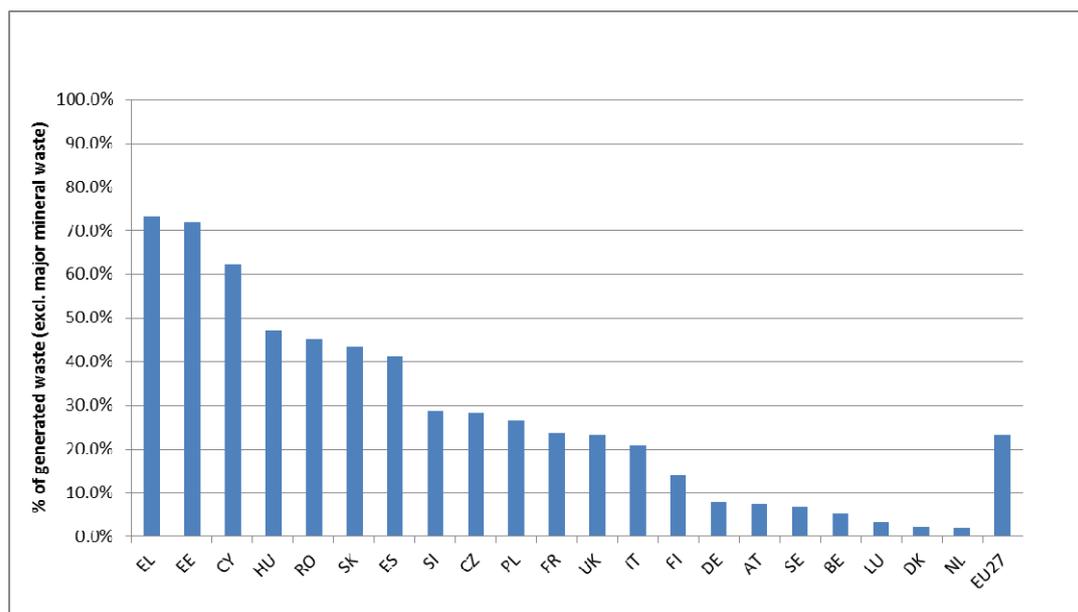
The total amount of waste generated in the EU has, however, declined over time. Between 2004 and 2010, the amount of waste produced per person in the EU fell by 7.1%, though there are wide variations between Member States. The amount increased by most in Greece, Denmark, Finland, Portugal, The Netherlands, Sweden, Latvia, Belgium, France and Luxemburg, while it declined significantly in Malta, Croatia, Austria, Romania, Hungary, the UK, Ireland, the Czech Republic and Spain.

Increasingly, waste is recycled or diverted for energy recovery. From 2004 to 2010, the proportion of waste recycled increased from 44% to 52% over the same period, while the proportion incinerated with recovery of energy also rose slightly (from just over 3% to just under 4%). The increase in recycling has been stimulated by EU and national legislation, landfill taxes and dumping fees as well as by rising prices for recycled materials and energy.

In 2010, the proportion of waste deposited in landfill is still around 23% in the EU-27². There are, however, marked variations across Member States. More than 70% of waste is still landfilled in Greece and Estonia while this share is above 40% in Cyprus, Hungary, Romania, Slovakia and Spain. Less than 5% goes to landfill in Belgium, Luxemburg Denmark and the Netherlands.

² Data on mineral waste are still of low data quality and have therefore been omitted from the calculation.

**Figure 45 Share of waste landfilled in selected EU Member States, in 2010
(% of total generated waste, excluding major mineral waste)**



Source: Eurostat

5.4. Sound ecosystems offer many vital services

Among their many functions, such offering habitats for various species of wildlife, ecosystems provide services for people³. These range from clean drinking water to good air quality, and from the pollination of crops to the regulation of water flows. Ecosystems in coastal and marine regions produce services by providing food, natural barriers to floods. Forests and woodland help to regulate water flows, capture carbon and air pollutants from the atmosphere and prevent soils from being eroded.. Wetlands have the capacity to improve the quality of water and regulate flows, diminishing the risk of floods. Ecosystem services are vital for human life, and sustaining their provision, as well as protecting natural capital, is increasingly recognised by EU policies as being important for tackling potentially changing conditions in future years.

One way of protecting natural capital is the conservation of biodiversity through establishing nature protected areas, such as the EU Natura 2000 sites, which are a particular form of green infrastructure⁴. The services that biodiversity provides, however, do not stop at the borders of protected areas. Many are produced outside nature sites from other forms of green infrastructure. Urban forests provide cheap and accessible recreational space for people. Floodplains, often on grasslands and pastures, provide protection against floods during periods of high water. Forests and woodland help to regulate water flows, capture carbon and air pollutants from the atmosphere and prevent soils from being eroded. This green infrastructure provides a wide range of benefits to people and is often an economically viable alternative to man-made solutions. For instance, there are many examples where the rehabilitation

³ An ecosystem is a dynamic complex of plant, animal, microorganism communities which interact with the non-living environment as a functional unit. Humans are an integral part of ecosystems.

⁴ Green infrastructure can be defined as natural land areas, working landscapes and other open spaces enhancing the capacity of ecosystems to provide goods and services.

of flood plains and wetlands has proved to be a more efficient and cheaper means of reducing the risk of floods than the construction of barriers.

The provision of ecosystem services has a strong regional dimension. It is highly dependent on the local context and varies with the endowment of natural capital and green infrastructure. The development model followed by modern economies has reduced dependence on nature to produce such services. While a few services such as food and timber production are maintained, many ecosystem services have been put at risk by industrialisation. Agricultural intensification, for example, is partly responsible for the loss of bees and other species which are essential to pollinate crops and maintain production levels⁵. Air pollution, e.g. NH₃ from the use of fertiliser and manure handling in agriculture, can lead to acidification and eutrophication. As a result, ecosystem services are mainly produced at present in regions where rural areas, mountains, wetlands, forests or coastal areas are important.

The potential capacity to produce ecosystem services in NUTS 2 regions is illustrated by Map 71 by means of a composite indicator, TESI - a total ecosystem services index, based on 13 individual indicators, each measuring the capacity to provide a particular service (production of food, livestock, water and timber; regulation of air, climate, soil quality, water and water quality; pollination, erosion, coastal areas protection and provision of recreational services). Four of indicators reflect provisioning services: the goods or products we obtain from ecosystems. Eight indicators refer to regulating services: the benefits we obtain from an ecosystem's control of natural processes. One indicator refers to a cultural service: recreation, which is a non-material benefit obtained from ecosystems⁶.

In general, regions with a low TESI, where a large part of the land area is taken for producing crops and urban development have less land left where ecosystems, such as forests and wetlands, can provide their services. By contrast, regions with a higher TESI have a wider and more balanced array of ecosystem services. The difference between medium and high TESIs results from more or less productive ecosystems, For example, wetlands and forests often generate higher levels of service than grass- or shrub-land.

As indicated above, green infrastructure comprises all natural, semi-natural and artificial ecosystems. There is a strong positive relationship across the EU between the area of a region covered by green infrastructure and its capacity to provide ecosystem services (Map 72). Investing in green infrastructure should therefore increase such services.

⁵ Zulian G., Maes J., and Paracchini MP., 2013, *Linking land cover data and crop yields for mapping and assessment of pollination services in Europe*, Land 2, 472-492.

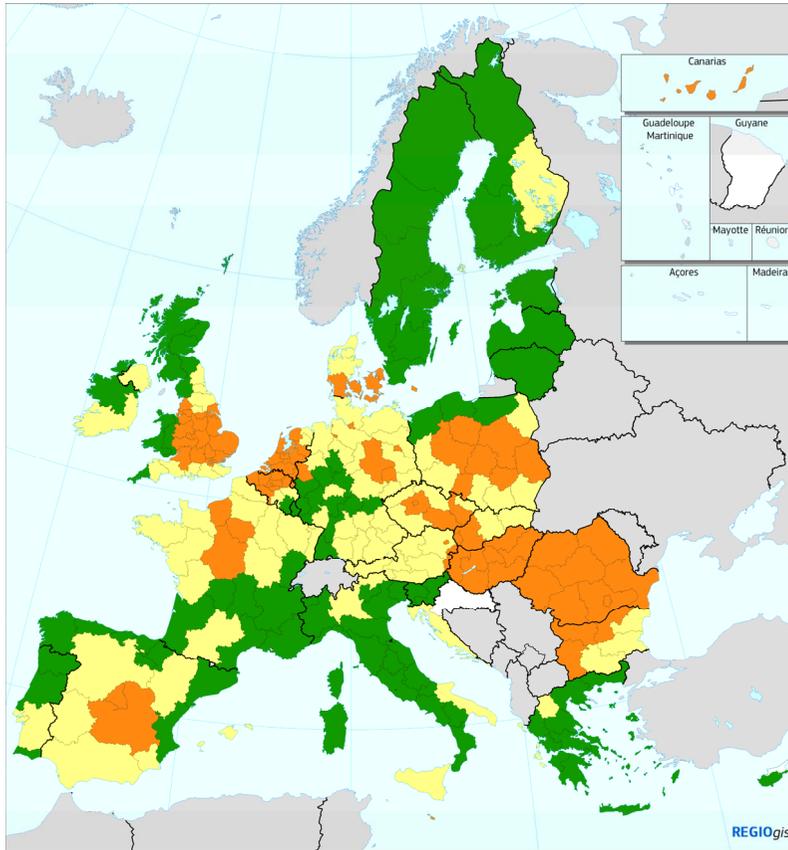
⁶ Details concerning the methodology are described in Maes J, Paracchini ML, and Zulian G., 2011, *A European assessment of the provision of ecosystem services, Towards an atlas of ecosystem services*. EUR 24750 EN, Publications Office of the European Union, Luxembourg and Maes J., Paracchini ML., Zulian G., and Alkemade R., 2012, *Synergies and trade-offs between ecosystem service supply, biodiversity, and habitat conservation status in Europe*, Biological Conservation 155, 1-12.

. Note that the TESI indicator has not been agreed in the context of the Mapping of Ecosystem Services (MAES).

Map 72 shows that even in regions where land is predominantly used for growing crops many ecosystem services can still be present. For instance, a recent study in the UK indicates that converting comparatively small amounts of land from agricultural use to open-access recreation leads to a relatively modest loss in farm produce but generates much larger social benefits⁷.

⁷ Bateman IJ., et al., 2013, *Bringing Ecosystem Services into Economic Decision-Making: Land Use in the United Kingdom*, *Science* 341(6141), 45-50.

Map 3: Capacity to deliver ecosystem services, TESI index, EU NUTS 2 regions



Capacity to deliver ecosystem services

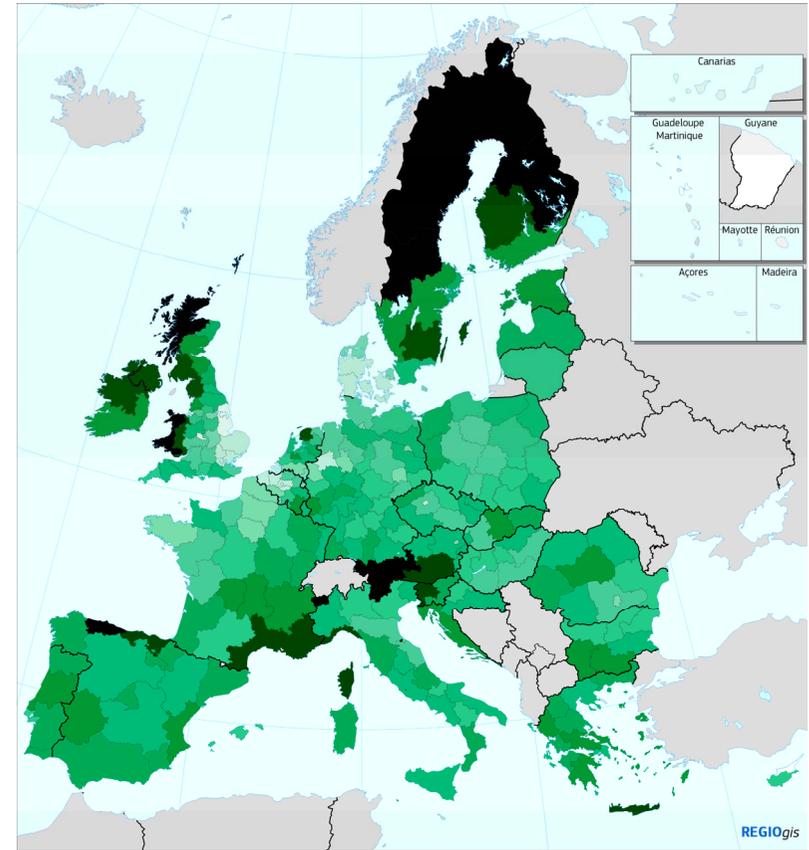
- Low capacity
- Medium capacity
- High capacity

Source: JRC

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Map 4: Green infrastructure, EU NUTS 2 regions (% of the surface area covered with green infrastructure)



Green Infrastructure

as a percentage of the surface areas

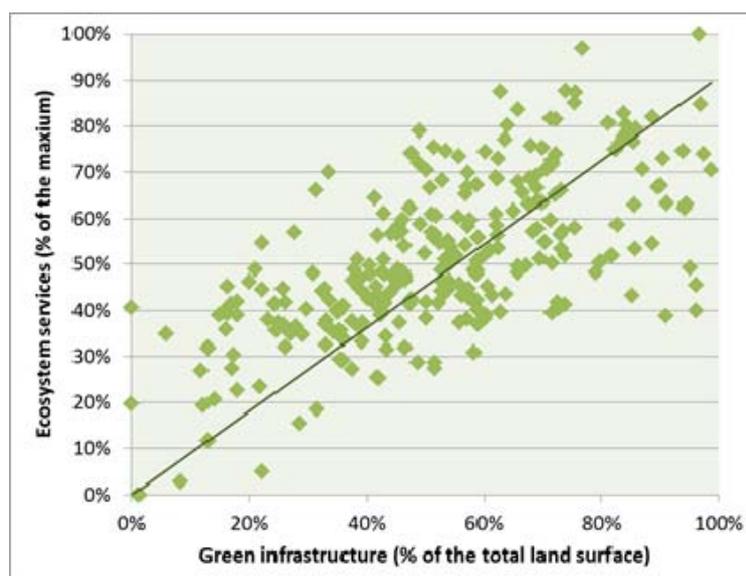
- <10
- 10 - 20
- 20 - 30
- 30 - 40
- 40-50
- 50 - 60
- 60 - 70
- 70 - 80
- 80 - 90
- >90

Source: JRC

0 500 Km

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Figure 46 Green infrastructure and the delivery of ecosystem services



In order to identify properly the types of action capable of increasing the benefits from the ecosystem, demand aspects also need to be taken into account. Demand for ecosystem services tends to rise as population density increases or human settlements are established. The action required to increase ecosystem services therefore differs between places, according to the specific features of the locality. This often implies a need to consider much smaller areas than NUTS 2 regions, as illustrated by the following examples relating to improving air and water quality.

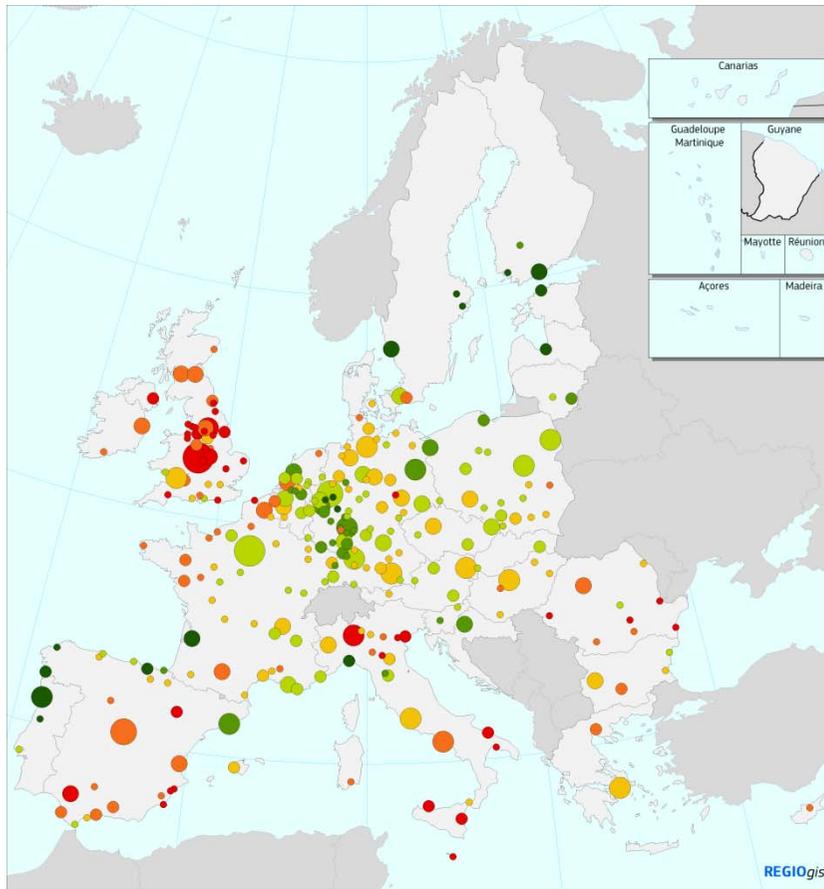
5.4.1. Air quality is still too low in many EU cities

As noted above, air pollution is a major environmental concern in cities across the EU. The removal of air pollutants and dust from the atmosphere is an ecosystem service provided to a large extent by forests and other wooded lands⁸. Regions in North Sweden and Finland have many such areas and so have a high capacity for providing this service. However, given their low population density, demand for the service in these regions is low especially compared with urban areas. It is therefore in the latter that policy action to increase the capacity of ecosystems to regulate air quality should be concentrated⁹. This can be done by investing in green infrastructure such as urban parks and green spaces, so that trees can help to reduce temperature, contribute to natural urban ventilation (dispersion of air pollutants) and remove pollutants such as NO₂ from the atmosphere. As just planting trees can also cause local hotspots of (other) air pollutants (e.g. PM) if not done properly, such action, however, needs to be part of an integrated strategy for improving air quality in EU cities.

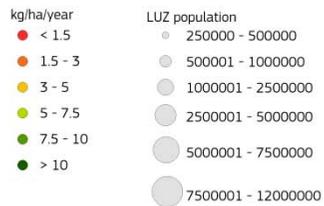
⁸ The difference between forests and other wooded lands is the extent of canopy coverage. Although there is no general EU definition for these land categories, the FAO definition of "forest" requires a minimum of 30% tree canopy cover, whilst other wooded land" has a canopy cover between 10 and 30%.

⁹ Forests, even in sparsely populated areas, obviously remain key natural assets to provide services such as climate regulation, CO₂ absorption, regulation of the hydrologic cycle and habitats for migratory birds.

Map 5: Removal capacity in larger urban zones



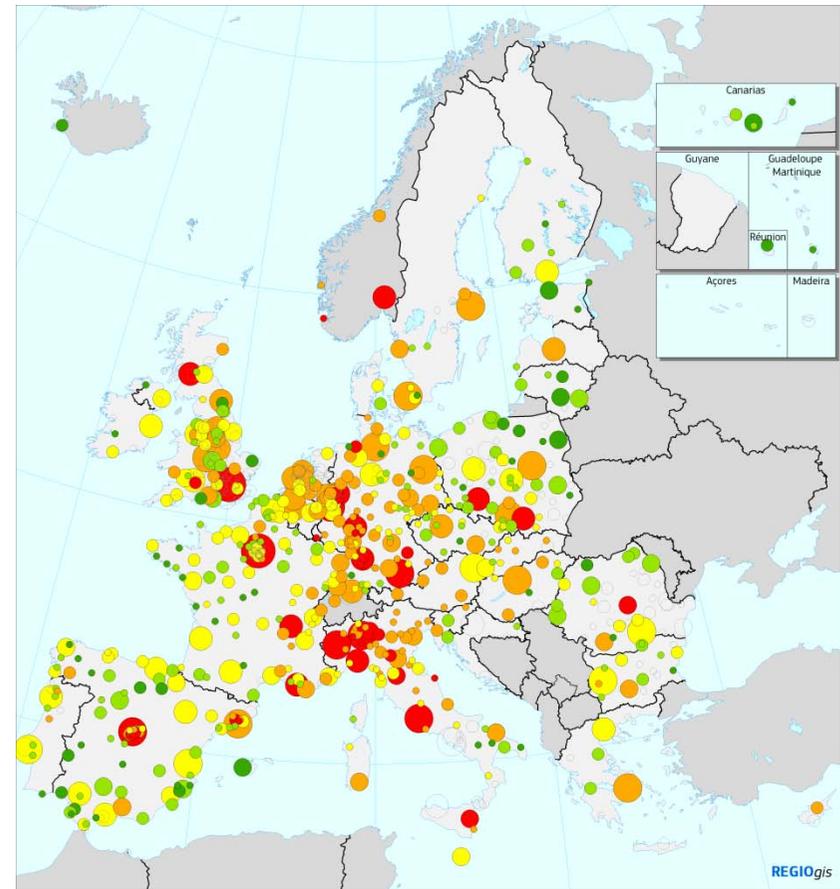
NO2 Removal Capacity



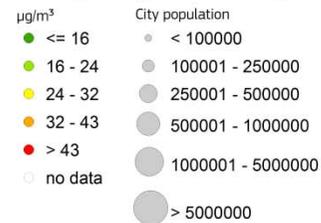
Sources: JRC



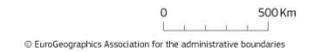
Map 6 NO₂ daily average concentrations, 2011



NO2 daily average concentration, 2011



Source: EEA, DG REGIO



Computer models which include data on air quality as well as details of green urban areas can be used to quantify the amount of pollutants that can be removed from the atmosphere by this means. The economic benefits of removing air pollutants can then be calculated by estimating the reduced costs of pollution to society not accounted for in the market price of goods and services, like electricity and transport, responsible for pollution.

The capacity of cities in the EU to regulate air quality differs greatly. This is illustrated by the example of nitrogen dioxide (NO₂), which is a major air pollutant released during the burning of fossil fuels. Map 73 illustrates how urban green areas contribute to NO₂ removal in larger urban zones across the EU.

The removal capacity of NO₂ per inhabitant differs widely between larger urban zones, depending primarily on the ratio between forested areas and population. Most large urban zones in Scandinavia, in Central and Eastern Europe (with the exception of Bulgaria and Romania), in Germany have a relatively high capacity to remove NO₂ per inhabitant. The removal capacity is much less in Southern Europe (except in Portugal) but also in Northern Italy and the UK.

In many EU cities NO₂ concentrations are high (Map 74), especially in the larger ones. For example, Milan and Madrid have high concentrations and a low removal capacity. Some cities like Berlin and Stockholm have a high removal capacity, which explains in part why their concentrations are lower than in other large cities. But these cities can also benefit from investment in removal capacity to further reduce concentrations, such as in green infrastructure like suburban woods, parks or green roofs¹⁰.

5.4.2. *Floodplains can regulate water flows and improve quality efficiently*

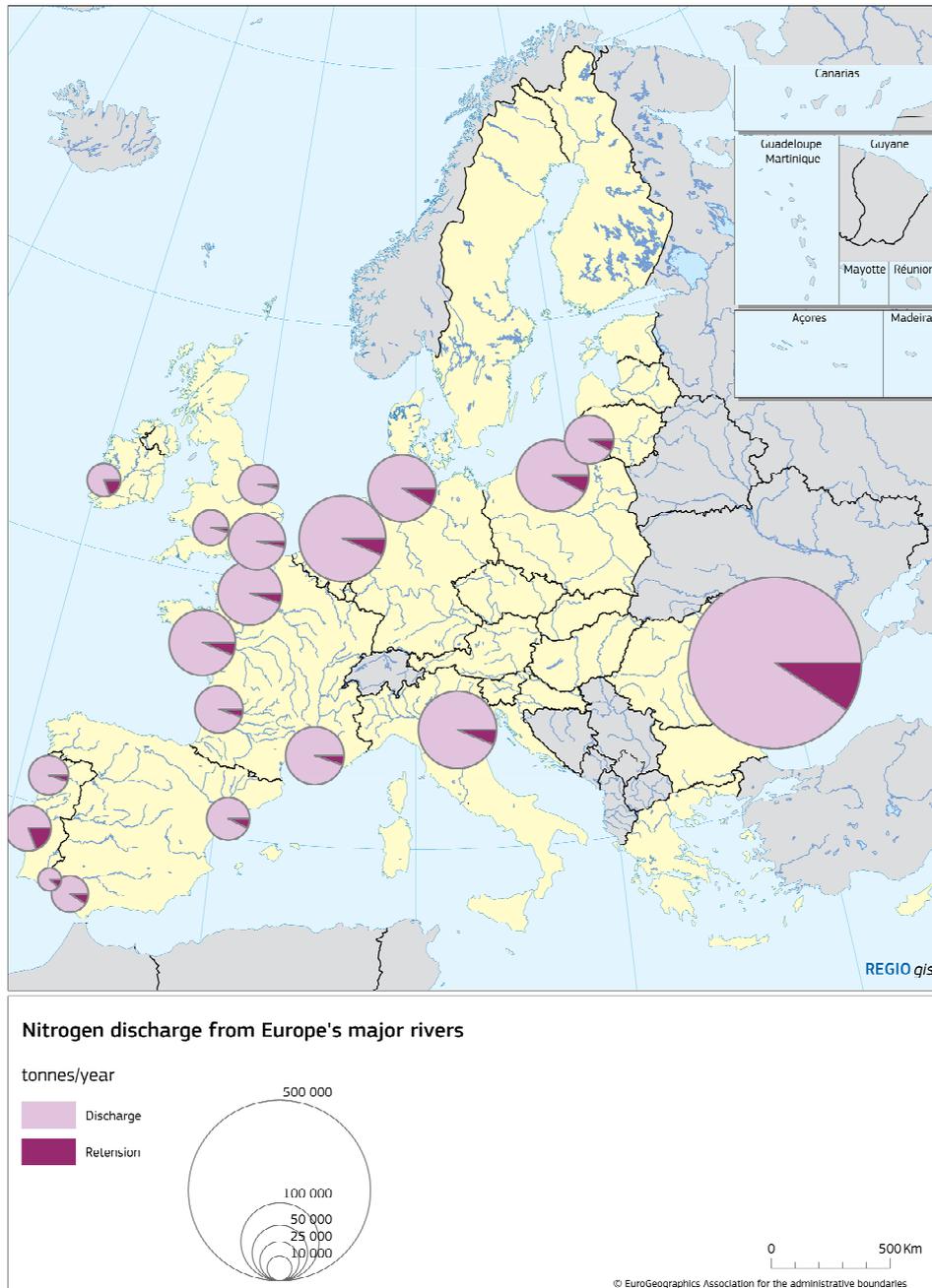
Floodplains are land areas bordering seas, lakes and rivers that are subject to recurrent flooding. If managed properly, floodplains can produce important ecosystem services. First and foremost, they prevent downstream areas from being flooded and so play an essential role in reducing the risk of disasters. Floodplains and wetlands also provide other services, in particular by purifying water, as they are very effective in retaining, processing and removing pollutants, sediments and excess nutrients, which avoids pollution downstream and more importantly, helps to provide clean water. As well as acting as natural water storage reservoirs and treatment plants, floodplains also provide a habitat for many species of flora and fauna and so are key to preserving biodiversity.

¹⁰ A green roof is one that is partially or completely covered with vegetation. It serves several purposes such as absorbing rainwater, providing insulation, creating a habitat for wildlife, and helping to lower urban air temperatures so mitigating the heat island effect.

Water purification is another less known ecosystem service provided by floodplains. Floodplains are particularly efficient in combating excessive nitrogen loading from artificial fertilisers and the combustion of fossil fuels, which affects the quality of water in many places and is a major cause of water pollution. Excess nitrogen runs into rivers, streams, lakes and further downstream into estuaries and coastal zones causing eutrophication which results in excessive algae and, on occasion, in harmful cyanobacterial harmful algal blooms (CyanoHABs).

Once a floodplain is flooded during high water, it starts removing nitrogen. Using floodplains as temporary reservoirs at times of peak flow can, therefore, substantially increase the capacity of rivers to retain, process and remove nitrogen from water. As Map 75 shows, a number of river basins in the EU such as the Rhine or Meuse, can provide such a service to densely populated areas and cities. (The map shows the total nitrogen discharge of major European rivers and simulates the potential retention of nitrogen under a scenario of implementing a floodplain strategy.)

Map 7: Nitrogen discharge/retention from Europe's major rivers



Integrating floodplains as temporary reservoirs in times of peak flow increases substantially the capacity of the river network to retain, process and remove nitrogen from water. For instance, model simulations show that reconnecting floodplains to rivers in areas where this is possible is expected to reduce the total nitrogen load of river basins to European seas by 7% on average¹¹.

¹¹ Maes J. et al., 2012, *A spatial assessment of ecosystem services in Europe: methods, case studies and policy analysis - Phase 2, Synthesis*, PEER report no 4, Ispra, Partnership for European Environmental Research.

6. CONCLUSION

Cohesion policy has a major role to play in helping EU regions to adopt more sustainable modes of development and address the many environmental challenges they face in the future. The analysis set out in this chapter has highlighted the wide variations in the performance of EU regions with regards issues related to environment.

The impact of climate change will differ considerably from one region to another, according to its location but also to the main economic activities situated there, the features of its human settlements (e.g. urban as opposed to rural) and the characteristics of its population (e.g. young or old). This implies a need to adopt adaptive measures tailored to the local context in order to limit the devastating impact of climate change in all, but especially the most vulnerable regions.

EU regions can also play a major role in limiting the extent of climate change by contributing to the targets set out in the EU Climate and Energy Package. In particular, Cohesion Policy can help national, regional and local public authorities to reduce GHG emissions in the sectors not covered by the emissions trading scheme such as transport and buildings. It can also support the expansion of renewable energy supply and contribute to increase energy efficiency, notably in public buildings and public transport.

Many of such measures aiming for transport, energy efficiency and renewable energy fit also well in Air Quality Plans under Directive 2008/50/EC to reduce concentrations of Particulate Matter, NO₂ and ozone, leading to better health for citizens and less damage to crops, buildings and ecosystems.

Although the situation has improved over time, substantial efforts remain to be made to enhance the treatment of urban wastewater in many EU regions, both in the EU12 and the EU15. The same holds for waste management. Considerable progress has been made to increase recycling and energy recovery and to reduce landfill, but some regions still need major investment to increase their capacity to treat waste in a way which is less damaging to the environment.

In addition, Cohesion Policy can help EU regions to increase the quality of their environment. This is not only necessary to improve well-being in general but it can also lead to substantial benefits as sound ecosystems generally have positive effect on health and offer vital services such as clean drinking water, breathable air, carbon sequestration or regulation of water flows. Cohesion policy can help to improve air quality in the urban centres where it is needed and to restore the capacity of ecosystems to deliver their services where these have deteriorated. In this perspective, supporting investment in green infrastructure is particularly appealing since it is often an effective and cost-efficient solution while at the same time it contributes to achieving the objectives which the EU has set for limiting biodiversity loss.