Green infrastructure

Building a coherent Trans-European Nature Network

Despite a strong policy framework and significant efforts by Member States (MSs) to halt biodiversity loss and ecosystem degradation in Europe, the conservation status of protected species and habitats continues to decline along with the provision of ecosystem services. The new EU biodiversity strategy to 2030 addresses this decline with a plan to 'build a truly coherent Trans-European Nature Network'. This will be built on the existing Natura 2000 network by analysing the potential connectivity between Natura 2000 sites using green infrastructure (GI) landscape elements important for delivering ecosystem services.

Key messages

Natural and semi-natural landscape elements connecting Natura 2000 sites dominated by forest and woodland extend over 33 % of EU territory. Around 80 % of those Natura 2000 sites are connected by natural and semi-natural terrestrial ecosystems outside the Natura 2000 network (including agro-forestry areas). Of these 50 % are fully connected by contiguous patches of unprotected forest and woodland. Around 15 % of disconnected Natura 2000 sites are less than 1 km apart but intersected by highways limiting species movement and do not form part of a potential green infrastructure (GI) network.

The area of ecosystems providing multiple services to people in the 27 EU Member States in 2012[1] was around 4 % larger inside than outside the GI network[2]. The area of ecosystems providing at least one ecosystem service was almost 6 % higher inside than outside the GI network.

The maintenance of favourable conservation status of species of Community interest is very high inside and outside the GI network. However, the level of ecosystem pressure outside the GI network is higher than inside it in EU Member States. To prioritise GI, around 80 % of GI neighbouring regions could be linked to the network with little or very little management intervention.

This briefing is based on an integrated assessment developed by the EEA and its European Topic Centre on Urban, Land and Soil Systems (ETC/ULS). That assessment builds on the most recent spatial data and developments in methodology presented in a joint JRC and EEA report on strategic green infrastructure and ecosystem restoration. The integrated assessment maps a **GI network** of protected Natura 2000 sites[3] and unprotected natural and semi-natural terrestrial ecosystems (including agro-forestry) relevant for the movement of medium-large mammal species[4] at the EU level.

The assessment further analyses the connectivity between protected and unprotected areas, the ecosystem services provided[5] and the conservation status of these connecting areas[6]. It demonstrates that GI has co-benefits for people and for the conservation status of species and habitats.This is because the geographical areas covered by the GI network have higher conservation status than those not in the network. Because the GI is overlapping with protected areas (i.e. the Natura 2000 network), this impact is even higher. Protecting additional areas in this GI network could potentially boost the delivery of ecosystem services and decrease pressure on species and habitats.

However, natural and semi-natural unprotected landscape elements are also important in determining conservation status, as these areas serve as connectors. High-density landscape features, in particular small woody features, could play a key role in this in agricultural areas, as proposed in the new strategy. The work highlights opportunities for strengthening the existing GI network and its capacity to deliver multiple ecosystem services.

The work summarised in this briefing contributes to methodologies for and approaches to building a network of and between protected areas. The network will be extended to meet the 30 % target under the biodiversity strategy to 2030 to by restoring protected and unprotected areas and managing them more

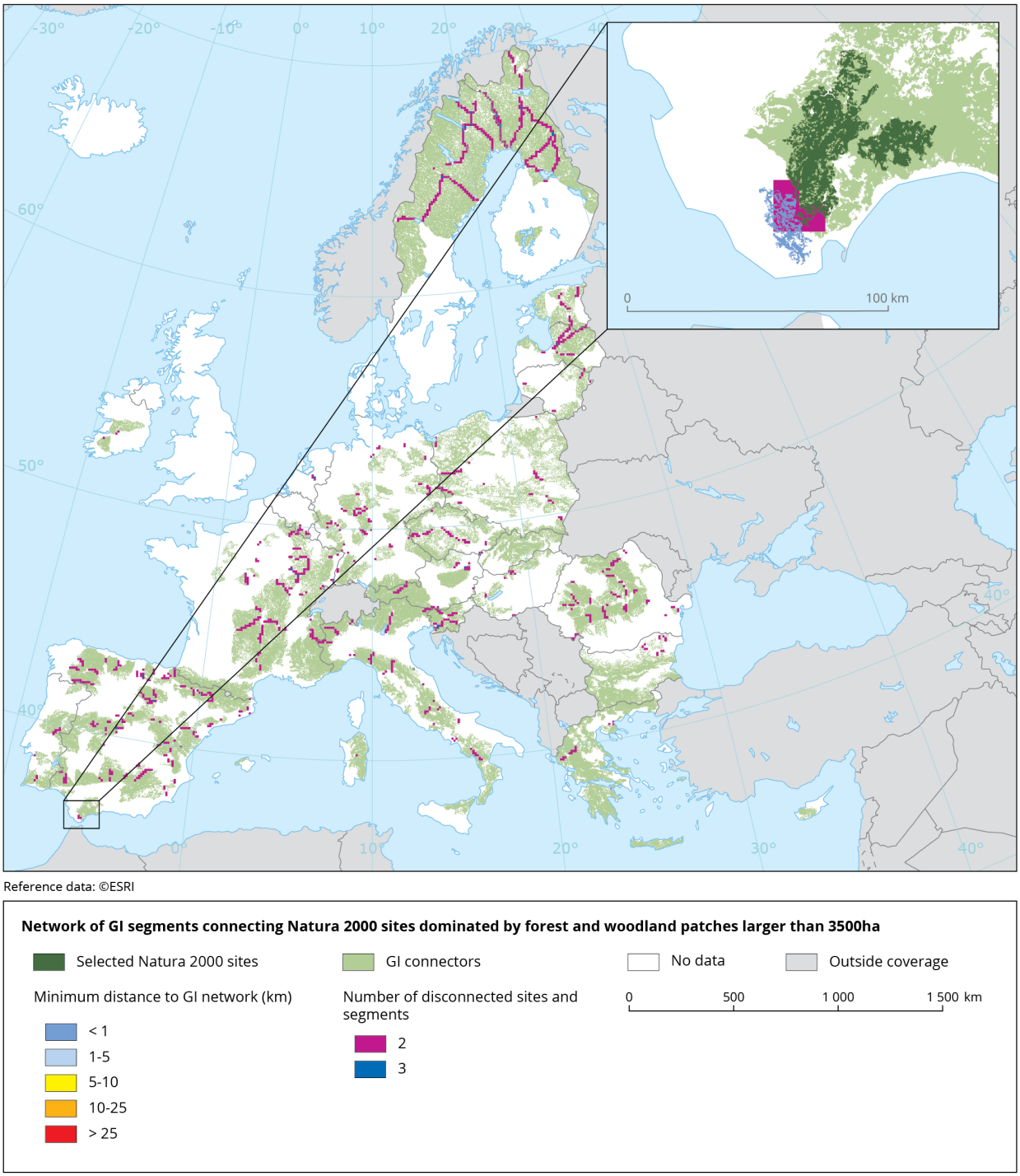
efficiently to increase the provision of ecosystem services. The existing elements of GI will be key elements in the network.

To what extent are Natura 2000 sites connected?

Around 80 % of Natura 2000 sites, dominated by woodland and forest — the backbone of the GI network — are connected by natural and semi-natural features in the 'wider landscape' (not part of the Natura 2000 sites) across the 27 EU MSs (EU-27)[7] (Figure 1). Of these sites, more than 50 % are connected by contiguous patches of unprotected forest and woodland ecosystems. Around 20 % of the Natura 2000 sites dominated by woodland and forests are not connected because they are fragmented by urban areas or agricultural land.

Figure 1 indicates that many of the breaks in the GI network are in the south-western and eastern regions of Europe, in particular in the Iberian Peninsula and the Carpathian region. This pattern is also seen to a lesser extent in the Grand Est region of France bordering Luxembourg because of the dense road network. Figure 1 indicates that about 15 % of the disconnected forest and woodland Natura 2000 sites are less than 1 km from mapped GI segments.

Figure 1. Network of GI segments connecting Natura 2000 sites dominated by forest and woodland patches larger than 3 500 ha



Note: Network discontinuities impeding links between GI segments and/or unconnected Natura 2000 sites within 10 km are shown in purple. Unconnected Natura 2000 sites closer than 1 km to an individual segment of the GI network are shown in blue.

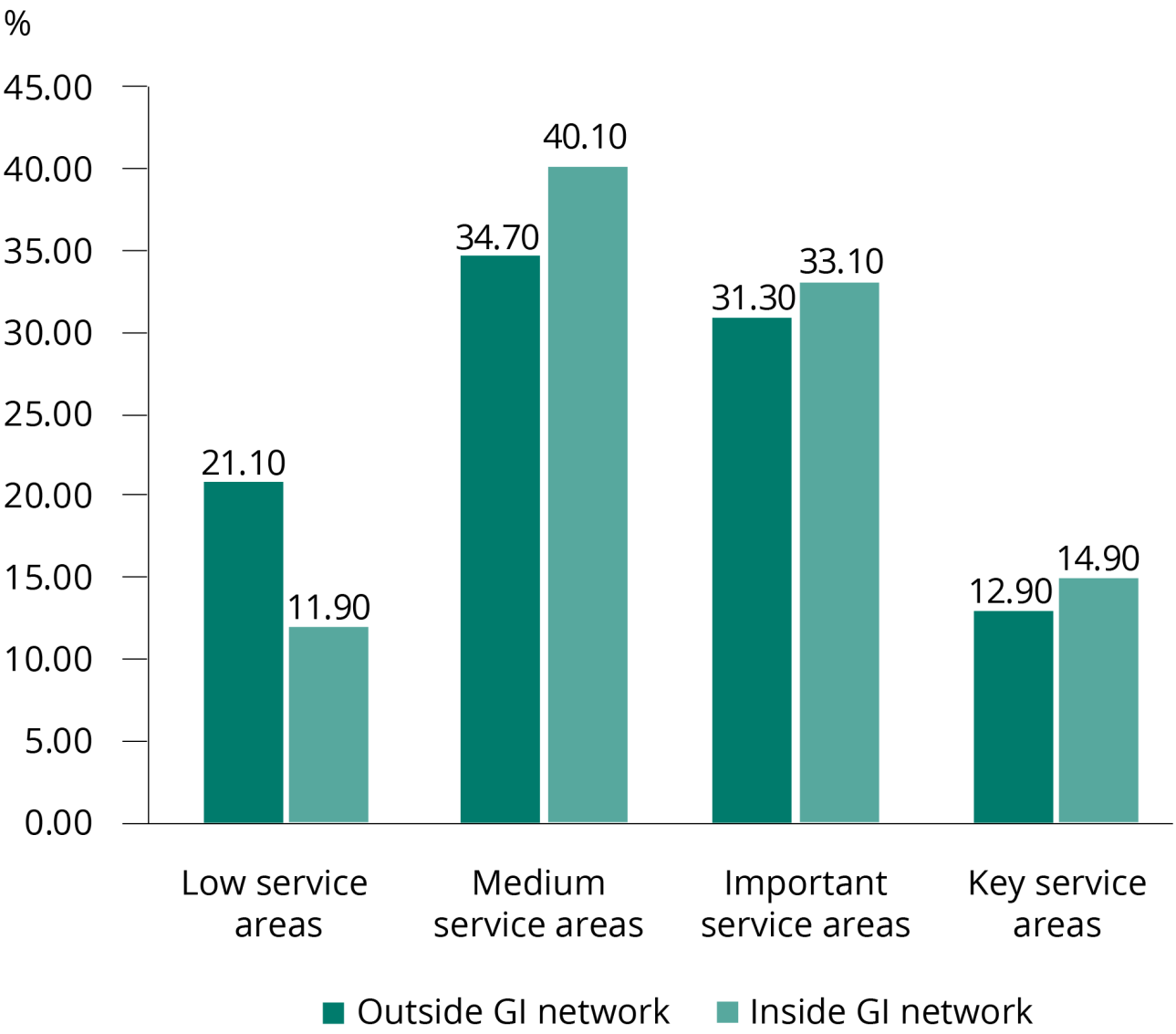
Source: https://www.eea.europa.eu/themes/biodiversity/green-infrastructure/building-a-coherent-trans-european/contributions-to-building-a-coherent/view

What is the capacity of key ecosystem services to deliver multiple co-benefits to people?

Around 70 % of the EU-27 territory is covered by ecosystems providing medium and important service areas, i.e. one or two of the three key services (pollination, flood control and recreation) to people in the same area.[8] However, there are more areas providing no services than those providing three services simultaneously.

Figure 2 shows that the GI network improves the provision of multiple ecosystem services in an area by almost 4 % compared with areas not included in the GI network (Figure 1). In addition, provision of at least one ecosystem service in medium service areas also increases by almost 6 % inside the GI network compared with outside the network. These results highlight the capacity of connected Natura 2000 sites to provide around 10 % more co-benefits to people compared with unprotected and disconnected landscape elements.

Figure 2. Distribution of multiple ecosystem services in areas outside (a) and inside (b) the GI network mapped in Figure 1



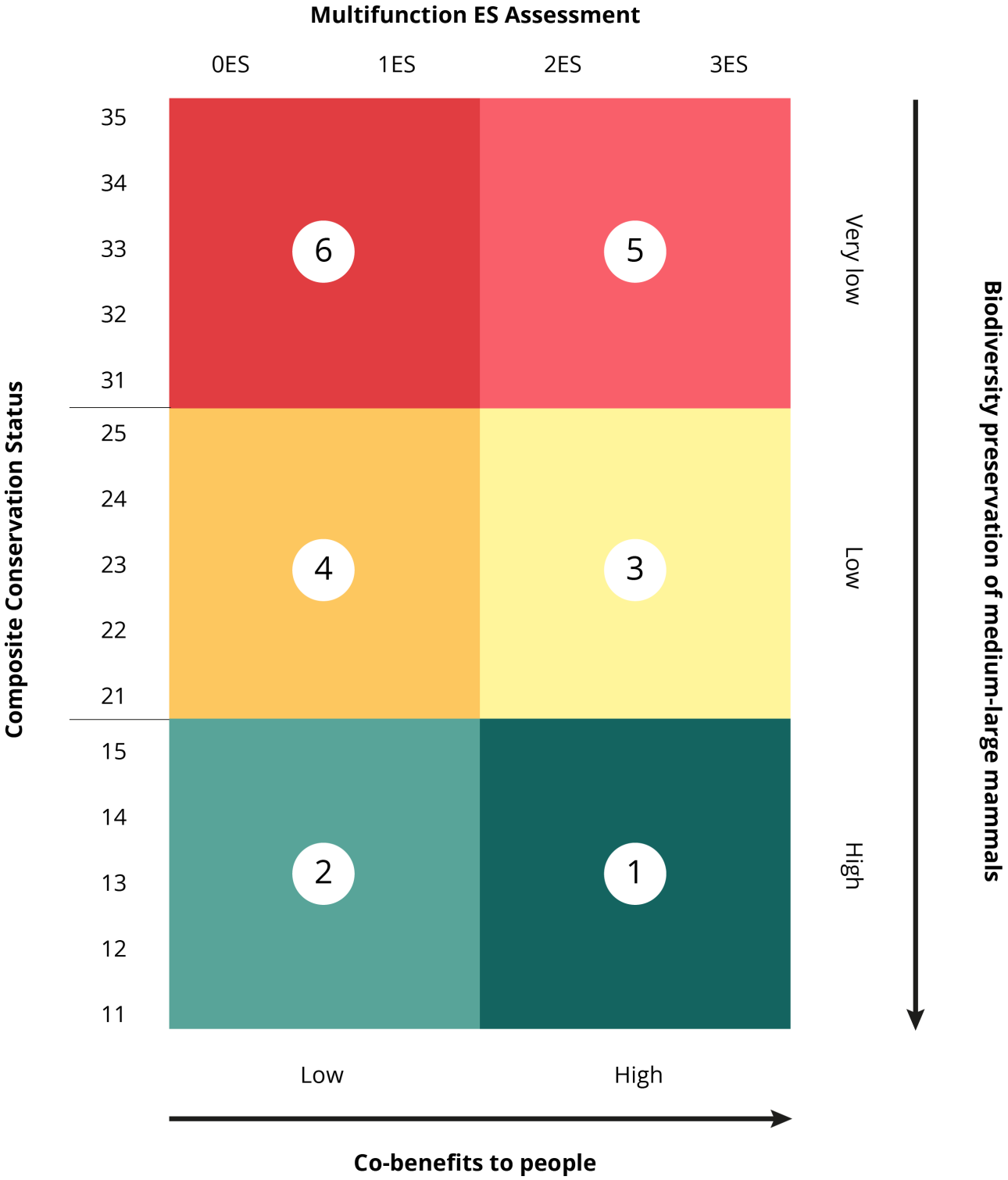
Note: Please see the main study for a detailed description of the classes presented in the plots.

Source: https://www.eea.europa.eu/themes/biodiversity/green-infrastructure/building-a-coherent-trans-european/contributions-to-building-a-coherent/view

Prioritising green infrastructure in the EU

Six prioritisation levels[9] are proposed for **conserving** existing biodiversity-rich ecosystems in good condition and **restoring** degraded ecosystems inside and outside the GI network. These levels enable to map where GI should be maintained, more effective managed, restored or further deployed inside and outside the Natura 2000 network. The prioritisation framework is based on a decision matrix that estimates the capacity of the GI network to simultaneously supply multiple ecosystem services and secure biodiversity conservation, with a special focus on areas that connect protected Natura 2000 sites (see Figure 3).

Figure 3. The proposed prioritization framework for measuring biodiversity preservation and the co-benefits of GI



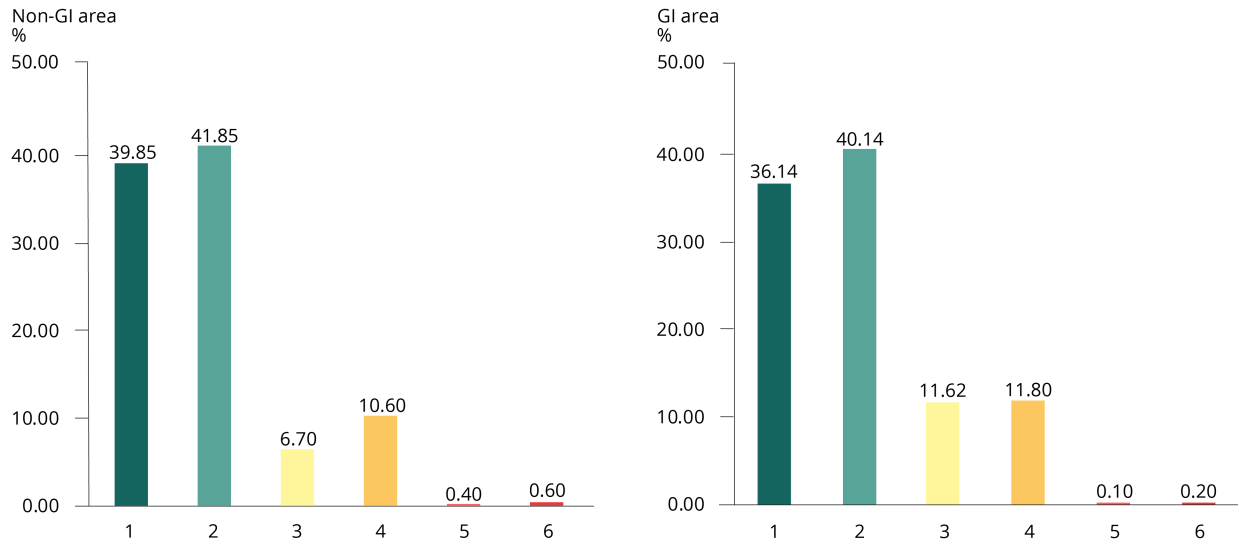
> **Source**: https://www.eea.europa.eu/themes/biodiversity/green-infrastructure/building-a-coherent-trans-european/contributions-to-building-a-coherent/view

This involves assessing the level of ecosystem pressure and need for management, on the one hand, and the probability of biodiversity being maintained or recovering, on the other.

Figure 4 shows that the likelihood of maintaining favourable conservation status is very high for selected mammal species inside and outside the GI network (levels 1 and 2). Moreover, approximately 80% of areas classified as levels 1 and 2 outside the GI network should be able to be included in the GI network with little or very little management. More important, however, is the fact that the areas inside the GI network seem to be subject to less ecosystem pressure (i.e. the percentage of areas under levels 5 and 6 prioritisation) then the areas outside the network.

A closer analysis of the results shows that levels 1 and 2 predominate in the Baltic countries, Poland, Slovakia, the Carpathian region, the central territory of Austria, the Spanish Extremadura region and the Pyrenees. Therefore, the GI elements in these areas should need little additional conservation management. However, this does not mean that there is no need to develop monitoring systems to mitigate and prevent future pressures on ecosystem condition and the conservation status of selected mammal species in those areas.

Figure 4. Distribution of priority interventions in areas outside (a) and inside (b) the GI network



Note: Please see Figure 3 and the main report for a detailed description of the GI prioritisation levels.

Source: https://www.eea.europa.eu/themes/biodiversity/green-infrastructure/building-a-coherent-trans-european/contributions-to-building-a-coherent/view

Major areas with low ecosystem services provision and unfavourable conservation status (i.e. levels 5 and 6) within the GI network are very few (less than 1 %). They are located in the north-eastern region around Paris, on Hungary's northern border, around Pamplona in the north of Spain and in south-central Spain. Although some of these areas provide co-benefits to people, most need urgent protection measures, such as local restoration plans, to re-establish the favourable conservation status of some mammals, e.g. the Iberian lynx in Spain, and to improve the type and quality of co-benefits for people.

The remaining GI segments across the EU-27 territory have a medium capacity to sustain the conservation status of selected mammals and simultaneously provide co-benefits to people by regulating ecosystem services. The

ecosystems covered by these GI elements are subject to pressures that need to be identified and reduced to restore their biodiversity and ability to provide multiple ecosystem services.

Potential ways forward in developing a Trans-European Nature Network

Deploying GI more effectively to meet the key commitments in the biodiversity strategy to 2030, in particular restoring ecosystems and establishing a Trans-European Nature Network (TEN-N), will need an EU framework for developing, managing, assessing and monitoring the GI network.

The results of the EEA work suggest that a holistic approach using spatial data to identify, select and manage GI priority areas essential for the network's connectivity will ensure its delivery of multiple ecosystem services. It will also contribute to achieving and maintaining good conservation status of species and habitats. To define the ecosystem services benefiting from this approach we need to specify the composition and needs of species and habitats. Threatened species (those under the nature directives or specified in the International Union for the Conservation of Nature Red List) need healthy ecosystems outside protected areas and rely on habitats not protected by Annex I of the Habitats Directive.

The GI priority areas identified may or may not already have protected status. Depending on its level and type of protection, GI can fall under different types of ownership and have diverse levels of biodiversity or other competing priorities. In these cases, there are various interventions that could be applied:

- Designate the GI element as a protected area to meet the 30 % target of the biodiversity strategy to 2030.
- Restore the area to improve the habitat condition and delivery of ecosystem services.

- Create new connecting landscape elements to physically or functionally connect existing GI elements. This can be done as part of environmental and sustainability measures implemented under the common agricultural policy and rural development planning.
- Maintain and manage the area in a sustainable way by defining and implementing targeted conservation measures, which may allow various types of low-impact land uses.

Such interventions should primarily improve biodiversity, but they can also be designed to contribute to other goals, e.g. adapting to climate change and improving human health. The upcoming EU restoration plan is an opportunity to include these interventions in a catalogue of measures for GI priority areas and provide guidance to MSs on planning measures. Local and regional conditions need to be considered in decision-making and drawing up recommendations and targeted actions.

Systematic assessment and frequent monitoring of the GI network at the EU level (linked to the assessment of the conservation status of habitats and species and of ecosystem services) could be established under the new plan to create a governance system for biodiversity. This will enable assessment of the performance of the TEN-N and its GI elements and highlight gaps and remaining needs in terms of natural habitats and species condition.

Footnotes

1 EU-27 in 2012, i.e. before Croatia joining the EU.

2 The GI network is composed of core areas defined as Natura 2000 network sites and all the other natural and semi-natural landscape elements connecting them.

3 Natura 2000 sites covered mainly by ‘forest and woodland’ MAES ecosystems (Maes et al, 2013) were considered the backbone of the GI network.

4 Medium-large mammal species were selected as the network functional group for connectivity analysis, provided that they meet the following criteria in particular: (1) considered for reporting under Article 17 of the Habitats Directive; (2) in need of spatial connectivity, transboundary and forest and woodland should be at least one of their preferred habitats. Transboundary species is defined as species that can be found in two or more countries.

5 Three regulating and cultural ecosystem services were taken into consideration to evaluate the multifunctionality of the network, namely (1) pollination potential, (2) flood control potential and (3) recreation potential.

6 Based on existing data at different spatial resolutions. Conservation status is at a resolution of 10 km 10 km, so there is variability inside each cell and the outcomes are applicable only at that spatial resolution.

7 EU-27 is the EU-28 minus Croatia, which did not join until 1 July 2013. From 1 February 2020, the EU-27 will mean the EU-28 minus the UK.

8 Service areas were defined according to multifunctionality at each location: low service areas — all ecosystem service values below average; medium service areas — one service above average; important service areas — two services above average; key service areas — all services above average.

9 Pressure prevention and/or minimisation (1); low-level management of pressure (2); prompt protection and/or restoration (3); active pressure reduction (4); urgent protection and restoration (5); fast-track management intervention (6).

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