



© Wild Wonders of Europe / Diego Lopez / WWF

## BRIEFING PAPER

# NATURE RESTORATION - THE MISSING PIECE IN THE EU CLIMATE ACTION PUZZLE

FEBRUARY 2022

## ANALYSIS OF THE CLIMATE MITIGATION POTENTIAL OF RESTORING HABITATS OF EU IMPORTANCE

### SUMMARY

Designed right, the upcoming EU nature restoration law can be a game-changer not only for addressing biodiversity loss but also the climate crisis. According to a new study by the Institute for European Environmental Policy (IEEP), commissioned by WWF, restoring degraded habitats that fall under the EU Habitats Directive could sequester 84 million tonnes of carbon (MtC) – or around 300 million tonnes of carbon dioxide – a year, equivalent to the annual GHG emissions of Spain or the combined emissions of the Benelux countries, or the current carbon sequestration by the entire EU land use, land-use change and forestry (LULUCF) sector.

For this to happen, the law must be ambitious, timely and enforceable. The study's findings point to the urgency of taking restoration action, as some habitats will take decades to improve and re-establish carbon cycling. This clearly shows why restoration needs to be accelerated and given immediate priority, and why the bulk of efforts must occur by 2030 and should not be postponed to 2040 or 2050.

The study further highlights the importance of increasing efforts to protect habitats that are not degraded, to preserve their existing carbon stocks. It also points to the huge benefits that restoring habitats that go beyond the scope of the EU Habitats Directive would have for climate action. In particular, rewetting drained organic soils that are currently under agricultural use could decrease emissions by more than 104 million tonnes of avoided CO<sub>2</sub> emissions – equivalent to the annual GHG emissions of countries like Austria or Romania.

This briefing covers the key findings of the study and provides policy recommendations for the upcoming EU nature restoration law.

### CONTENTS

<b>SUMMARY</b>	<b>1</b>
<b>INTRODUCTION</b>	<b>2</b>
<b>KEY FINDINGS</b>	<b>2</b>
Restoring Annex 1 habitats has a huge potential for climate mitigation but urgent implementation is needed	2
Restoration must go hand in hand with protection of intact habitats	3
Which ecosystems to prioritise?	4
Beyond Annex 1: Significant potential for carbon benefits	5
<b>CONCLUSIONS AND KEY RECOMMENDATIONS FOR POLICYMAKERS</b>	<b>6</b>



## NATURE RESTORATION - THE MISSING PIECE IN THE EU CLIMATE ACTION PUZZLE

### INTRODUCTION

Protecting and restoring nature and well-functioning ecosystems is a fundamental tool in tackling the twin crises of biodiversity loss and climate change, the effects of which are already hitting us today. The joint report<sup>1</sup> by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) and the Intergovernmental Panel on Climate Change (IPCC) finds that ambitious land and ocean-based actions to protect, sustainably manage and restore ecosystems offer co-benefits for climate mitigation, climate adaptation and biodiversity objectives. They can also help keep temperature rise within the limits envisioned by the Paris Agreement, provided that such actions support, rather than replace, ambitious reductions of emissions from fossil fuels and land-use change.

The European Commission is currently working on legally binding EU nature restoration targets to restore biodiversity and degraded ecosystems. This nature restoration law, which the Commission is expected to propose in March 2022, is a once-in-a-decade opportunity to contribute to halting and restoring biodiversity loss and tackling climate change.

WWF European Policy Office commissioned a study<sup>2</sup> by IEEP to review the carbon storage and sequestration potential of habitat types for which the European Union has a particular responsibility (defined by the EU Habitats Directive as “Annex 1 habitats”<sup>3</sup>) and to examine the feasibility of prioritising these habitat types to maximise their co-benefits of carbon removal and biodiversity conservation. The study uses information on the carbon storage and sequestration information of Annex I habitats, based on a literature review conducted for the European Environment Agency (EEA)<sup>4</sup>.

In this briefing paper, WWF highlights some of the key findings of the study and their relevance for the EU nature restoration law.

“...ambitious land and ocean-based actions to protect, sustainably manage and restore ecosystems offer co-benefits for climate mitigation, climate adaptation and biodiversity objectives...”

Scientific outcome of the IPBES-IPCC co-sponsored workshop on biodiversity and climate change

### KEY FINDINGS

#### **Restoring Annex 1 habitats has a huge potential for climate mitigation but urgent implementation is needed**

According to the IEEP study, if Annex 1 habitats for which enough information is available (excluding sparsely vegetated and marine habitats), and which are in bad and unknown condition, were to be restored (47.2 Mha),

1 IPBES and IPCC (2021). Scientific outcome of the IPBES-IPCC co-sponsored workshop on biodiversity and climate change. IPBES secretariat, Bonn, Germany..

2 Kopsieker, L., Costa Domingo, G., Underwood, E. (2022). Climate mitigation potential of large- scale restoration in Europe. Analysis of the climate mitigation potential of restoring habitats listed in Annex 1 of the Habitats Directive. Institute for European Environmental Policy, Brussels, Belgium.

3 Under the EU Habitats Directive Annex I lists today 233 European natural habitat types, including 71 priority types (i.e. habitat types in danger of disappearance and whose natural range mainly falls within the territory of the European Union): [https://ec.europa.eu/environment/nature/legislation/habitatdirective/docs/Int\\_Manual\\_EU28.pdf](https://ec.europa.eu/environment/nature/legislation/habitatdirective/docs/Int_Manual_EU28.pdf)

4 Hendriks, Kees, Susan Gubbay, Eric Arnts and John Janssen, (2020). Carbon storage in European ecosystems; A quick scan for terrestrial and marine EUNIS habitat types. Wageningen, Wageningen Environmental Research, Internal Report. 66 pp.; 22 fig.; 22 tab.; 77 ref.

© Wild Wonders of Europe / Diego López / WWF

**When restored, the Annex 1 habitats that are currently in degraded condition could sequester around 300 million tonnes of carbon dioxide equivalent a year.**

they could sequester as much as 84 million tonnes of carbon (MtC) – or around 300 million tonnes of carbon dioxide ( $\text{CO}_2$ ) equivalent – a year. This is around the same as the annual GHG emissions of Spain or the combined emissions of the Benelux countries, and roughly equivalent to the current net removal of  $\text{CO}_2$  from the atmosphere by the entire EU land use, land-use change and forestry (LULUCF) sector.

The authors stress that this number is not an exact figure but, based on available data, it illustrates the magnitude and potential of restoring these habitats in terms of climate mitigation. In cases where the degraded

Annex 1 habitats are currently emitting carbon – as is the case for drained peatlands – the number could be much higher, while for those that are sequestering carbon (which is likely happening in forest habitats, even when degraded), it could be lower.

The estimates by IEEP reflect those from an assessment conducted by the United Nations Environment Programme (UNEP) on a global scale<sup>5</sup>, suggesting that even if the figures might not be exact, they are still within the same order of magnitude.

The study also highlights the urgency of nature restoration, as it can take decades to improve the state of certain habitats and re-establish their potential for carbon cycling. In the face of the ongoing climate and nature emergencies, this shows that the EU needs to implement restoration actions as soon as possible, and that the bulk of the efforts must occur by 2030 and should not be postponed to 2040 or 2050.

**The EU needs to implement restoration actions as soon as possible. The bulk of the efforts must occur by 2030 and should not be postponed to 2040 or 2050.**

## Restoration must go hand in hand with protection of intact habitats

Annex 1 habitats for which enough information is available (excluding sparsely vegetated and marine habitats) hold an estimated 5,564 MtC to 17,807 MtC on 87 Mha. These habitats are hugely important carbon stocks that must be protected. This is even more relevant as about two-thirds of the terrestrial Annex 1 habitats are

located outside the Natura 2000 network and are therefore not formally protected.

**Ensuring continued and strict protection is necessary to preserve the large carbon stocks held in old, undisturbed habitats.**

Ensuring continued and strict protection is necessary to preserve the large carbon stocks held in old, undisturbed habitats. The so-called passive restoration – through strict protection and elimination of all types of pressures, – is often the most effective way to restore ecosystems and is the best restoration measure for many marine habitats and mature natural forests.

<sup>5</sup> The IEEP researchers compared their calculations to estimates by UNEP. UNEP found that restoring 350 Mha globally could capture as much as 13-26 gigatons of greenhouse gases out of the atmosphere. This would put the order of magnitude within a similar range to the estimates by IEEP.

UNEP (2019). New UN Decade on Ecosystem Restoration offers unparalleled opportunity for job creation, food security and addressing climate change. Nature Action. Press release. Accessed on: 25/11/2021. Available at: <https://www.unep.org/news-and-stories/press-release/new-un-decade-ecosystem-restoration-offers-unparalleled-opportunity>

© Wild Wonders of Europe / Diego López / WWF

Left undisturbed, marine sediments, the largest pool of organic carbon on the planet, can store carbon for thousands of years. Marine Protected Areas (MPAs) that restrict harmful human activities, like bottom trawling or dredging, have been found to be a highly effective tool in securing marine carbon stocks, as well as protecting biodiversity and boosting fisheries yield.<sup>6</sup>

Old-growth and mature forests typically have higher carbon stocks per hectare than other forests in similar environments. In addition, evidence shows these forests continue accumulating carbon long after they have reached maturity, meaning that they can remain active carbon sinks for centuries<sup>7</sup>.

## Which ecosystems to prioritise?

Forests and wetlands are widely seen as the most effective ecosystems to restore in terms of carbon benefits, and this is confirmed by the IEEP study.

The authors conclude that habitats that have a large spatial extent, are highly degraded and have high carbon sequestration rates, have the highest potential for carbon gains. In the EU, these include forests such as beech forests and the western taiga<sup>8</sup>, as well as wetlands such as bog woodlands<sup>9</sup> and the aapa mires<sup>10</sup>.

**Forests and wetlands are widely seen as the most effective ecosystems to restore in terms of carbon benefits.**

## Coastal wetlands can accumulate carbon over much longer periods than most terrestrial habitats.

Intact wetlands, and in particular peatlands, are important habitats in terms of carbon sequestration and storage. Although the carbon sequestration rates per hectare of most peatland habitats are smaller than those of forest habitats, carbon stocks are proportionally higher as they continuously accumulate carbon in growing peat layers. Wetlands have the highest carbon stocks of any terrestrial habitat making them a key ecosystem for carbon storage. Globally, they contain 30% of the total organic soil carbon despite covering only around 5-8% of the world's surface area<sup>11</sup>. Degraded peatlands are a major source of GHG emissions making them a priority for restoration, with the largest climate benefits of rewetting peatlands due to avoided emissions.

Coastal wetlands, such as estuaries, salt marshes and coastal lagoons, are also important carbon sinks, as they can accumulate carbon over much longer periods than most terrestrial habitats<sup>12</sup>.

6 Sala, E., Mayorga, J., Bradley, D., Cabral, R. B., Atwood, T. B., Auber, A., ... & Lubchenco, J. (2021). Protecting the global ocean for biodiversity, food and climate. *Nature*, 592(7854), 397-402.

7 Barredo, J.I., Brailescu, C., Teller, A., Sabatini, F.M., Mauri, A. Janouskova, K, Mapping and assessment of primary and old-growth forests in Europe, EUR 30661 EN, Publications Office of the European Union, Luxembourg, 2021, ISBN 978-92-76-34230-4, doi:10.2760/797591, JRC124671

8 Boreal forest habitat type, including both natural old forests as well as young forest stages naturally developing after fire. <https://eunis.eea.europa.eu/habitats/10176>

9 A type of wetland with the largest spatial extent in the EU, consisting of coniferous and broad-leaved forests on a humid to wet peaty substrate. <https://eunis.eea.europa.eu/habitats/10197>

10 Boreal fen habitat. <https://eunis.eea.europa.eu/habitats/10154>

11 Xu, J., Morris, P.J., Liu, J et al. (2018) PEATMAP: Refining estimates of global peatland distribution based on a meta-analysis. *CATE-NA*, 160. pp. 134-140. ISSN 0341-8162

12 Mcleod, E., Chmura, G.L., Bouillon, S., Salm, R., Björk, M., Duarte, C.M., Lovelock, C.E., Schlesinger, W.H. and Silliman, B.R. (2011), A blueprint for blue carbon: toward an improved understanding of the role of vegetated coastal habitats in sequestering CO<sub>2</sub>.



## NATURE RESTORATION - THE MISSING PIECE IN THE EU CLIMATE ACTION PUZZLE

The same is true for other marine ecosystems that were excluded from the IEEP analysis due to the lack of information at a habitat level. For example, seagrass can bury carbon more effectively per hectare than tropical rainforests<sup>13</sup>, but this incredible sequestration capacity is weakened in degraded habitats. This means that despite its challenges, seagrass restoration can deliver high climate benefits<sup>14 15</sup>.

Although restoring other ecosystems such as grasslands and heathland delivers comparatively smaller carbon sequestration benefits, their restoration potential should not be neglected. These ecosystems cover large areas of the EU, and their restoration can deliver many other important co-benefits.

The following key factors must be considered when prioritising Annex I habitats for restoration for carbon benefits:

- Whether protection of the existing habitat to eliminate pressures (“passive” restoration) is more efficient for protecting carbon stocks and sequestration than “active” restoration.
- Potential trade-offs between biodiversity conservation and carbon capture and storage. For Annex I habitats, restoring the biodiversity value of the habitat should be the primary objective, short-term carbon sequestration should never come at the cost of biodiversity or longer-term, resilient carbon storage.
- Feasibility of restoration, including site conditions, the time needed to achieve restoration and the needed investment and benefits of restoration actions. Given the wide range of co-benefits provided by nature restoration, its benefits are 10 times higher than the costs<sup>16</sup>.

It is important to ensure that long-term monitoring is in place on restored sites and that pressures have been eliminated, to secure the permanence of the carbon gains resulting from restoration measures.

The available data on carbon sequestration potential, carbon flows and carbon stocks is still limited. This is especially the case for marine habitats but also for coastal and tundra ecosystems. More research is needed on the carbon benefits of ecosystem restoration and the timescales over which such benefits could be realised for some of those lesser-known ecosystems or habitat types. However, this should not be a reason to postpone the urgent restoration action also for those ecosystems.

**Data on carbon sequestration potential, carbon flows and carbon stocks is still limited. This is especially the case for marine habitats but also for coastal and tundra ecosystems.**

### Beyond Annex 1: Significant potential for carbon benefits

There is a huge potential for carbon benefits from restoring land and sea areas that are not listed as Annex I habitats and the nature restoration law should also include targets for them. These include marine habitats

Frontiers in Ecology and the Environment, 9: 552-560. <https://doi.org/10.1890/110004>

- 13 Mcleod, E., Chmura, G.L., Bouillon, S., Salm, R., Björk, M., Duarte, C.M., Lovelock, C.E., Schlesinger, W.H. and Silliman, B.R. (2011), A blueprint for blue carbon: toward an improved understanding of the role of vegetated coastal habitats in sequestering CO<sub>2</sub>. Frontiers in Ecology and the Environment, 9: 552-560. <https://doi.org/10.1890/110004>
- 14 Oreska, M.P.J., McGlathery, K.J., Aoki, L.R. et al. The greenhouse gas offset potential from seagrass restoration. Sci Rep 10, 7325 (2020). <https://doi.org/10.1038/s41598-020-64094-1>
- 15 Macreadie, P.I., Costa, M.D.P., Atwood, T.B. et al. Blue carbon as a natural climate solution. Nat Rev Earth Environ (2021). <https://doi.org/10.1038/s43017-021-00224-1>
- 16 IPBES (2018). Summary for policy makers of the assessment report on land degradation and restoration. <<https://www.ipbes.net/document-library-catalogue/summary-policymakers-spm-land-degradation-and-restoration-laid-out>>



© Wild Wonders of Europe / Diego López / WWF

## NATURE RESTORATION - THE MISSING PIECE IN THE EU CLIMATE ACTION PUZZLE

### The other priority of the restoration law should be the rewetting of drained organic soils under agricultural use.

like soft-bottom and sediment habitats, together with their associated communities of fauna and flora.

Besides restoring Annex 1 habitats, the other priority of the restoration law should be the rewetting of drained organic soils under agricultural use. Such soils cover around 52,000 km<sup>2</sup> in the EU, including both grassland and cropland, and are currently a major source of carbon emissions.

Rewetting these soils could lead to decreases in emissions of around 20 tonnes CO<sub>2</sub> equivalent per hectare per year (ha<sup>-1</sup> yr<sup>-1</sup>), or 104 million tonnes of avoided CO<sub>2</sub> emissions per year in total<sup>17</sup>. This is more than the annual GHG emissions of countries like Austria or Romania.

The EU Biodiversity Strategy for 2030 includes a target to bring back at least 10% of agricultural area under high-diversity landscape features. This will play an important role in biodiversity conservation and contribute to carbon sequestration in managed landscapes, but will also support climate adaptation and increase the resilience of landscapes towards extreme weather events. For example, the carbon sequestration potential from agroforestry practices on European farmland has been estimated to range between 0.09 and 7.29 t C ha<sup>-1</sup> depending on the type of agroforestry (i.e., hedgerows, alley cropping, orchards with fruit trees and pollinator habitats)<sup>18</sup>.

### CONCLUSION AND KEY RECOMMENDATIONS FOR POLICYMAKERS

The IEEP study clearly shows the huge role large-scale nature restoration can play in helping tackle climate change. It also highlights how important it is to protect the existing carbon stock from further deterioration.

To fully reap the potential benefits of nature restoration for climate change, the upcoming EU nature restoration law must:

**The IEEP study clearly shows the huge role large-scale nature restoration can play in helping tackle climate change.**

- ▶ Include a **robust and understandable EU headline target**, overarching the individual ecosystems (and species) specific targets. This is indispensable to mobilise Member States' actions at the required scale. This headline target must be a clear numerical target, to create legal certainty for speedy and effective implementation. WWF advocates for a headline target to **restore at least 15 % of the EU land and sea area, as well as 15% of river length by 2030**, to which all underlying ecosystem specific targets should contribute. That would mean the restoration of 650,000 km<sup>2</sup> on land, 1,000,000 km<sup>2</sup> of marine EU area and 178,000 km of rivers.
- ▶ Respond to the urgency of tackling the biodiversity and climate crises by setting targets that will result in large scale nature restoration in the coming decade, and **not postpone the bulk of the restoration actions to 2040 or 2050**.
- ▶ Focus on **creating new nature areas beyond the Annex 1 habitats** of the EU Habitats Directive. The most obvious measure that will have a big co-benefit in terms of climate mitigation is the rewetting of all drained organic soils currently under agricultural use.

<sup>17</sup> Glenk, K. & Martin-Ortega, J. (2018). The economics of peatland restoration. Journal of Environmental Economics and Policy, 7(4) 345-362.

<sup>18</sup> Kay, S., Rega, C., Moreno, G., den Herder, M., Palma, J. H., Borek, R., ... & Herzog, F. (2019). Agroforestry creates carbon sinks whilst enhancing the environment in agricultural landscapes in Europe. Land use policy, 83, 581-593.



© Wild Wonders of Europe / Diego Lopez / WWF

## NATURE RESTORATION - THE MISSING PIECE IN THE EU CLIMATE ACTION PUZZLE

- **Include safeguards** to ensure the restoration and protection of any restored habitats and the associated carbon gains are permanent.

The IEEP study also highlights the big carbon stock currently held in Annex 1 habitats. It is important to protect these habitats from deterioration and to strictly protect the most vulnerable biodiversity and carbon-rich habitats.

The commitments in the EU Biodiversity Strategy – to strictly protect 10% of the EU land and sea area by 2030 and to strictly protect all remaining old-growth and primary forests in Europe – should be urgently implemented. Measures should also be taken to ensure that potential old-growth forests are not logged while the process to identify them and put the protection regime in place is ongoing.

Lastly, for marine ecosystems, strict protection is often the most effective restoration measure. It allows time and space for the recovery via passive restoration of these ecosystems, their natural processes and fish stocks, including those that are commercially fished. These benefits alone make it obvious that the new restoration law should facilitate the integration of strict protection targets in the EU. It will help to create legal certainty concerning the commitment to strictly protect land and sea to allow natural processes to develop.

### For more information

Sabien Leemans  
Senior Biodiversity Policy Officer  
[sleemans@wwf.eu](mailto:sleemans@wwf.eu)

Bartosz Brzezinski  
Communications Officer on Biodiversity  
and Agriculture Policies  
[bbrzezinski@wwf.eu](mailto:bbrzezinski@wwf.eu)



Working to sustain the natural world for the benefit of people and wildlife.

together possible. [wwf.eu](http://wwf.eu)

WWF European Policy Office, 123 rue du Commerce, 1000 Brussels, Belgium.

WWF® and World Wide Fund for Nature® trademarks and ©1986 Panda Symbol are owned by WWF-World Wide Fund For Nature (formerly World Wildlife Fund). All rights reserved.