Support to the coordination of national research and innovation programmes in areas of activity of the European Energy Research Alliance

SUPEERA

Policy Brief

EU BIODIVERSITY STRATEGY

CHALLENGES AND OPPORTUNITIES AHEAD

Setting the scene

Two years after the launch of the European Green Deal, the European Union has made substantial steps forward in its efforts to promote the green transition. The publishing of the Fit for 55 package in 2021 is the most telling example of this endavour and the finalisation and roll out of the legislative proposals therein contained in the next years will be crucial to attain the 2030 and 2050 EU climate goals.

The year 2022 initally marked a crucial moment for European research, and the EU in general, signalling the halfway point of the current European Commission and European Parliament terms, but also the start of the Horizon Europe Missions. Nonetheless, it has already become a watershed point in energy research and management in the EU due to the unfolding of two major crises: the rise in energy prices and the war in Ukraine led by Russia. The two are highly intertwined and pose serious challenges to energy security in Europe.

Efforts to increase the autonomy of the EU in energy terms will be undermined without the active participation and support of the research community. Only by combining state of the art research with careful policymaking the EU will be able to reach its ambitious goal of detaching from Russian fossil fuels by 2030 and becoming climate neutral by 2050. The research community has a pivotal role to play in this process, supporting identified political priorities with empirical findings and developments. It can also advise policymakers on the way forward through fundamental research, particularly focused on low TRLs, to advance breakthrough technologies, materials, and systemic approaches. Crucial in this effort will be the participation of the industrial sector, without which developments will be unattainable. In particular with the new objectives posed by REPowerEU, a close interaction between research, industry and Member States will be more fundamental than ever.

In the context of the SUPEERA project, a series of policy briefs are currently being developed to identify concrete R&I challenges in EU policies relevant to the energy research community. The final goal is to support the achievement of the Clean Energy Transition (CET). This policy brief focuses on the EU Biodiversity Strategy for 2030, published by the European Commission in May 2020 as a key document to ensure that the defense of Europe’s biosphere will remain at the top of the policy agenda.

The EC Communication for a EU Biodiversity Strategy for 2030

The European Commission published on 20 May 2020 the “**EU Biodiversity Strategy for 2030**”[1], a comprehensive, ambitious and long-term plan to protect nature and reverse the degradation of ecosystems. The strategy aims to put Europe's biodiversity on a path to recovery by 2030 and contains specific actions and commitments.

The table below summarises each objective's main actions and features by following the document's structure.

Key priorities	Identified R&I challenges
Decarbonisation of the energy system and decreasing pollution	1. In light of the EU Green Deal and the efforts to decarbonise the energy system: 1.1. Invest in the deployment of more sustainably sourced renewable energy with a priority on ocean energy, offshore wind, solar-panel farms, sustainable bioenergy. 1.2. Increase energy efficiency to reduce energy consumption and reducing consumption from sources and energy technologies that damage the environment or don’t contribute to the reduction of GHG emissions. 1.3. Further pressure to minimize the use of whole trees, food and feed crops as biofuels for energy production – increasing the sustainability criteria as highlighted in the Renewable Energy Directive
Compatibility of renewable energy infrastructure and biodiversity restoration	2. The restoration of biodiversity should take into account the deployment of renewable energy and vice-versa: 2.1. Member States shall assess and ensure if suitable land and sea areas are available for renewable energy projects, considering their national energy and climate plans, the availability of resources, grid infrastructure and the targets of EU Biodiversity Strategy – as outlined in REPowerEU. 2.2. Promoting energy performance and efficiency of buildings, in addition to accelerating the permitting for renewable energy projects, while providing identification of renewable go-to areas, either on land or sea. 2.3. Ensuring compatibility of the designation of these renewable go-to areas while maintaining and fostering the Member States’ respective national restoration plans. 2.4. Encouraging Member States to foster synergies between their restoration plans and the designation of renewable go-to areas in, for instance, managing the permitting procedures applicable to both endeavours. 3. Ensuring that the deployment or use of renewable energy technologies does not harm green/blue areas and the biodiversity within them: 3.1. Mitigating the harmful local environmental effects that the deployment of certain technologies may have, such as the possible negative impact of Marine energy technologies on Marine biodiversity 3.2. The EU is thus prioritising options such as: offshore wind, which also allows for fish stock regeneration; solar-panel farms that provide biodiversity-friendly soil cover; amongst other options. 3.3. Increasing need to assess and consider such risks as the Clean Energy Transition and the subsequent deployment of additional renewable energy infrastructure
Increasing the sustainability and management of biomass and biofuels-based energy sources	6. Ensuring that the future supply of woody biomass won’t hamper the efforts made to increase the forest area in the EU, which will substantially increase if the GHG emissions are indeed drastically reduced by 2050 6.1. Fostering compatibility between the climate neutrality goals (and their subsequent benefits for biodiversity) and the use of biomass and biofuels energy – as indicated in the Renewable Energy Directive.

[1] Official Strategy Overview

	6.2. Establishment of thresholds that allow for a win-win scenario in forest management and woody biomass for energy production, in a way that reduces pressures on forest and agro-ecosystems, while allowing for the continuation of bioenergy production in a sustainable way. 7. Increasing the sustainability criteria of bioenergy and the use of biofuels
Building an integrated and sustainable whole-of-society approach	8. Ensuring that environmental and social interests are fully embedded into business strategies in order to increase sustainable corporate governance: 8.1. The European Commission will incentivise nature-based solutions and businesses, which will lead to a significant increase in employment opportunities in various sectors that are key for innovation in biodiversity-friendly businesses. 8.2. Measuring the environmental footprint of products and organisations through life-cycle analysis and natural capital accounting. 9. Develop a trade policy that actively contributes to the ecological transition by fostering trade and imports of products into the EU that are environmentally friendly and sustainable and do not harm the environment through, for instance, contributing to deforestation or undesirable CO2 emissions.
Improving knowledge, education and skills	10. Fostering and increasing research and innovation on biodiversity and investing in the respective solutions. 11. Training and reskilling the workforce across a wide range of sectors. 12. Incentivising local, regional, national and European level partnerships and cooperation in the research and innovation community. 13. The Horizon Europe Programme will include a long-term strategic research agenda for biodiversity, including a science policy mechanism for research-based options.

Biodiversity and energy have the potential to be mutually beneficial instead of clashing forces

Biodiversity has become a **crucial theme in current policy planning.** From a tipping point[2] perspective, looking at the physical limits of planet Earth in terms of nature preservation, **the protection of biodiversity is an absolute priority**. It reduces the speed at which humanity is approaching the boundaries of an irreversible modification of all species' living environment. Many forms of energy result from a service provided by ecosystems (e.g., agroecosystems, forest ecosystems, grassland ecosystems, and aquatic ecosystems). Conversely, society's growing requirements for energy are resulting in significant changes in the same ecosystems, both in the search for energy sources and due to energy use patterns. Given that energy is a fundamental requirement for supporting development in all economies, the challenge is to sustainably provide it without driving further loss of biodiversity.

The **exploitation of fossil fuel sources along the entire supply chain** is arguably the activity which usually leads to the biggest damage to biodiversity[3]. A driver of climate change, it is also associated with air pollution, including acid rain[4]. Punctual phenomena like oil spills are reported to be extremely harmful to aquatic and marine ecosystems[5]. Shale oil and gas can also

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[2] https://www.stockholmresilience.org/research/research-news/2013-11-06-avoid-tipping-over.html

[3] Harfoot, MBJ, Tittensor, DP, Knight, S, et al. Present and future biodiversity risks from fossil fuel exploitation. Conservation Letters. 2018; 11:e12448. https://doi.org/10.1111/conl.12448; Butt, Nathalie & Beyer, Hawthorne & Bennett, Joseph & Biggs, Duan & Maggini, Ramona & Mills, Morena & Renwick, A & Seabrook, Leonie & Possingham, Hugh. (2013). Biodiversity Risks from Fossil Fuel Extraction. Science (New York, N.Y.). 342. 425-6. 10.1126/science.1237261.

[4] Grennfelt, P., Engleryd, A., Forsius, M. et al. Acid rain and air pollution: 50 years of progress in environmental science and policy. Ambio 49, 849–864 (2020). https://doi.org/10.1007/s13280-019-01244-4

[5] Eklund, R. L., Knapp, L. C., Sandifer, P. A., & Colwell, R. C. (2019). Oil Spills and Human Health: Contributions of the Gulf of Mexico Research Initiative. GeoHealth, 3, 391– 406. https://doi.org/10.1029/2019GH000217

severely impact ground waters and other natural ecosystems[6]. While **phasing out fossil fuels needs to stay as an urgent and overarching global priority**, it is critical to **include biodiversity considerations in all ongoing fossil-fuel-related activities** with the view to minimise damage and plan future reconversion and ecosystem restoration.

While impacts on biodiversity are more evident in the case of fossil fuels, those tend to be less apparent for renewable energy sources (RES). The environmental performance of renewable energy solutions is now at the centre of the stage. Given the recent provisions in EU legislation, the deployment of RES should be strongly increased to face the issues created by the energy crisis in the EU. To counter the decrease in Russian gas supply, the EU plans to use RES as the primary tool to secure energy supply.

One of the challenges linked to RES uptake is related to permitting procedures for renewable energy projects, which are now deemed to be far too long. To answer the matter, the EU has established that Member States will be encouraged to create **"go-to areas" for the installation of RES**, where permits will follow a faster approval process. While the measure answers investors' concerns, it raises doubts about the projects' ecosystem and biodiversity impact assessment.

Another issue connected to the fast deployment of several RES and which deserves particular attention from a biodiversity perspective is the **mining of Critical Raw Materials (CRM).** Policy steps in this direction should ensure that biodiversity considerations cover industrial development in Europe as well as the actual production process of clean energy technologies. In addition, it will be important to envisage biodiversity impact assessment frameworks for the technologies currently at a lower TRL level but that will become increasingly important in the future, such as hydrogen.

Against this background, research has a critical role to play by not only identifying **solutions that minimise RES impacts on the ecosystems** but also **actively supporting nature preservation and restoration**.

The section below looks at some key examples of energy sources, their impacts on biodiversity and how these can be best addressed.

Solar energy is today one of the major players in the renewable energy sector, not only because its price has increasingly dropped in the past years but also given the consistent push that REPowerEU gives to its deployment, especially in the case of solar PV. One of the major impacts is the one on land, as solar installations can modify and fragment considerable amounts of land. They might not only represent an obstacle to the movement of different animal species but increase deaths due to heliostat collisions and burning[7]. Impacts on biodiversity also include the damage to water-scarce ecosystems brought by concentrated solar power

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[6] Margaret C. Brittingham, Kelly O. Maloney, Aïda M. Farag, David D. Harper, and Zachary H. Bowen Environmental Science & Technology 2014 48 (19), 11034-11047
DOI: 10.1021/es5020482

[7] A. Gasparatos et al., 2017, "Renewable energy and biodiversity: Implications for transitioning to a Green Economy"

(CSP) plants, which need large amounts of water. Nonetheless, solar energy has ample margins for improvement. The **integration of PV installations with agricultural areas**, for example, will ensure that solar panels co-exist with the ecosystem instead of creating dangers to its existence and diversity. In general, **building solar installations in low-biodiversity areas** could already represent a step forward. Furthermore, **reducing the environmental footprint of PV equipment and installation procedure** could go a long way. Overarching will also be the **research on materials**, making the mining activities related to panel deployment more sustainable.

Wind energy must be discussed concerning the location of its production: offshore and onshore wind each carry their own opportunities and challenges. Both technologies present their unique issues, mainly impacting fauna offshore and onshore, with the former also affecting maritime flora. The main threat is the collision of birds and downdraught generated by turbine movement, and additional information is needed on the impacts of wind farms on insects, mammals and other fauna. Nonetheless, researchers are already working on addressing the main issues: not only **designating proper installation areas**, but also **improving biodiversity protection in processes and instruments** for wind operations. These actions will require thorough research, as the most suitable locations for wind deployment (e.g., unpopulated areas) also represent the greater risk for animal populations. Also, **aggregation of turbines** could be an option to reduce the impact on fauna, given the higher visibility that multiple turbines would have.

Hydropower is an additional technology posing serious challenges to biodiversity, but compared to the previous examples, is also much more influenced by environmental modifications. The construction of dams and structures in rivers impacts the water flow regimes of different environments, affecting fish communities needing to navigate water streams, plants, and the broader aquatic ecosystem. The fragmentation of water streams due to the construction of barriers is a powerful factor in this process. Nonetheless, changes in the surrounding environment threaten hydropower itself: reduced soil water retention, increase in debris from forests and water plants, and augmented or decreased precipitation are all features of a less healthy and diverse environment. This situation could be highly damaging for hydropower structures and impair the technology's potential for energy production. Hydropower needs to seriously factor in biodiversity issues, as its existence highly depends on ecosystem changes. The **development of pumped-hydro solutions** will be key for the long-term survival of the technology, especially in the case of prolonged droughts and low rainfall levels. But more broadly, research should aim to **create new solutions that look at nature for inspiration.** Some examples of sustainable management of soils include reforestation, reclaiming of land, and restoration of ecosystems: all of these can contribute to increasing water holding capacity in the soil and reducing surface runoff.

Another prominent example of the interrelation between energy and biodiversity is the use of **bioenergy**. The land use correlated with the increase of feedstock for energy solutions can substantially impact habitat and biodiversity loss, although this is context-specific according to research[8]. In addition, biomass energy operations have been documented to release harmful

[8] Núñez-Regueiro, M.M., Siddiqui, S.F. and Fletcher, R.J., Jr (2021), Effects of bioenergy on biodiversity arising from land-use change and crop type. Conservation Biology, 35: 77-87. https://doi.org/10.1111/cobi.13452

emissions into the environment, again with some exceptions. In this case, factors influencing emissions include feedstock, yields, conversion technologies and pollution control mechanisms[9]. Most of the same risks apply to feedstock for biofuels too. However, **side and waste streams for bioenergy production typically impact biodiversity much less.** Research for improved biodiversity protection can look **to mitigation measures like the reduction of monocultures** and the **adoption of more environmentally-friendly processes**, including the development of impact assessment tools to effectively mitigate risks connected with the practice.

In addition to these examples, many more are the dynamics at play between RES and biodiversity. The impacts of the European energy systems on biodiversity can be direct on land, waters, forest and other natural ecosystems but also indirect when considering repercussions on developing countries and regions. When thinking of solutions for a better future, research is a key area to invest in. **R&D investment will therefore be needed** if the EU plans aim to be effective, as the increase in renewable energy deployment foreseen by the EU institutions will not be sustainable in the long run if environmental protection is not factored into the equation.

Finally, **nuclear energy** should also be given careful attention. Currently, there is little research on the impacts of nuclear energy on the surrounding ecosystem. This is mainly because compared to the previously mentioned energy sources, nuclear has much less impact on the environment, given its small land footprint. Nonetheless, the technology has remarkable effects on biodiversity, mainly related to operating risks, long-term radioactive wastes, thermal pollution or mining threats[10]. For example, releasing cooling water into water streams has a non-negligible impact on aquatic fauna and flora[11]. Researchers should therefore set their sights **on innovation in the management of nuclear energy operations,** ranging from the treatment of wastewater to the overall sustainability of the production process.

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[9] A. Gasparatos et al., 2017, “Renewable energy and biodiversity: Implications for transitioning to a Green Economy”

[10] Patricia Mateo-Tomás, José Vicente López-Bao, A nuclear future for biodiversity conservation?, Biological Conservation, Volume 270, 2022, 109559, ISSN 0006-3207, https://doi.org/10.1016/j.biocon.2022.109559.

[11] Madden, N., Lewis, A., Davis, M., 2013. Thermal effluent from the power sector: an analysis of once-through cooling system impacts on surface water temperature. Environ. Res. Lett. 8, 035006.

Conclusions

Ensuring access to energy while maintaining biodiversity and vital ecosystem services will require an **integrated and practical multi-pronged approach**. In this regard, a **holistic perspective** to managing biodiversity and natural resources will be needed, together with a **shift in environmental governance** to incorporate policies and incentives promoting energy production and use. Besides**, increasing partnerships with the private sector** to promote energy programmes that internalise the total costs of biodiversity and livelihoods will also be critical. The EU Biodiversity Strategy for 2030 is undoubtedly a step in the right direction, although more decisive action is needed.

Research must play a critical role in this effort by identifying solutions that minimise the impacts of energy on the ecosystems and actively support nature preservation and restoration. In this respect, a **sustained R&I&D investment** will be key to ensuring the availability of the latest state-of-the-art environmental protection measures to minimise the negative impacts on biodiversity in the EU and their repercussions on a global scale.

In the specifics of the various energy sources and their deployment, the case of **fossil fuels** is arguably the one having the most impact on biodiversity. While their urgent phasing-out remains the absolute priority, it will be nevertheless critical to include biodiversity considerations into all ongoing activities to lessen damage and plan future reconversion and ecosystem restoration.

As far as RES are concerned, research can develop in various directions to minimise biodiversity loss and install a virtuous circle of ecosystem restoration:

- **Solar energy** entails substantial land use issues but also a high potential for improvement regarding biodiversity. The research community can play a decisive role, e.g., in ensuring reduced ecosystem damage by solar panels, minimising the environmental footprint of PV equipment and installation procedures, and in promoting further research on materials.
- To enhance biodiversity performance of **wind energy**, researchers are designating proper installation areas and improving biodiversity protection in processes and instruments.
- Research should aim to develop solutions around **hydropower** that look at nature for inspiration**,** with sustainable management of soils, including reforestation, reclaiming of land, and restoration of ecosystems.
- In **bioenergy**, research should look at measures such as the reduction of monocultures and the adoption of more environmentally-friendly processes along with the development of impact assessment tools to effectively reduce related risks.

Finally, as far as **nuclear energy** is concerned, researchers should focus on the innovation of biodiversity-related practices in nuclear energy operations, including waste materials management.

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