

RESEARCH ARTICLE

Implementing the European Union Biodiversity Strategy: Interlinked challenges and a potential way forward

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Abstract

1. Biodiversity loss and ecosystem collapse are considered essential threats to our well-being both in Europe and worldwide. The EU Biodiversity Strategy 2030 was launched in May 2020, and it was reviewed by the Commission in 2024, assessing progress and identifying implementation gaps. To avoid the failure of yet another very ambitious Biodiversity Strategy, it is key to understand the obstacles and challenges which contribute to limiting actual implementation.
2. This study includes an evidence-based analysis leading to categorization of challenges and indicating the interlinkages between them. Based on an exploratory and a targeted literature review, semi-structured expert interviews, and expert consultations we identified and analysed eight strongly interlinked challenge categories: accessibility of knowledge, engagement, funding, sectoral policy coherence, management effectiveness, systematic spatial planning, vertical policy implementation, and current political and economic structures.
3. We found that challenges stemming from path-dependent institutional processes and the broader socio-political context can significantly constrain the availability of straightforward solutions. Political short-termism, the influence of the subsidiarity principle on effective EU law enforcement in Member States, and the prioritisation of economic growth over environmental considerations are among the key challenges arising from political and economic structures.

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4. The category of 'knowledge accessibility' appeared central, creating a notable opportunity for science–policy interfaces to positively impact several other challenge categories.
5. *Policy implications.* Facilitating interactions between science and biodiversity policy could potentially impact the underlying causes of implementation failures. However, this influence can only be achieved by transcending mere knowledge synthesis and actively engaging in constructive critique, fostering capacity development and collaborative learning.

KEYWORDS

biodiversity governance, biodiversity policy, conservation, implementation challenges, policy analysis, science–policy interface

1 | INTRODUCTION

Addressing the detrimental impacts of the intertwined climate and biodiversity crisis is one of the main concerns of the European Green Deal, which is the first policy initiative to integrate biodiversity and climate issues across sectors within the European Union (EU). The EU Biodiversity Strategy 2030 (European Commission [EC], 2021) was launched on 20 May 2020 as part of the European Green Deal. The Strategy's 16 measurable targets focus on the main drivers of biodiversity change, moving well beyond the improvement of protected area management to address problems caused by industrial agriculture, deforestation, pollution and the overuse of aquatic resources, among others, thereby broadening the conservation agenda with a new restoration focus. Capitalising on the experiences and lessons learned from previous strategies, the EU Biodiversity Strategy 2030 also sets out an enhanced governance framework to support the full implementation of EU legislation and pull together all existing efforts that can safeguard biodiversity, including the launch of new regulations and the creation of support services (e.g. the Science Service for Biodiversity). Despite these efforts and some progress already realised, the midterm evaluation of the Biodiversity Strategy 2030 (European Commission [EC], 2024) indicates significant gaps between the targets and the achievements. Our paper studies why such gaps between the plans and the actual implementation might occur and identifies a potential way to accelerate the achievement of the 2030 biodiversity targets.

The research for this article was conducted as part of a Horizon Europe project aiming to set up a European Science Service for biodiversity (BioAgora, Horizon Europe grant agreement number 101059438) and sought to answer the question: What are the main implementation challenges related to the current Biodiversity Strategy and how are they interlinked? By implementation challenges, we mean the obstacles that impede the process of policy implementation, which is often considered as the final stage of the policy cycle where specific policy instruments (i.e. legal regulations and financial incentives) are getting into force (and monitored), once the problem is defined and the framework is designed (DeGroff &

Cargo, 2009). Improving the implementation of biodiversity policy in Europe was already underlined by the IPBES Regional Assessment for Europe and Central Asia, with a particular focus on more efficient biodiversity mainstreaming through improved policy instruments, better integration of sectoral policies and increased stakeholder involvement (IPBES, 2018). While several recommendations of this IPBES report have been taken up when the current EU Biodiversity Strategy was prepared (e.g. quantitative targets), the lengthy and conflictual process of reforming EU regulations—such as the adoption of the Nature Restoration Law or the rejection of the Sustainable Use of Pesticides Regulation, which both were included as objectives in the Biodiversity Strategy 2030—suggests that long-standing difficulties might still limit the implementation of the current strategy. Analysing the challenges and lessons from the past may bring a better understanding of the current implementation gaps. Moreover, lessons from the European Union—often considered as a leader in global biodiversity policy (del Castillo, 2020)—can offer insights on why global biodiversity targets have not been achieved.

Based on an exploratory and a targeted literature review, semi-structured expert interviews and expert consultations, we identified eight implementation challenge categories: accessibility of knowledge, engagement, funding, sectoral policy coherence, management effectiveness, systematic spatial planning, vertical policy implementation and current political and economic structures. Within each category, we provide a summary of a literature review, followed by an analysis of interviews with EU and national-level policy actors. Finally, interlinkages between the challenges are discussed, together with potential future actions as well as contradictions and limitations.

2 | MATERIALS AND METHODS

A multi-method qualitative research strategy was applied, including an exploratory and a targeted literature review, semi-structured expert interviews and an expert workshop (Figure 1).

As the first step, an exploratory literature search was carried out in Google Scholar during September and October 2022 to identify

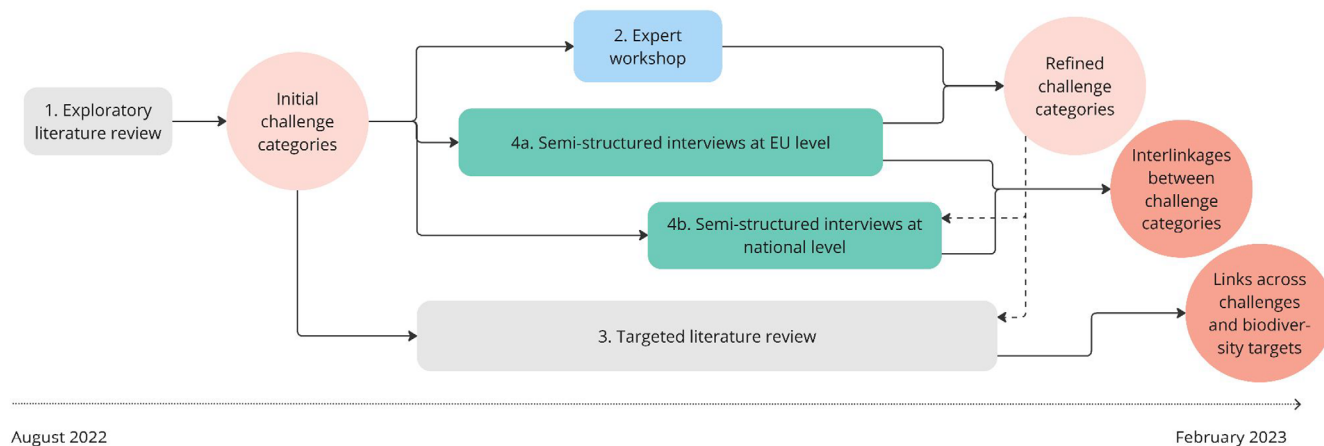


FIGURE 1 Schematic overview of the research process and its main outcomes. Different colours indicate different types of methods: Grey boxes represent literature reviews, the blue box represents the expert workshop, while the turquoise boxes represent expert interviews. The circles include the interim (light red) and final (dark red) results of the analysis.

broad challenge categories that are associated with the implementation of biodiversity policies in Europe. We tested keywords and their variations that effectively identified articles addressing the challenges of European biodiversity policy and governance, particularly the EU Biodiversity Strategy. The search terms employed included “EU”, “European”, “biodiversity”, “conservation”, “strategy”, “policy”, “governance”, “implementation”, “evaluation”, as well as “barrier”, “challenge” and “issue.” We screened and analysed peer-reviewed articles, books and book chapters published in English after 2010. The papers' relevance was assessed based on their ability to offer conceptual insights into the factors that impede the implementation of EU biodiversity policy. We classified papers in thematic folders, outlining the draft challenge categories.

These draft challenge categories were refined in an expert workshop in the second phase. Forty-nine scientists and policy experts from 12 European countries participated, representing both natural and social sciences. During the workshop, participants provided feedback on the definitions of the categories, proposed additional categories and shared examples of challenges from their own areas of expertise. The refined categories were used to carry out the targeted literature review and, as theory-driven codes, to analyse the expert interviews, as indicated by the dotted lines in Figure 1.

As the third step, a targeted literature review was performed using Google Scholar for each target of the Biodiversity Strategy 2030. Target-specific fixed terms (e.g. invasive species and soil ecosystem), plus three general (i.e. EU, biodiversity and implementation) and three interchangeable terms (i.e. challenge, barrier and issue) were used. Hits were ranked according to relevance, and the first 15 papers were analysed in each topic to identify linkages between challenge categories and biodiversity targets. Recognising the inherent limitations of a targeted literature review, we further engaged in online consultations with 11 biodiversity scientists. They validated our findings and provided additional citations addressing the most pertinent challenges. A total of 179 peer-reviewed papers were screened during the two literature reviews (in first and third phase).

As the fourth step, 20 semi-structured interviews were carried out with EU- and national-level policy experts and decision-makers. Prior to each interview, participants were verbally informed of the research purpose, voluntary participation and confidentiality measures, including the assurance of complete anonymity. To formalise their agreement, written informed consent forms were signed after the interviews. Ethical approval was considered unnecessary according to the regulations of the first author's institution, as the interviews did not include personal or sensitive data. We selected experts with substantial experience in biodiversity policy, and we strived for diversity in terms of background and geography (Figure 2). We could achieve a balanced representation of policy (e.g. policy officers from different Directorate Generals of the European Commission or from national ministries), public administration (e.g. governmental agencies) and the NGO sector, and we could harvest country-level information from seven European countries. Still, our sample remained quite homogenous in terms of disciplinary background (only four respondents had a degree in social or interdisciplinary sciences while the majority was trained in natural sciences), and there was also an imbalanced representation of European regions (most of the national-level interviews were done in Central-Eastern Europe). EU-level interviews focused on the broad challenge categories, while national-level interviews discussed specific on-the-ground implementation issues. EU-level interviews lasted between 60 and 96 min and were carried out virtually. National-level interviews lasted between 25 and 90 min, and 8 (out of 13) were performed virtually. EU-level interviews were recorded and transcribed for the analysis. Most national-level interviews were conducted in native languages and only their detailed (English language) summaries were used for analysis.

Interviews were analysed with qualitative content analysis (Mayring, 2021). Theory-driven codes corresponding to implementation challenges (predefined in the literature review and refined in the workshop) were used to systematically code the interview transcripts and notes. We also coded when certain sentences

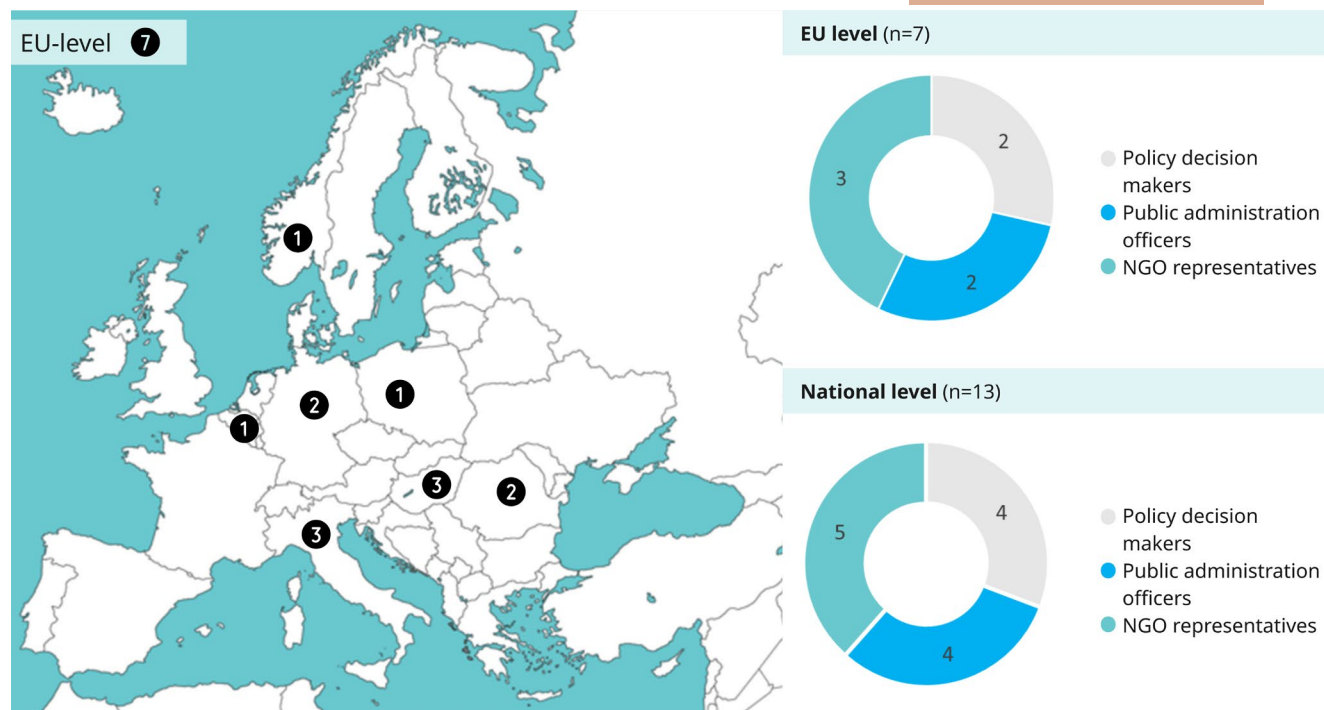


FIGURE 2 Geographical and professional background of the interviewed experts. Numbers in red circles on the map indicate the number of interviews carried out in specific countries, and at the EU-level (fourth step).

or paragraphs referred to specific objectives of the Biodiversity Strategy and when specific groups of actors—that is, policymaking and public administration at different spatial scales, the business sector (especially the primary sector, including agriculture, forestry, fisheries, etc.) and the civil sphere (including NGOs, local communities and citizens in general)—were mentioned by the interviewee in relation to the given challenge. Coding was done by three researchers individually in an iterative way to ensure inter-coder reliability. First, one interview was selected to test the predefined codebook; then, the coders discussed the initial coding results and refined the codebook. The rest of the interviews were coded afterwards separately. After coding all interviews, the research team met again to discuss individual interpretations of selected quotes, and when researchers' interpretations were different, coding was refined. At the last stage, separate analytical templates for the EU- and the national-level interviews were filled with key findings and quotations along the main coding categories in Excel, and a written summary was prepared for each challenge category.

3 | RESULTS

Altogether eight main categories of implementation challenges were identified, the first seven were based on the exploratory literature review and expert workshop, while the last one ('Current political and economic structures') emerged as a common theme in both the EU and the national-level interviews. In this section, we

briefly define each category, summarise how these challenges are reported in scientific articles and share our results derived from the expert interviews. Challenge categories and specific challenges are summarised and illustrated with selected quotes at the end of this section, in Table 1.

3.1 | Accessibility of knowledge

Accessibility of knowledge refers to knowledge gaps and inequalities in data availability, constrained information flow between science, policy and society, and limited capacities in on-the-ground implementation to use available knowledge.

The lack of standardised monitoring of biodiversity and the environmental impacts of human activities is highlighted in the literature in relation to most objectives of the Biodiversity Strategy 2030, for example soil health (Zeiss et al., 2022), forest management (Gosselin et al., 2018), freshwater ecosystems (Van Rees et al., 2021) or marine ecosystems (Katsanevakis et al., 2020). Furthermore, bias has been identified towards specific scales, regions, habitats and taxonomic groups in research on the Natura 2000 network (Orlikowska et al., 2016).

Bridging across knowledge production and use is reported in the literature as a challenge due to the diversity of disciplines involved (Görg et al., 2016), the complex interrelations between ecological and socio-economic processes (Shrader-Frechette & McCoy, 1993), and the characteristics of the policy field, for example unequal power relations (Görg et al., 2016). Local knowledge of habitat change or

TABLE 1 EU biodiversity Strategy 2030 implementation: Specific challenges and illustrative quotes by category.

Challenge category	Specific challenge	Related quote
Accessibility of knowledge	A lack of a standardised independent EU-level monitoring system for biodiversity	'The bigger problem here is that we lack long term data series and continuous monitoring which is covering the EU in a balanced way'. [EU_P4]
	Insufficient Member State monitoring capacities	'I think they know how to monitor properly, but there is no funding and no stuff, and so they don't have good data, no good robust data from their country on how species and habitats are doing'. [EU_P4]
	Monitoring can be complicated and expensive (e.g. in the case of marine ecosystems)	'It's impossible to monitor everything. (...) you cannot measure everything, because the price is incredible and of course that goes to everything that is related to marine observation and I guess observation in general, for biodiversity'. [EU_P6]
	Monitoring often depends on access to privately owned land	'Go to this area, but this can be private land, agricultural parcel. You don't have permission to actually go there and collect information on biodiversity. And if a farmer says no, we cannot do it...'. [EU_P1]
	Fixed-term, project-based funding can further reduce the reliability and long-term availability of monitoring data.	'The only serious funding we get to monitor species and habitats is through research projects that are really short. So, even if scientists can do a great job in three years, three or four years for that research project, that's not monitoring'. [EU_P3] 'The funding is precarious, and it comes from research projects. And then research projects are finishing and nobody cares'. [EU_P6]
Engagement	Insufficient environmental literacy of citizens	'(...) when I'm speaking about environmental literacy I'm not speaking about short term initiatives, one workshop here and there. This is structural, and should be incorporated into education frameworks, if we want it to be effective'. [EU_P6]
	Gap between citizens and EU-level decisions	'(...) they normally don't get up to talk with the people making the policy at that higher level. But the people at the local level might be able to talk with their mayor, maybe with the province representative who might take it to the national level, but there are too many steps'. [EU_P2]
	Top-down policy approach, multiple decision levels and a complex technical language hindering communication	'It's very much top-down even though there are instruments to allow for a stakeholder participation at that higher level. The problem is that there you have the interest groups, economic interest groups as stakeholders, not always the local actors. It's too complicated. They don't understand the language or there is a call for whatever, it's not part of the daily life'. [EU_P2]
	Preference at the EU level for engaging with a manageable number of interest groups	'It's difficult to bring everybody to the same page. It's difficult to use a language that everybody understands, and it's difficult to convince that what you want to take out if this is going to benefit everybody. It's also quite challenging to stop big interests from driving the discussion. And it's time consuming'. [EU_P6]
	Decisions are made already before consulting people, and several MS have limited interest in open dialogue as it could impede corruption	'If they do the public consultations, they are fake. (...) The planning documents get agreed with the bosses of the farm unions before the public consultation even gets done'. [EU_P5] '(...) And this is not sloppiness, or ineffectiveness, this is designed to ensure that citizens who are not part of the power system cannot get in the way of the people who distribute the money to themselves and their friends'. [EU_P5]
Funding	Disproportionality of the budget allocated to direct conservation action vs. sectoral developments that use (and destroy) the natural environment	'You are short in one hand, and you're fighting someone much bigger with the other hand. That's what I think is the problem with biodiversity funding in Europe and worldwide. (...) You give hundreds in a subsidy to something that is going to cut trees and give one in a subsidy to something that is going to plant trees'. [EU_P2]
	Some sectoral subsidies for agriculture and fisheries were perceived as harmful for biodiversity	'Obviously, what EU claims to be spending on biodiversity is mostly a lie, as it has been documented from time to time, and again we are counting whole chunks of the CAP, and so on, things that are actually harmful to nature, that have nothing to do with nature, are being counted as biodiversity spending'. [EU_P5]
	Lack of political prioritisation of biodiversity leads to a lack of funding at the EU and the national level	'Hopefully everybody would see that biodiversity is the basis for economic activity, but we are not there yet'. [EU_P1]
	Long route from the EU-level funds to local-level conservation action	'When it goes at the more granular level, it becomes more difficult. And that's, I presume, because of all the different stages that you need to go through before you can actually get the big donor to the small person. (...) There are so many layers in between that makes it very difficult'. [EU_P2]

TABLE 1 (Continued)

Challenge category	Specific challenge	Related quote
Sectoral policy coherence	Incoherence at the level of legal documents and strategic objectives vs. incoherence at the level of concrete measures, financial allocation and policy implementation	'In the common fishery policy, we have an article that is actually asking for protecting essential fisheries habitats. (...) It's a brilliant one, very useful one. It is not used. No member state declares a habitat that is an essential fishery habitat. In the text it is brilliant, and it's very well aligned with all the biodiversity goals, but maybe it is not used'. [EU_P3]
	Conflicts and competition between different sectors at the stage of policy implementation	'I mean, same with the Common Fisheries Policies, even the climate stuff, pretty much everything touches biodiversity. Like in every family, at the level of the Commission there are different interests, people pushing in different directions. So, you already have a battle there, and then in the member states you also have different interests'. [EU_P2]
	Lack of sectoral policy coherence because of the current political and economic structures	'When you act in an economic paradigm, in a socioeconomic paradigm that prioritizes growth, and growth is fundamental to the prosperity of societies, you are never going to have a different result. I'm angry about it but I do understand why policies are developed this way. You have to change the whole system to have something different'. [EU_P6]
	Marginalisation of conservation in local- or regional-level policy implementation caused by the lobby activities of business stakeholders	'Regarding the stop of specific activities in PAs. (...) But the policy representative of the human activity that was related with the aspect would say, this is impossible and would push to ask an extension. (...) So, and they won. They won because they went to the Parliament, and in the Parliament, there are politicians, and the politicians are not elected by the trees'. [EU_P6]
Management effectiveness	A lack of real management and control activities in the designated areas despite having management plans on paper	'So, it's not a secret that in Europe we have a lot of paper bags. So designated areas that are not in reality being controlled or managed. They don't have any resources to be monitored, apart from voluntary schemes'. [EU_P3]
	The implementation and enforcement framework of protected area management is too flexible, and it does not work due to the lack of political will	'So, the management effectiveness is almost a 100% an issue of political will. (...) You either have an implementation framework that works, that you don't allow specific things, and you allow others, or you have management frameworks that are very loose and very flexible, and in general they don't work'. [EU_P6]
	The prioritisation of economic interests reduces management effectiveness and site managing bodies are too weak to resist the pressure of large-scale business actors	'And then you have the sites where the management body is too weak to stand up to all the values, either too weak or too corrupt, to stand up to all the pressures from above'. [EU_P5]
	A more holistic approach of management effectiveness is missing	'So, if you just be smart and let nature do most of the job intelligently, it would be easier. But no, we decided to go for species level conservation. So, we want to conserve each species individually. (...) There are hundreds of thousands of species. You don't consider the trade-offs between different conservation plans. What you need is a biodiversity approach, ecosystem health and resilience approach, holistic approach, not a reductionist approach'. [EU_P1]
Systematic spatial planning	Lack of long-term environmental thinking in culture, politics and economy	'If you are a well planner, then you have to think decades ahead because you have a system that reacts slowly to the restoration measures, for instance. It's only for a few illustrated academics that understand the models and think about what the world would be in 2050'. [EU_P3]
	Politicians aim to provide fast and visible results, even if it went against long-term environmental and social well-being	'It's not only for the politicians, but they are also reflecting their voters, and their voters will only support them if they ensure that today, this year, I do have the food, the energy, and my comfort zone'. [EU_P3]
	As the dominant dichotomous worldview does not consider us as part of nature, biodiversity conservation efforts remain fragmented and ineffective	'That would be a systematic approach, you look at the system and you see what is the best overall. I mean it's not only about specific conservation of species or habitats, it's really about how we live with nature in harmony basically, how not to live against it'. [EU_P1]
	The lack of a clear minimum EU requirements on ecosystem-based spatial planning implementation, added to conflicting economic interests at the national level, leads to limited coordination between Member States and poor national implementations	'Each member State has the freedom to do it as they want, there is not an overarching EU direction on spatial planning meaning that they manage their own space, and, of course, the different interests and views play a role in the case of a limited space, conflicting request for the same space ... It's very difficult to handle'. [EU_P3]

(Continues)

TABLE 1 (Continued)

Challenge category	Specific challenge	Related quote
Vertical policy implementation	Although EU strategic targets and directives are well incorporated into national laws on paper, they may not be effectively implemented, enforced and monitored by Member States	'If all agricultural ministries were spending the CAP money kind of in line with what the EU legislation says, and with the declared EU criteria, we would be in a completely different place. If all Member States were correctly implementing the Birds and Habitats Directive, the Nitrate Directive, we would have solved the vast majority of the problems we have'. [EU_P5]
	The BDS2030 is not legally binding, so Member States and authorities may not take it seriously	'If you go to a directive, there is always a reporting obligation you have to measure and report this. For the biodiversity strategy that's not the case. (...) So, that's for me also a challenge, the lack of reporting obligation in particular for the strategy and the lack of the legally-binding part'. [EU_P3]
	Monitoring remains a challenge due to ambiguous goals, scarce and vague reporting, and poor implementation of EU policies in Member States	'So, when you have a goal that is as vague as 'good environmental status', and you say to the Member States: you need to report to us every 6 years this and this parameter, and the Member State says: Okay, we're going to report. And then you have a report in Greece, for instance, with six monitoring stations for the whole Aegean Sea, saying that the status is fine, everything is good. Very vague results and implementation of the governance framework'. [EU_P6]
Current political and economic structures	Short-termism in democratic politics and political preference for economic interests over the long-term ecological and socio-economic concerns of society	'These people need to be elected every 4 or 5 years in the Member States and they will not take decisions that will make their electorate not vote for them in the next election. So, unfortunately, national governments tend to go for the economy before the environment, well, with the consequences that it has in the longer term'. [EU_P2]
	The prioritisation of economic growth makes the achievement of sustainability impossible	'What we are trying to do currently, unsuccessfully, is to create sustainability through an unsustainable political and economic structure'. [EU_P6]
	The EU has little influence on land management in Member States. Member States and private landowners stick to their competences in defining land use	'Can we, in the 21st century, deal with global challenges without redefining what land ownership means? If we cannot tell people using 80% of the land what they should be doing for a common goal, should we be even trying to develop and implement policies that are required? This is a question that is not being discussed at all'. [EU_P1]
	Stronger law enforcement in biodiversity policy is not possible due to a significant imbalance in resources (i.e. staff or budget) allocated to the DG Environment versus other DGs	'The reality is that with the staff that DG environment has, it just cannot even on paper enforce the existing environmental legislation. Same thing is the allocation of the EU budget. That's, you know, the money that is allocated, you see it, and you are clear what you can get out of it'. [EU_P5]

Note: Quotes are from EU-level expert interviews; codes (e.g. EU_P1) refer to anonymised participants.

species behaviour often exists, but is rarely incorporated into scientific and policy studies, partly because few ecologists work closely with those who have maintained land- and seascapes for generations, such as herders or fishermen (Molnár et al., 2020). These more general knowledge-related challenges lead to a deficient use of knowledge in local policy implementation; consequently, most recent scientific knowledge is rarely used to improve management practices (Bianchi et al., 2013).

Despite a growing body of scientific knowledge on biodiversity conservation, experts both at the EU and national level found available knowledge insufficient, and monitoring data highly uneven (e.g. for marine ecosystems, insect species or certain regional drivers of change). The root cause is the lack of a standardised independent EU-level monitoring system for biodiversity. Monitoring by Member States suffers from uneven capacities of public administrations and heterogeneous protocols applied. EU-level interviews also mentioned that Member States may have economic counter-interests in transparently presenting their actual status of biodiversity.

Some experts highlighted further technical and financial challenges related to data and knowledge. Monitoring can be complicated and expensive (e.g. in the case of marine ecosystems). It often depends on access to privately owned land (e.g. monitoring of semi-natural habitats in farmed landscapes) and sometimes relies on proprietary data (e.g. data on economic yields of fisheries or forests). Fixed-term project-based funding can further reduce the reliability and long-term availability of monitoring data.

Considering the flow of information between science, policy and society, EU-level interviewees underlined the importance of clearly communicating established scientific facts to citizens. Even though robust scientific knowledge is already available, converting it into actionable knowledge remains a proven challenge. Incorporation of the topic into formal education was proposed to increase the environmental literacy of citizens. Experts also emphasised the need to fight against the current post-truth culture, because the relativisation of facts now appears not just in social media but also in negotiations by interest group representatives.

3.2 | Engagement

This challenge category encompasses difficulties and contradictions related to stakeholder participation and public engagement. We distinguish stakeholder participation and public engagement: the first concept refers to the engagement of those actors who have an influence or who directly depend on biodiversity policy, while the second refers to deliberation with citizens in general. This category includes obstacles to the shift from top-down decision-making to more inclusive governance arrangements, lack of democratic traditions, resources and skills to organise and participate in engagement processes, and lack of community influence over policy decisions.

While biodiversity policies usually strive for stakeholder participation, participatory processes are often skewed towards interest groups and do not give equal opportunities for those who are more vulnerable or marginalised (e.g. small-scale producers or local communities) due to conflicts, mistrust and unequal power relations (Paloniemi et al., 2015). In a context of shrinking welfare state and consensus-driven neoliberal rhetoric, some Member States use diverse political strategies to align nature conservation to capitalist interests, excluding local community groups from conservation (Apostolopoulou et al., 2014).

Research on the Natura 2000 network is rich in evidence on engagement challenges, especially in agricultural areas. Since the Natura 2000 network lacks regulatory standards for involving stakeholders, site designation mainly follows ecological criteria, and the engagement of local communities and small-scale producers remains tokenistic. This leads to conflicts around restrictions to human activities, bureaucratic procedures, unclear institutional roles and insufficient information (Gallo et al., 2018). Biodiversity conservation in agricultural landscapes relies on top-down decision-making, despite stakeholder preference for an alternative governance approach (Velten et al., 2018).

In addition, small-scale, local producers often see Natura 2000 as a hindrance to economic development (Pellegrino et al., 2017). They are rarely aware of their own impacts on biodiversity (Flávio et al., 2017) and of the benefits they receive from nature (Pellegrino et al., 2017; Vassiliki et al., 2015). Though necessary, stakeholder capacity development remains scarce (Campagnaro et al., 2022).

According to experts interviewed, the number of interest groups taking part in EU biodiversity policy making is increasing, leading to better representation of different interests. Additionally, some social movements, such as Fridays for Future, proved to have the ability to raise political interest towards biodiversity. Nevertheless, several experts agreed on the gap between citizens and EU-level decisions due to a complicated system characterised by a top-down policy approach, multiple decision levels and a complex technical language hindering communication. Preference at the EU level for engaging with a manageable number of interest groups was explained by the regular conflict between effective decision-making and time-consuming consultations with diverse stakeholders—a challenge intrinsic to the multi-level

governance system. Several examples of other deficiencies were shared. For instance, participatory processes are often tokenistic because decisions are made already before consulting people, and several Member States have limited interest in open dialogue as it could impede corruption.

The majority of national-level interviews showed that, despite favouring national regulations, the lack of meaningful engagement of stakeholders and citizens hampers effective implementation of biodiversity policies. Cooperation with different sectors (e.g. agriculture, mining or energy) is poor; negotiations are slow, and the environmental awareness of stakeholders and citizens in general is low. The engagement of business actors shows huge regional heterogeneity—while some countries show positive trends, in others business actors fail to comply with biodiversity conservation efforts.

3.3 | Funding

Challenges related to funding include situations where conservation funding is insufficient, fragmented across different sectors and organisations, or biased.

A recent report estimated a financing gap of approximately 186.89 billion EUR to implement the Biodiversity Strategy from 2021 to 2030 (Nesbit et al., 2022). Although there is a dedicated financial source to fund conservation activities within the EU (i.e. the LIFE programme), most of the biodiversity funding comes from other sources, mainly the common agricultural policy (CAP) (Hermoso et al., 2022) which, beside Natura 2000 or agri-environmental payments, includes arguably adverse subsidies (Pe'er et al., 2020; see Section 3.4). This has led to sectoral conflicts and dissatisfaction; for instance, Vassiliki et al. (2015) highlighted that most stakeholders would prefer an independent Natura 2000 fund to the present integration of financing into the CAP. Sectoral fragmentation of available funds also means that funding opportunities are often not specifically attributed to biodiversity conservation measures (Illes et al., 2017).

At local level, the coexistence of different institutions in charge can lead to further fragmentation of funding, increasing bureaucratic burdens and blocking access to finance (Pellegrino et al., 2017). Furthermore, small-scale local producers often face social and financial barriers to adopt biodiversity-friendly management practices (Montanarella & Panagos, 2021).

Evidence also highlights taxonomic bias in funding towards the species listed in the EU Birds and Habitats Directives (Mammides, 2019). Concerning the protection of multi-realm species, terrestrial conservation needs are favoured over marine ones (Giakoumi et al., 2019). Despite an unprecedented decline in freshwater biodiversity, it has been among the least financially supported areas of biodiversity (Maasri et al., 2022). The underrepresentation of invertebrates in the EU Habitats Directive seriously affects soil biodiversity, receiving 468 times less conservation funding compared with vertebrates (Königer et al., 2022).

Both EU and national-level interviews reinforced funding insufficiency as a major implementation challenge. They agreed that political priorities neither at the EU nor at the national level consider biodiversity critical enough to allocate substantial amounts of funding for conservation. Nevertheless, most of them also noted that the European Green Deal and the current Biodiversity Strategy offer a more solid background and a more balanced sectoral approach than previous EU strategies. The LIFE Programme was acknowledged for its positive biodiversity impacts, but the huge disproportionality of the budget allocated to direct conservation action vs. sectoral developments that use (and destroy) the natural environment was also underlined.

Further challenges were associated with the accessibility and inefficient use of available biodiversity funds. Several experts mentioned the long route money needs to flow through from the EU-level funds to local-level conservation action, often making it difficult for the actual land managers to cover their expenses or investments.

3.4 | Sectoral policy coherence

This category refers to the incompatibility of the objectives of biodiversity policy and other sectoral policies, the insufficient integration of biodiversity-related objectives into other sectoral policies, and the incoherence between biodiversity-focused and other sectoral policy instruments and implementation practices.

While aspects of policy incoherence can be observed among different sectors, for example forestry (Selva et al., 2020), renewable energy (Gasparatos et al., 2017) or urban development (Kosłowski et al., 2020), we use agriculture and conservation as one of the most well-researched topics to illustrate this challenge category.

Recent CAP reforms have put more and more emphasis on integrating biodiversity into Pillar 2 (rural development), and to a lesser extent into Pillar 1 (direct payments) measures and included biodiversity conservation and restoration and climate adaptation among its strategic objectives. Nevertheless, due to incompatibility and lack of proper integration, trade-offs emerge between multiple objectives (Bouwma et al., 2019). Scientific evidence shows that CAP's area-based direct payments (Pillar 1) have been largely inefficient in achieving environmental aims and promoting biodiversity-friendly agri-environmental measures. Reasons include the lack of relevant environmental requirements, the high administrative complexity and the lack of environmental impact monitoring, among others (Pe'er et al., 2020). Incentives still focus mainly on large-scale industrial farming (Bianchi et al., 2013), resulting on one hand in a relative lack of funding for biodiversity-friendly farm management, and on the contrary in the maintenance of harmful subsidies (Pe'er et al., 2020).

Regarding policy implementation, the evidence indicates a failure to integrate ecosystem-friendly landscape approaches into agricultural policy (Falco et al., 2021). Rinaldi (2021) also highlights Member States' prioritisation of short-term economic objectives over long-term conservation of natural wealth during implementation.

Subsidies encourage an individual perspective of farm resources, which incentivises actor fragmentation and hinders the delivery of coordinated farmland biodiversity management at a landscape scale (Leventon et al., 2017). Therefore, intensive agricultural practices remain dominant, resulting, for example, in increased nitrogen loads in freshwaters (Van Rees et al., 2021), the decline in farmland bird populations (Gamero et al., 2017) and negative effects on soil biodiversity (Königer et al., 2021).

Incoherence across biodiversity policy and other sectoral policies was among the most frequently mentioned challenges by EU-level and national-level experts. Most interviewees made a distinction between incoherence at the level of legal documents and strategic objectives, versus incoherence at the level of concrete measures, financial allocation and policy implementation.

Coherence at the level of strategic objectives increased in recent years as nature has occupied a more central role in EU-level policy-making. However, severe critique was formulated around conflicts and competition between different sectors at the stage of policy implementation. Several examples were mentioned from the fisheries, agricultural and energy sectors, where even if policy objectives are more or less aligned, the sectoral interests are strongly opposing, which can lead to imbalanced budget allocation, loose regulations and weak law enforcement.

Some interviewees traced back the lack of sectoral policy coherence to the political and societal priorities (i.e. economic growth is prioritised over biodiversity), which are embedded in the current political and economic structures, and therefore hard to change in the short run. Others mentioned that the marginalisation of conservation in local- or regional-level policy implementation may also be the result of the lobby activities of business stakeholders.

The lack of constructive communication and cooperation between sectors emerged as a crucial problem in several interviews. According to the country-level experts, this is because self-interest and economic considerations are favoured over biodiversity values that are not incorporated into the operating principles of each sector.

3.5 | Management effectiveness

Management challenges are related to the implementation of area-based conservation measures (e.g. Natura 2000 sites), like developing comprehensive management plans based on relevant local ecological, cultural and socio-economic context, and carrying out conservation measures by informed, active and coordinated stakeholders, supported by an effective institutional setup.

Numerous biodiversity areas lack comprehensive management plans as well as management objectives, measures and monitoring plans (European Environment Agency [EEA], 2020). The management of designated protected areas falls short of appropriate intensity (Van Rees et al., 2021) and lacks an ecosystem-based approach, for which increasing awareness of ecosystem values would be needed (Schirpke et al., 2017). Insufficient funding hampers

site monitoring, which is an integral component of management (Vassiliki et al., 2015), while the excessive number of authorities, organisations and institutions in charge per site translates into ineffective management and a burden for stakeholders (Pellegrino et al., 2017).

While protected areas in Europe are taken historically as a guarantee that biodiversity will flourish, most interviewees noted a lack of real management and control activities in the designated areas despite having management plans on paper. Reasons cited are various. The implementation and enforcement framework of protected area management is too flexible; it does not work due to the lack of political will. The prioritisation of economic interests reduces management effectiveness and site managing bodies are too weak to resist the pressure of large-scale business actors. Finally, due to the lack of resources assigned to monitoring, accountability is missing. The problem of prioritising economic interests over biodiversity aspects was reinforced by national-level interviews.

Two EU-level interviewees argued for a more holistic approach to management effectiveness, that is to follow a dynamic vision of nature that prioritises ecosystem health and resilience and allows natural successions and spontaneous regeneration.

3.6 | Systematic spatial planning

This challenge category is related to the lack of systematic conservation planning with transparent spatial priorities and clear conservation targets that avoid taxonomic bias and which are based on solid ecological, social and economic criteria. Low representation of threatened species, prioritisation of economic interests and lack of planning tools emerged as critical topics in this category.

Evidence shows a limited use of conservation planning tools with the potential to effectively maximise conservation efforts (Felix et al., 2022). Without systematic planning during site designation, the Natura 2000 network may fail at sufficiently protecting biodiversity within the EU, due to ignoring landscape connectivity issues, the small size of PAs, the underrepresentation of habitats and organism groups, and the likely impacts of climate change (Friedrichs et al., 2018).

Lack of systematic spatial planning is associated with several targets of the Biodiversity Strategy 2030. For instance, it is reported as crucial to restore biodiversity in agricultural lands and to create a balance between different interests (Bianchi et al., 2013; Falco et al., 2021), to avoid conflicts between renewable energy generation and biodiversity conservation (Gasparatos et al., 2017), or to restore streams in freshwater ecosystems (Geist & Hawkins, 2016). The application of multi-realm ecosystem approaches is needed in marine sites, where planning is often influenced by economic interest (Giakoumi et al., 2019; Katsanevakis et al., 2020).

According to EU-level interviews, many of the challenges associated with spatial planning stem from the lack of long-term environmental thinking in culture, politics and economy. As the dominant

dichotomous worldview does not consider us as part of nature, biodiversity conservation efforts remain fragmented and ineffective. Several interviewees suggested that politicians aimed to provide fast and visible results, even if it went against long-term environmental and social well-being. This highlights the strong interconnection between systematic spatial planning and current economic and political structures.

Interviews revealed that spatial planning is also linked to vertical policy implementation. The lack of clear minimum EU requirements on ecosystem-based spatial planning implementation, added to conflicting economic interests at the national level, leads to limited coordination between Member States and poor national implementations. Even a good directive, like the EU Marine Strategy Framework Directive, which prioritises ecosystem-based criteria, may fail if its implementation is up to 27 governments.

Additionally, country-level interviews mentioned the problem of land scarcity: Not only would more protected areas be essential for biodiversity conservation and soil remediation, but also more precise designation and conservation laws are needed, especially in the case of biodiversity hotspots and marine areas.

3.7 | Vertical policy implementation

This challenge category is related to the incorporation of EU strategic targets and directives into the national and regional laws and regulations of Member States. It includes the difficulties of coordinating between counties and across decision-making levels within one country, the inadequate or asymmetric implementation due to differing legal structures and counter-interests among counties, and the weak enforceability of EU regulations, among others.

Scientific evidence suggests a top-down governance gap: Since EU-level strategic documents are not legally binding and Member States have relatively large flexibility in adopting them, EU strategies have often been poorly transposed to national and regional policies (Vassiliki et al., 2015). While there are several existing legal instruments, such as the Birds and Habitats Directive, the Water Framework Directive and the Marine Strategy Framework Directive, which must be adopted at national and regional levels, their effective enforcement is often difficult (Yakusheva, 2017). At the same time, legally non-binding policies are implemented in a highly asymmetric way, for example, forestry policies (Aggestam & Pölzl, 2018). Hering et al. (2023) stress that appropriate resources and capacity-building should be provided for biodiversity policy implementation and monitoring.

According to EU-level interviews, although EU strategic targets and directives are well incorporated into national laws on paper, they may not be effectively implemented, enforced and monitored by Member States. The Biodiversity Strategy 2030—except for certain targets backed by directives—is not legally binding; thus, the EU's power to intervene is even more limited. The EU Nature Restoration Law is a positive step towards increased

enforceability, but heated debates during the negotiations indicate strong conflicts of interest and risked dilution of the regulation. The ambiguous goals combined with scarce and vague reporting connect to monitoring challenges and further aggravate policy implementation.

National experts reported that although the legal framework is in place, implementation is lagging, partly because of competing individual interpretations of the framework. In addition, top-down governance systems and prioritisation of other interests often overshadow biodiversity principles and impede strategic objectives to be implemented at the local level.

3.8 | Current political and economic structures

These are challenges related to the dominant economic and political system, like limitations to public interest deriving from the market society, or short-sighted political vision for biodiversity due to shortcomings of representative democracy.

Several EU-level interviews highlighted short-termism in democratic politics as a critical challenge. Politicians prioritise electoral politics over responsible, science-based decisions for long-term societal needs. This short-termism was considered the main reason that fuels the political preference for economic interests and growth over the long-term ecological and socio-economic concerns of society, which makes the achievement of sustainability impossible.

National experts also considered current political and economic structures a fundamental obstacle to implementing the Biodiversity Strategy since economic prosperity—in its mainstream approach—outweighs biodiversity protection. This is well reflected by ongoing unsustainable projects in key conservation areas, the lack of cooperation with primary sector stakeholders due to competing interests and the fragmentation of the conservation sector.

If looking beyond this overall pattern of 'economy comes first' [EU_P2], some more specific barriers can be identified. For instance, some experts explained that the EU has little influence on land management in Member States, which is a structural challenge related to systematic spatial planning. Member States and private landowners stick to their competences in defining land use, and public discussion is lacking on property rights concerning environmental public goods.

Another structural barrier, highlighted by one of the interviewees, is the subsidiarity principle, which sometimes translates into a deregulation approach to environmental policy. Although the European Green Deal favours stronger law enforcement than biodiversity policy under the previous Commissions, there is still a significant imbalance in resources (i.e. staff or budget) allocated to the DG Environment versus other DGs. Furthermore, law-breaking has often been tolerated among Member States due to the exchange of favours in political negotiations. Stronger political will both at the EU and the national level was perceived as the only guarantee to overcome these structural barriers.

4 | DISCUSSION

4.1 | Cross-linkages between implementation challenges

Our analysis illuminated multiple challenges that hinder the implementation of the Biodiversity Strategy 2030. Both the literature review and the interviews indicated that these challenges are strongly interlinked and, sometimes, it is hard to draw a clear boundary between them. In this section, we explain these interrelations (see [Supporting Information: Annex 1](#) for more details of the analysis).

'Current political and economic structures' represents the most overarching challenge, which is at the same time the most difficult to tackle. It determines political and social priorities through which it contributes to power battles, conflicts and incoherences between sectoral policies. The category of 'Sectoral policy coherence' is rooted in this political and economic context and has a strong influence on public budget distribution. By prioritising certain economic activities and aspects of well-being against others, the interplay between sectoral policies leads to insufficient and imbalanced funding for biodiversity, as well as too much funding for policies harmful to biodiversity. Further connections can be observed between 'Funding' and 'Vertical policy implementation'. On the one hand, the multi-level and often bureaucratic institutional system through which biodiversity policy is enacted in the EU hinders the efficient allocation of funds to the actual implementation. On the other hand, insufficient financial resources do not allow to strengthen institutions and improve the vertical integration across the local, national and EU level. The interplay of these four challenge categories appears not just at the EU-level, but also nationally and locally, creating a spillover effect and hindering effective spatial planning and conservation management. Challenges related to 'Management effectiveness' and 'Systematic spatial planning' are rooted mainly in the local ecological, socio-cultural and economic characteristics, while 'Engagement' and 'Accessibility of knowledge' create interlinkages between locally rooted and more system-wide challenges.

Figure 3 visualises the above explained interlinkages between the challenge categories in an action-oriented way and places the 'Accessibility of knowledge' in the centre. 'Accessibility of knowledge' is directly linked to almost all other challenges, and at the same time can be influenced by the research community. For instance, lack or inconsistency of data (and long-term monitoring) hinder 'Systematic spatial planning' and 'Management effectiveness'. The imperfect information flow and the limited opportunities for knowledge co-creation between science and society lead to missed opportunities of awareness raising, creating a linkage towards the 'Engagement' category. Poor science-policy information flow contributes to political short-sightedness and to downgrading environmental issues in the political agenda, linking 'Accessibility of knowledge' to 'Vertical policy implementation' and 'Current political and economic structures'. Therefore,

if 'Accessibility of knowledge' is improved, on-the-ground implementation, engagement of stakeholders and citizens, and higher level political decisions can be positively influenced. This is in line with a recent NGO report that reflects on the midterm evaluation

of the Biodiversity Strategy and claims science-based biodiversity decision-making, wider citizen participation and advanced technological solutions in biodiversity monitoring (Birdlife International, 2024).

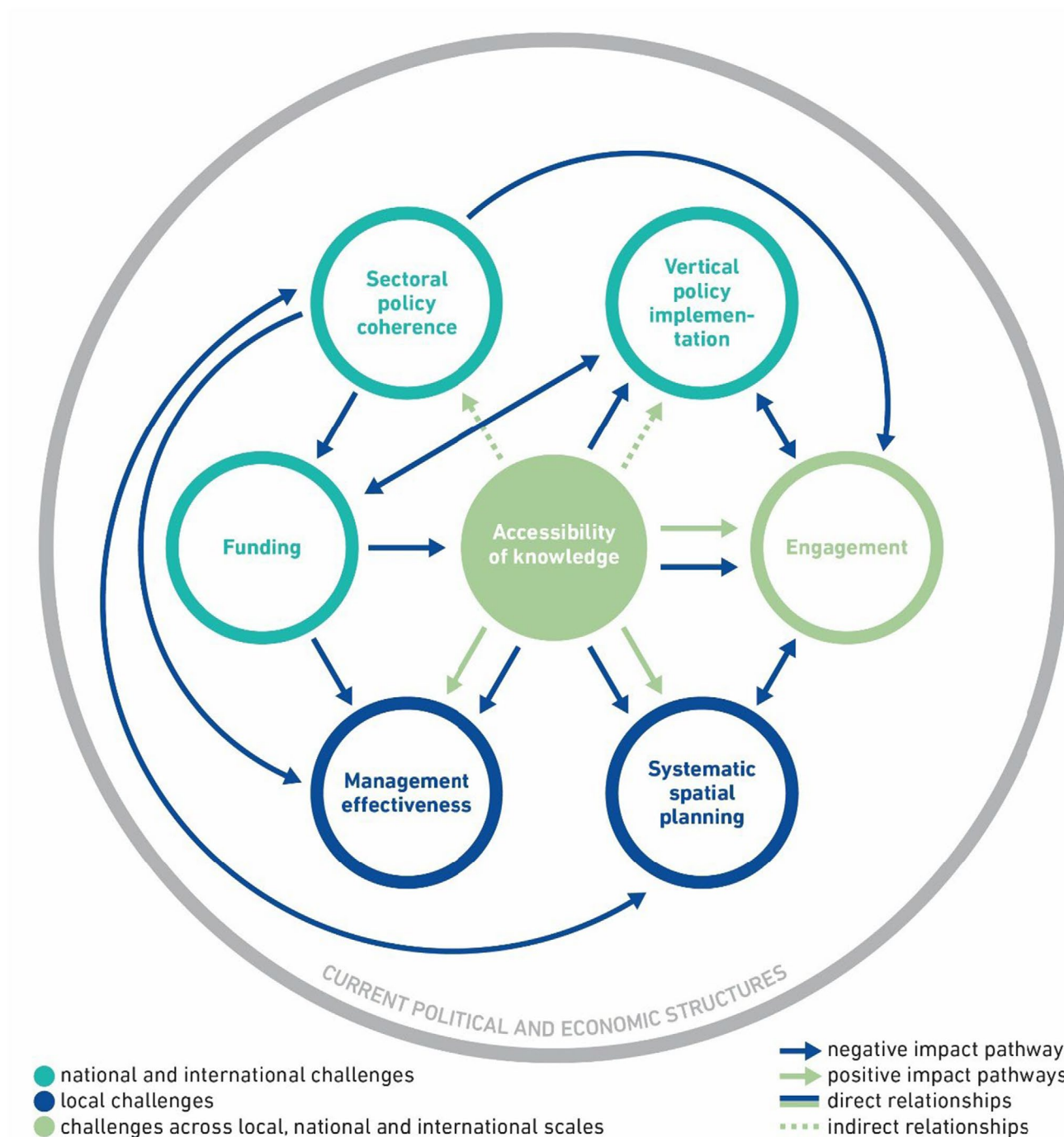


FIGURE 3 Cross-linkages between the eight challenge categories. Turquoise circles include challenges emerging from the national and international policy environment. Blue circles refer to locally rooted challenges. Green circles highlight challenges that cut across the local and the national-international scale. Blue arrows indicate negative while green arrows positive impact pathways. Solid lines signify direct, while dotted lines indirect relationships between two categories, which means that favourable results can be achieved by strengthening the supporting frameworks.

4.2 | Science–policy interactions as an opportunity to address challenges

To fully capitalise on the potential of increased knowledge accessibility, science–policy interactions should focus more on bridging different forms of knowledge and broadening the knowledge base, especially towards the social sciences, citizen science, as well as local, practical and traditional knowledge types. While locally rooted knowledge is key to avoiding implementation failures, critical social studies offer theoretical and empirical insights on current political and economic structures and ways forward. The dialogue between different narratives (rooted in distinct epistemic traditions) enables co-learning and creates a solid understanding of a policy decision's potential consequences. However, experimentation with new tools and approaches to weave knowledge across different epistemic traditions is necessary to avoid disciplinary domination and give room for knowledge co-production.

To contribute to better implementation, science–policy interactions should be present not just in policy formulation, but also in other stages of the policy cycle, offering constructive critique, building bridges across actors and holding policy makers accountable. Since policy implementation largely depends on on-the-ground actors, science–policy interactions should be expanded both vertically and horizontally (across different sectors) to increase knowledge accessibility and build capacities at all relevant decision-making scales. Nevertheless, efforts of the researcher community to improve the accessibility of knowledge will only make a difference if policy processes can become more transparent and open to participation.

4.3 | Contradictions and limitations

Contradictory findings emerged in two challenge categories. Regarding 'Vertical policy implementation', country-level interviews evidenced that broad EU biodiversity objectives and targets hinder effective national implementation, because the large flexibility in policy adoption enables national business interests to undermine the objectives. At the same time, some interviewees pointed out that certain countries face excessive burdens due to tensions between standardised EU requirements and varying national baselines. While most of our interviewees called for stronger EU law enforcement across all scales, they also realised that such a move creates opposition with business interests and can undermine legislative reforms. There was no consensus either regarding the preferred form of engagement, despite all respondents acknowledging its growing relevance. Stakeholder participation was perceived as the more manageable and traditionally accepted way of democratising biodiversity-related decisions, but at the same time plenty of examples were found for manipulative participation. Directly engaging citizens in deliberative processes was considered a more radical solution, although several interviewees questioned its practicality (i.e.

mismatch with current decision-making structures, low awareness and lack of capacities of citizens to effectively take part). These contradictions highlight that not even those experts have a clear view on how to improve the implementation of the current Biodiversity Strategy who are directly involved in policy planning and implementation at the EU and national level. Reforms of the governance context should, therefore, be accompanied by wide-scale consultations and capacity development.

Finally, we must acknowledge the limitations of our study. We conducted an exploratory and a targeted literature review instead of a systematic review. While a systematic review would obviously be more reliable, we had limited time (which is not rare at the science–policy interface); this made a more systematic analysis impossible. To avoid the pitfalls stemming from this methodological choice, we combined the literature review with various forms of expert consultations. Nevertheless, we faced further challenges when contacting policy experts and decision-makers for interviews—approximately half of the contacted people refused to participate in the study due to lack of time, perceived lack of relevance to their work, fear of political consequences, or without giving any reason. Consequently, most of the interviews were done with experts whose main activities focus on biodiversity and conservation, while other sectors with a strong impact or dependence on biodiversity (e.g. agriculture, forestry or fisheries) were not represented. In addition, as national-level interviews were done in native languages and their English-language summaries were used for the analysis, the analysis could not go to the same level of depth as for the EU-level interviews. Despite these limitations, our analysis reveals robust and relevant results thanks to the triangulation of different methods.

5 | CONCLUSIONS

In this study, we identified and assessed challenges that hinder the implementation of earlier biodiversity strategies, and which might have negative impacts on the current Biodiversity Strategy: accessibility of knowledge, current political and economic structures, engagement, funding, sectoral policy coherence, management effectiveness, systematic spatial planning and vertical policy implementation. Based on the results, we argue that the most severe challenges are deeply rooted in the currently unsustainable social-economic and political system. This may be attributed to several factors: a lack of focus on broader political and economic context due to a bias towards natural sciences and a prioritisation of ecological and biological aspects; insufficient interdisciplinary research that combines ecological, political and economic perspectives; or the prioritisation of providing attainable policy recommendations instead of examining underlying political and economic dynamics.

Accessibility of knowledge was found to be a special challenge category because it is intertwined with almost all other types of challenges. Improving the knowledge base and widening its accessibility can have a direct positive influence on management effectiveness,

spatial planning and engagement. An additional indirect positive impact is expected to emerge in cross-sectorial and vertical policy implementation, as more and better accessed knowledge can support institutional capacity-building at different levels of policymaking. Orchestrating science–policy interactions on biodiversity can directly improve the accessibility of knowledge; therefore, it can positively influence some of the root causes of implementation failures, but only if they can go beyond knowledge synthesis towards constructive critique, capacity development and co-learning. To this end, science and policymaking should be both transformed to be more plural, inclusive and responsive.

AUTHOR CONTRIBUTIONS

Eszter Kelemen designed the methodology and György Pataki contributed to refining it. Attila Lenti and Carla Klusmann carried out the literature review. Attila Lenti, Eszter Kelemen and Kármén Czett collected and analysed the empirical data. Attila Lenti, Eszter Kelemen, Kármén Czett, Carla Klusmann and György Pataki wrote the draft manuscript. Attila Lenti shaped the draft into a coherent article aligned with journal standards. Ágnes Zólyomi, Davide Geneletti, Esther Chinweuba, Jiska van Dijk, Kati Vierikko, Marie Vandewalle, Myriam Dumortier, Nikita Sharma, Sonja C. Jähnig and Twan Stoffers reviewed the text, offering valuable insights and making substantial contributions to its content. Attila Lenti and Eszter Kelemen prepared the final draft of the manuscript. All authors contributed critically to the drafts and gave final approval for publication.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

Data are available from the Zenodo research data repository <https://doi.org/10.5281/zenodo.7685651> (Lenti et al., 2023) and <https://doi.org/10.5281/zenodo.7685109> (Lenti, 2023).

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REFERENCES

- Aggestam, F., & Pölzl, H. (2018). Coordinating the uncoordinated: The EU forest strategy. *Forests*, 9(3), 1–19. <https://doi.org/10.3390/f9030125>
- Apostolopoulou, E., Bormpoudakis, D., Paloniemi, R., Cent, J., Grodzińska-Jurczak, M., Pietrzyk-Kaszyńska, A., & Pantis, J. D. (2014). Governance rescaling and the neoliberalization of nature: The case of biodiversity conservation in four EU countries. *International Journal of Sustainable Development and World Ecology*, 21, 481–494. <https://doi.org/10.1080/13504509.2014.979904>
- Bianchi, F. J. J. A., Mikos, V., Brussaard, L., Delbaere, B., & Pulleman, M. M. (2013). Opportunities and limitations for functional agrobiodiversity in the European context. *Environmental Science & Policy*, 27, 223–231. <https://doi.org/10.1016/j.envsci.2012.12.014>
- Birdlife International. (2024). *Time to restore. Progress and pitfalls in implementing the EU biodiversity strategy*. <https://www.birdlife.org/wp-content/uploads/2024/11/EU-Biodiversity-Strategy-Progress-Report-1.pdf>
- Bouwma, I., Zinngrebe, Y., & Runhaar, H. (2019). Nature conservation and agriculture: Two EU policy domains that finally meet? In L. Dries, W. Heijman, R. Jongeneel, K. Purnhagen, & J. Wesseler (Eds.), *EU bioeconomy economics and policies: Volume II. Palgrave advances in bioeconomy: Economics and policies* (pp. 153–175). Springer International Publishing. https://doi.org/10.1007/978-3-030-28642-2_9
- Campagnaro, T., McIntosh, N., Trentanovi, G., & Sitzia, T. (2022). Capacity development challenges and solutions for Natura 2000: An approach through blended learning. *Oryx*, 56, 764–773. <https://doi.org/10.1017/S0030605322000679>
- DeGroff, A., & Cargo, M. (2009). Policy implementation: Implications for evaluation. *New Directions for Evaluation*, 2009(124), 47–60. <https://doi.org/10.1002/ev.313>
- del Castillo, T. F. (2020). The EU diplomacy for biodiversity. In M. Campins Eritja (Ed.), *The European Union and global environmental protection* (pp. 35–49). Routledge.
- European Commission (EC). (2021). *EU Biodiversity Strategy for 2030: Bringing nature back into our lives*. European Commission.
- European Commission (EC). (2024). *Report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the 8th Environment Action Programme Mid-Term Review*. European Commission. <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52024DC0123>
- European Environment Agency (EEA). (2020). *Management effectiveness in the EU's Natura 2000 network of protected areas*. <https://www.eea.europa.eu/publications/management-effectiveness-in-the-eus>
- Falco, F. L., Feitelson, E., & Dayan, T. (2021). Spatial scale mismatches in the EU agri-biodiversity conservation policy. The case for a shift to landscape-scale design. *Land*, 10(8), 1–24. <https://doi.org/10.3390/land10080846>
- Felix, L., Houet, T., & Verburg, P. H. (2022). Mapping biodiversity and ecosystem service trade-offs and synergies of agricultural change trajectories in Europe. *Environmental Science & Policy*, 136, 387–399. <https://doi.org/10.1016/j.envsci.2022.07.004>
- Flávio, H. M., Ferreira, P., Formigo, N., & Svendsen, J. C. (2017). Reconciling agriculture and stream restoration in Europe: A review relating to the EU water framework directive. *Science of the Total Environment*, 596, 378–395. <https://doi.org/10.1016/j.scitotenv.2017.04.057>
- Friedrichs, M., Hermoso, V., Bremerich, V., & Langhans, S. D. (2018). Evaluation of habitat protection under the European Natura 2000

- conservation network – The example for Germany. *PLoS One*, 13(12), e0208264. <https://doi.org/10.1371/journal.pone.0208264>
- Gallo, M., Pezdevšek Malovrh, Š., Laktić, T., De Meo, I., & Paletto, A. (2018). Collaboration and conflicts between stakeholders in drafting the Natura 2000 management Programme (2015–2020) in Slovenia. *Journal for Nature Conservation*, 42, 36–44. <https://doi.org/10.1016/j.jnc.2018.02.003>
- Gamero, A., Brotons, L., Brunner, A., Foppen, R., Fornasari, L., Gregory, R. D., Herrando, S., Hofák, D., Jiguet, F., Kmecl, P., Lehtikoinen, A., Lindström, Å., Paquet, Y.-I., Reif, J., Sirkä, P. M., Škorpilová, J., van Strien, A., Szép, T., Telenský, T., ... Voříšek, P. (2017). Tracking progress toward EU biodiversity strategy targets: EU policy effects in preserving its common farmland birds. *Conservation Letters*, 10(4), 395–402. <https://doi.org/10.1111/conl.12292>
- Gasparatos, A., Doll, C. N. H., Esteban, M., Ahmed, A., & Olang, T. A. (2017). Renewable energy and biodiversity: Implications for transitioning to a green economy. *Renewable and Sustainable Energy Reviews*, 70, 161–184. <https://doi.org/10.1016/j.rser.2016.08.030>
- Geist, J., & Hawkins, S. J. (2016). Habitat recovery and restoration in aquatic ecosystems: Current Progress and future challenges: Aquatic restoration. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 26(5), 942–962. <https://doi.org/10.1002/aqc.2702>
- Giakoumi, S., Hermoso, V., Carvalho, S. B., Markantonatou, V., Dagys, M., Iwamura, T., Probst, W. N., Smith, R. J., Yates, K. L., Almpandidou, V., Novak, T., Ben-Moshe, N., Katsanevakis, S., Claudet, J., Coll, M., Deidun, A., Essl, F., García-Charton, J. A., Jimenez, C., ... Vogiatzakis, I. N. (2019). Conserving European biodiversity across realms. *Conservation Letters*, 12(1), e12586. <https://doi.org/10.1111/conl.12586>
- Görg, C., Wittmer, H., Carter, C., Turnhout, E., Vandewalle, M., Schindler, S., Livorelli, B., & Lux, A. (2016). Governance options for science–policy interfaces on biodiversity and ecosystem services: Comparing a network versus a platform approach. *Biodiversity and Conservation*, 25(7), 1235–1252. <https://doi.org/10.1007/s10531-016-1132-8>
- Gosselin, F., Cordonnier, T., Bilger, I., Jappiot, M., Chauvin, C., & Gosselin, M. (2018). Ecological research and environmental management: We need different interfaces based on different knowledge types. *Journal of Environmental Management*, 218, 388–401. <https://doi.org/10.1016/j.jenvman.2018.04.025>
- Hering, D., Schürings, C., Wenskus, F., Blackstock, K., Borja, A., Birk, S., Bullock, C., Carvalho, L., Bou Dagher-Kharat, M., Lakner, S., Lovrić, N., McGuinness, S., Nabuurs, G.-J., Sánchez-Arcilla, A., Settele, J., & Pe'er, G. (2023). Securing success for the nature restoration law. *Science*, 382(6676), 1248–1250. <https://doi.org/10.1126/science.adk1658>
- Hermoso, V., Carvalho, S. B., Giakoumi, S., Goldsborough, D., Katsanevakis, S., Leontiou, S., Markantonatou, V., Rumes, B., Vogiatzakis, I. N., & Yates, K. L. (2022). The EU biodiversity strategy for 2030: Opportunities and challenges on the path towards biodiversity recovery. *Environmental Science & Policy*, 127, 263–271. <https://doi.org/10.1016/j.envsci.2021.10.028>
- Illes, A., Kettunen, M., ten Brink, P., Santos, R., Droste, N., & Ring, I. (2017). Exploring the policy mix for biodiversity financing: Opportunities provided by environmental fiscal instruments in the EU. In S. Weishaar, L. Kreiser, J. Milne, H. Ashiabor, & M. Mehling (Eds.), *The green market transition* (pp. 261–276). Edward Elgar Publishing. <https://doi.org/10.4337/978178811171.00030>
- IPBES. (2018). *Summary for policymakers of the regional assessment report on biodiversity and ecosystem services for Europe and Central Asia of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*. IPBES secretariat.
- Katsanevakis, S., Coll, M., Fraschetti, S., Giakoumi, S., Goldsborough, D., Mačić, V., Mackelworth, P., Rilov, G., Stelzenmüller, V., Albano, P. G., Bates, A. E., Bevilacqua, S., Gissi, E., Hermoso, V., Mazaris, A. D., Pita, C., Rossi, V., Teff-Seker, Y., & Yates, K. (2020). Twelve recommendations for advancing marine conservation in European and contiguous seas. *Frontiers in Marine Science*, 7, 565968. <https://doi.org/10.3389/fmars.2020.565968>
- Königer, J., Lugato, E., Panagos, P., Kochupillai, M., Orgiazzi, A., & Briones, M. J. I. (2021). Manure management and soil biodiversity: Towards more sustainable food systems in the EU. *Agricultural Systems*, 194, 103251. <https://doi.org/10.1016/j.agsy.2021.103251>
- Königer, J., Panagos, P., Jones, A., Briones, M. J. I., & Orgiazzi, A. (2022). In defence of soil biodiversity: Towards an inclusive protection in the European Union. *Biological Conservation*, 268, 109475. <https://doi.org/10.1016/j.biocon.2022.109475>
- Koslowski, M., Moran, D. D., Tisserant, A., Veronesi, F., & Wood, R. (2020). Quantifying Europe's biodiversity footprints and the role of urbanization and income. *Global Sustainability*, 3, e1. <https://doi.org/10.1017/sus.2019.23>
- Lenti, A. (2023). *Non-systematic literature review of challenges that hinder the implementation of specific targets of the BDS 2030 (Version V1) [Data set]*. Zenodo. <https://doi.org/10.5281/ZENODO.7685109>
- Lenti, A., Kelemen, E., Czett, K., Carla, K., & Pataki, G. (2023). *Typology of challenges that hinder the implementation of BDS 2030*. Zenodo. <https://doi.org/10.5281/ZENODO.7685651>
- Leventon, J., Schaal, T., Veltin, S., Dänhardt, J., Fischer, J., Abson, D. J., & Newig, J. (2017). Collaboration or fragmentation? Biodiversity management through the common agricultural policy. *Land Use Policy*, 64, 1–12. <https://doi.org/10.1016/j.landusepol.2017.02.009>
- Maasri, A., Jähnig, S. C., Adamescu, M. C., Adrian, R., Baigun, C., Baird, D. J., Batista-Morales, A., Bonada, N., Brown, L. E., Cai, Q., Campos-Silva, J. V., Clausnitzer, V., Contreras-MacBeath, T., Cooke, S. J., Datry, T., Delacámara, G., De Meester, L., Dijkstra, K. B., Do, V. T., ... Worischka, S. (2022). A global agenda for advancing freshwater biodiversity research. *Ecology Letters*, 25(2), 255–263. <https://doi.org/10.1111/ele.13931>
- Mammides, C. (2019). European Union's conservation efforts are taxonomically biased. *Biodiversity and Conservation*, 28(5), 1291–1296. <https://doi.org/10.1007/s10531-019-01725-8>
- Mayring, P. (2021). *Qualitative content analysis: A step-by-step guide*. SAGE Publications.
- Molnár, Z., Kelemen, A., Kun, R., Máté, J., Sáfián, L., Provenza, F., Díaz, S., Barani, H., Biró, M., Máté, A., & Vadász, C. (2020). Knowledge co-production with traditional herders on cattle grazing behaviour for better management of species-rich grasslands. *Journal of Applied Ecology*, 57(9), 1677–1687. <https://doi.org/10.1111/1365-2664.13664>
- Montanarella, L., & Panagos, P. (2021). The relevance of sustainable soil management within the European green deal. *Land Use Policy*, 100, 104950. <https://doi.org/10.1016/j.landusepol.2020.104950>
- Nesbit, M., Whiteoak, K., Underwood, E., Rayment, M., Hart, K., Aubert, G., Kollenda, E., Lórán, A., & Kopsieker, L. (2022). *Biodiversity financing and tracking: Final report*. Institute for European Environmental Policy and Trinomics. <https://doi.org/10.2779/950856>
- Orlikowska, E. H., Roberge, J. M., Blicharska, M., & Mikusiński, G. (2016). Gaps in ecological research on the World's largest internationally coordinated network of protected areas: A review of Natura 2000. *Biological Conservation*, 200, 216–227. <https://doi.org/10.1016/j.biocon.2016.06.015>
- Paloniemi, R., Apostolopoulou, E., Cent, J., Bormpoudakis, D., Scott, A., Grodzińska-Jurczak, M., Tzanopoulos, J., Koivulehto, M., Pietrzyk-Kaszyńska, A., & Pantis, J. D. (2015). Public participation and environmental justice in biodiversity governance in Finland, Greece, Poland and the UK: Public participation in biodiversity governance. *Environmental Policy and Governance*, 25(5), 330–342. <https://doi.org/10.1002/eet.1672>
- Pe'er, G., Bonn, A., Bruelheide, H., Dieker, P., Eisenhauer, N., Feindt, P. H., Hagedorn, G., Hansjürgens, B., Herzog, I., Lomba, Á., Marquard, E., Moreira, F., Nitsch, H., Oppermann, R., Perino, A., Röder, N.,

- Schleyer, C., Schindler, S., Wolf, C., ... Lakner, S. (2020). Action needed for the EU common agricultural policy to address sustainability challenges. *People and Nature*, 2(2), 305–316. <https://doi.org/10.1002/pan3.10080>
- Pellegrino, D., Schirpke, U., & Marino, D. (2017). How to support the effective Management of Natura 2000 sites? *Journal of Environmental Planning and Management*, 60(3), 383–398. <https://doi.org/10.1080/09640568.2016.1159183>
- Rinaldi, A. (2021). Biodiversity 2030: A road paved with good intentions: The new EU Commission's biodiversity strategy risks to remain an empty husk without proper implementation. *EMBO Reports*, 22(6), 1–7. <https://doi.org/10.15252/embr.202153130>
- Schirpke, U., Marino, D., Marucci, A., Palmieri, M., & Scolozzi, R. (2017). Operationalising ecosystem services for effective management of protected areas: Experiences and challenges. *Ecosystem Services*, 28, 105–114. <https://doi.org/10.1016/j.ecoser.2017.10.009>
- Selva, N., Chylarecki, P., Jonsson, B. G., & Ibsch, P. L. (2020). Misguided forest action in EU biodiversity strategy. *Science*, 368(6498), 1438–1439. <https://doi.org/10.1126/science.abc9892>
- Shrader-Frechette, K. S., & McCoy, E. D. (1993). *Method in ecology: Strategies for conservation*. Cambridge University Press.
- Van Rees, C. B., Waylen, K. A., Schmidt-Kloiber, A., Thackeray, S. J., Kalinkat, G., Martens, K., Domisch, S., Lillebø, A. I., Hermoso, V., Grossart, H.-P., Schinegger, R., Decler, K., Adriaens, T., Denys, L., Jarić, I., Janse, J. H., Monaghan, M. T., De Wever, A., Geijzendorffer, I., ... Jähnig, S. C. (2021). Safeguarding freshwater life beyond 2020: Recommendations for the new global biodiversity framework from the European experience. *Conservation Letters*, 14(1), e12771. <https://doi.org/10.1111/conl.12771>
- Vassiliki, K., Hovardas, T., Dieterich, M., Ibsch, P. L., Mihok, B., & Selva, N. (2015). The challenge of implementing the European network of protected areas Natura 2000: Implementing Natura 2000. *Conservation Biology*, 29(1), 260–270. <https://doi.org/10.1111/cobi.12366>
- Velten, S., Schaal, T., Leventon, J., Hanspach, J., Fischer, J., & Newig, J. (2018). Rethinking biodiversity governance in European agricultural landscapes: Acceptability of alternative governance scenarios. *Land Use Policy*, 77, 84–93. <https://doi.org/10.1016/j.landusepol.2018.05.032>
- Yakusheva, N. (2017). *Parks, policies and people. Nature conservation governance in post-socialist EU countries*. Elander. <https://www.diva-portal.org/smash/get/diva2:1088692/FULLTEXT01.pdf>
- Zeiss, R., Eisenhauer, N., Orgiazzi, A., Rillig, M., Buscot, F., Jones, A., Lehmann, A., Reitz, T., Smith, L., & Guerra, C. A. (2022). Challenges of and opportunities for protecting European soil biodiversity. *Conservation Biology*, 36(5), e13930. <https://doi.org/10.1111/cobi.13930>

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

Data S1. Interview guide for EU level policy implementers.

Interview guide for national/local level policy implementers.

Annex 1. Frequency of different challenge categories mentioned together by EU-level interviewees.

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