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2 Narratives for positive nature futures in 3 Europe

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24 **Abstract**

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26 1) The Nature Futures Framework (NFF) is a novel tool for the development of positive
27 scenarios centred on the relationship of nature and people, emphasising biodiversity
28 as part of the solution to environmental challenges across various spatial and temporal
29 scales, explicitly addressing a plurality of values for nature .

30 2) In this work, we describe the process that has led to the formulation of continental-
31 scale positive narratives for conservation in Europe based on the NFF and its value
32 perspectives (Nature for Nature; Nature for Society; Nature as Culture), through a
33 stakeholder group elicitation. We focused on 6 topics in the narratives: Nature
34 Protection and Restoration; Forestry; Freshwater Ecosystems; Urban Systems;
35 Agriculture, and Energy. We analyse differences and similarities among the narratives
36 across these topics.

37 3) We develop three novel Nature Futures narratives for Europe with contrasting
38 perspectives and priorities for the six topics. Within the EU socioeconomic trends and
39 policy framework, common solutions that simultaneously tackle biodiversity
40 conservation and instrumental and cultural Nature's Contributions to People (NCP)
41 provision emerged.

42 4) This set of narratives may integrate preferences concerning EU-level conservation
43 targets and plausible socio-ecological development pathways, supporting the
44 modelling of positive scenarios for nature that can be crucial in guiding policy
45 decisions towards recovery of nature.

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46 **Keywords**

47 EU Biodiversity Strategy, IPBES Nature Futures Framework, conservation storylines,
48 participatory scenarios, protected areas, nature restoration.

49 **1. Introduction**

50 The global biodiversity crisis has received increasing attention globally, but the
51 actions have so far been insufficient to reverse the trend of declining biodiversity (CBD
52 secretariat, 2020; IPBES, 2019). In Europe, the EU Biodiversity Strategy for 2030 provides a
53 framework for current and future conservation endeavours by setting clear targets and
54 objectives that largely align with the Kunming-Montreal Global Biodiversity Framework
55 (EC, 2020a; KM GBF, 2022). The strategy sets ambitious goals, including the expansion of
56 protected areas (PAs) to reach a minimum of 30% spatial coverage for both land and sea.
57 Importantly, at least one third of these areas should be managed under strict protection. In
58 addition, the pending European Nature Restoration Law demands action to ecologically
59 restore at least 20% of degraded land and sea areas within the EU, and support the recovery
60 of ecosystems and species in synergy with area protection targets (EC, 2022a). Yet, the long
61 history of intensive exploitation of ecosystems in Europe and conflicts with other relevant
62 socio-economic activities, such as agricultural, forestry, urbanisation or energy production,
63 makes the achievement of these policy targets challenging.

64 Achieving ambitious goals in the context of competing interests requires an integrated
65 management approach that explores all relevant nature conservation values and options.
66 Environmental change scenarios are valuable for nature conservation for investigating the
67 potential impacts of different societal development pathways and policy choices on
68 biodiversity and Nature's Contributions to People (NCP), while also facilitating
69 communication and involving multiple stakeholders in the process (Pereira et al., 2020). The
70 widely used Shared Socio-Economic Pathways (SSPs) scenario framework integrates drivers

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71 such as demography, governance efficiency, inequality at both national and international
72 levels, socio-economic advancements, institutional factors, technological advancements, and
73 environmental conditions (van Vureen et al., 2014; O'Neill et al., 2014). However, scenarios
74 based on SSPs typically do not take in consideration positive features specifically for nature
75 and biodiversity, and are thus limited in their use for exploring different societal preferences
76 related to the role of nature, and related policies driving human socio-economic development
77 (IPBES, 2016; Saito et al., 2019; Pereira et al., 2020; Lundquist et al., 2021).

78 At the same time, it is increasingly clear that different stakeholders exhibit different
79 preferences for nature, depending both on their relationship with nature and the information
80 provided given different nature management options (Capper et al., 2024; Carvalho Ribeiro et
81 al., 2013; van der Wal et al., 2014). Recognizing the plurality of views of nature across
82 people is important to democratise the management of landscapes, acknowledging tensions
83 between stakeholders but also their perspectives on nature (Dotson & Pereira, 2022). This
84 richness of perspectives on nature is not currently represented in existing scenarios, with
85 often only one “desirable” perspective for nature being considered in a given set of scenarios
86 (Rosa et al., 2017; Pereira et al., 2020).

87 To address the limitations within existing scenarios, the expert group on scenarios and
88 models of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem
89 Services (IPBES) developed the Nature Futures scenario Framework (NFF) (IPBES, 2023a).
90 The NFF aims to support the development of positive scenarios centred on the relationship of
91 people with nature across various spatial and temporal scales (IPBES, 2023b; Kim et al.,
92 2023). This framework incorporates different perspectives, all with nature at the centre of the
93 scenario design rather than just as an outcome, and allows the consideration of diverse value
94 perspectives (Rosa et al., 2017; Pereira et al., 2020). NFF scenarios encompass three value
95 perspectives that capture and cluster the many different preferences for nature across people

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96 (Mansur et al., 2022; Pascual et al., 2023), and can be represented as three corners of a
97 triangle (Fig. S1). The Nature for Nature (NfN) perspective, emphasises the intrinsic value of
98 nature, including preserving individual species and species diversity, habitats, ecosystems,
99 natural processes, and the self-regulatory processes of nature. The Nature for Society (NfS)
100 perspective focuses on the maximisation of instrumental values, benefits, and services that
101 biodiversity and ecosystems provide to people, including food provisioning, water
102 purification, disease control. Finally, the Nature as Culture (NaC) perspective highlights the
103 relational values between nature and people, where society, traditions, beliefs and emotions
104 drive socio-ecological landscapes, such as silvo-pastoral landscapes (Bugalho et al., 2011;
105 Zerbe, 2022).

106 The NFF has been applied to assess preferences for nature in existing participatory
107 scenarios (Quintero-Uribe et al., 2022), to develop new scenarios, e.g., in a National Park in
108 the Netherlands (Kuiper et al., 2022), in a rural landscape in northeastern Japan (Haga et al.,
109 2023), and in urban management (Mansur et al., 2022). Recently, the framework has been
110 adopted to explore how contrasting narratives would translate into land use scenarios for
111 Europe by 2050 (Dou et al., 2023). However, the NFF has never been applied to formulate
112 continental-scale positive nature future narratives. These aim to integrate societal visions and
113 preferences concerning EU-level conservation targets and plausible socio-ecological
114 development pathways, thus supporting policy decisions towards recovery of nature.

115 Here we designed NFF narratives for Europe through a participatory approach with
116 stakeholders that were previously identified through a mapping exercise, and then invited to
117 join two stakeholder engagement events, both in person and online. The narratives describe
118 different scenarios that explore conservation and restoration priorities and policies. We aimed
119 to answer the questions: what are possible contrasting positive futures for European
120 landscapes? What are the common enabling conditions that need to be met for any of these

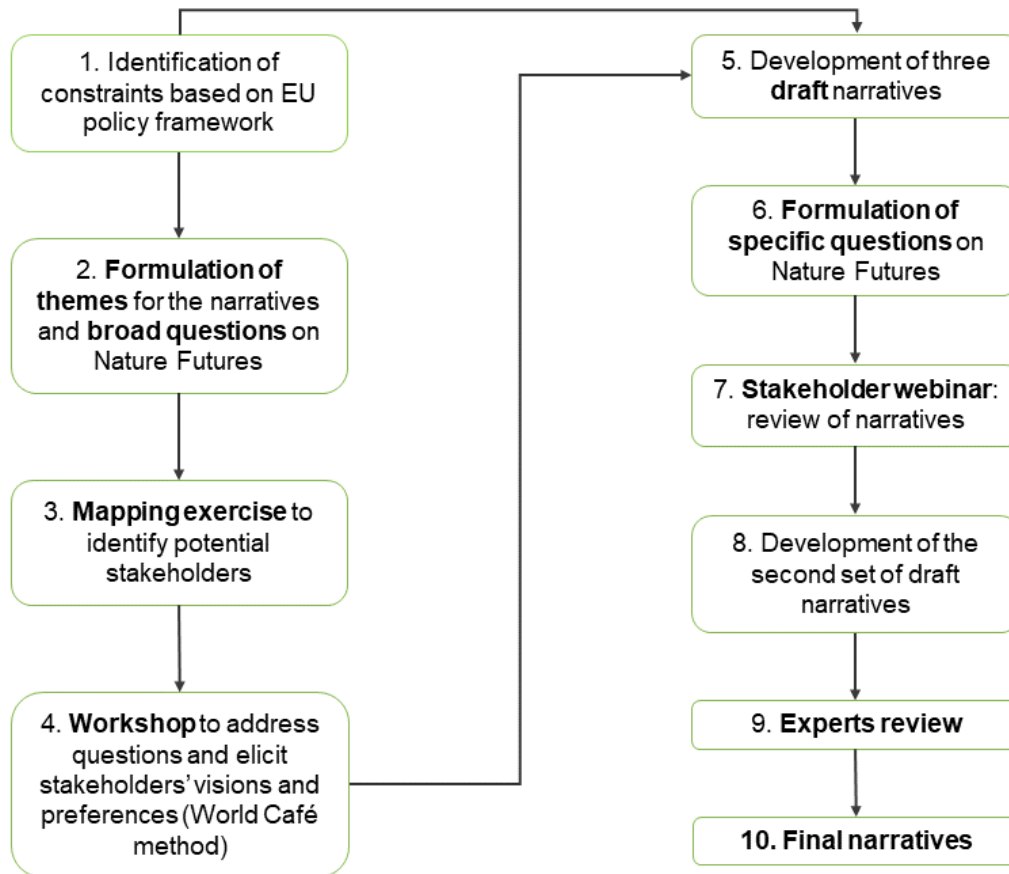
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121 positive futures to come to fruition? Through a participatory process, we gathered
122 perspectives and priorities from stakeholders and formulated NFF narratives based on key
123 topics: Nature Protection and Restoration, Forestry, Freshwater Ecosystems, Urban Systems,
124 Agriculture, and Energy. These topics emerged in the context of the current challenges for
125 nature conservation to help envision a sustainable future for nature and society. The
126 narratives can support integrated planning and land use modelling towards the achievement
127 of EU policy targets, by supporting modellers in the field of conservation, and consequently
128 assisting the EU Member States in developing an ecologically representative, resilient, and
129 well-connected Trans-European Nature Network (TEN-N) (NaturaConnect, 2024). To our
130 knowledge they are the first of their kinds that explicitly place conservation and restoration in
131 the centre, in line with EU policy targets and in a globally comparable framework (IPBES
132 NFF).

133 **2. Material and methods**

134 To develop the NFF narratives aligned with the three perspectives, representing the
135 corners of the triangle (Fig. S1), we implemented the method from Pereira et al. (2020), into a
136 sequence of ten steps (Fig. 1) (see Appendix 2 for further details).

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138 **Figure 1.** The process of development of the Nature Futures narratives for Europe.

139

140 **1)** We identified a set of EU assumptions, or 'constraints', that coerce the NFF narratives. We
141 considered key EU legislation, regulations, objectives and strategic priorities as mandatory
142 for all NFF narratives. These include the EU Biodiversity Strategy objectives for 2030, such
143 as the expansion of PAs and strictly protecting one third of these areas; the implementation of
144 multifunctional Green and Blue Infrastructure; and the Nature Restoration Law (EC, 2022a).
145 We also took into account the Common Agricultural Policy; the EU Farm to Fork Strategy
146 (EC, 2020b); the "No Net Land Take " by 2050 objective (EC, 2016); and the European
147 Climate Law (EC, 2023b). **2)** According to the challenges and constraints facing Europe, we
148 decided to address a preliminary set of themes and, based on them, we formulate a set of
149 broad questions to be asked to stakeholders (Appendix 2.1). **3)** We identified key
150 stakeholders through a mapping exercise, based on their influence in specific sectors of

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151 interest at the European level. Stakeholders were mapped using a power-interest grid, a
 152 conceptual framework that sorts stakeholders into four quadrants based on their interest in the
 153 different workflows of the process and influence on its outcomes (Figure S2; Appendix 2.2)

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155 **Table 1:** Table listing the stakeholders identified through the mapping exercise and clustered

156 according to their levels of interest and influence. Key stakeholders, with high interest and

157 influence are reported in the top right-hand box.

Low Interest/ High Influence	High Interest/ High Influence
<ul style="list-style-type: none"> ● DG Agriculture ● DG REGIO ● DG Clima ● Ministries of the Environment ● European Landowner Association ● European State Forest Association (EUSTAFOR) ● European Council of Young Farmers (CEJA) ● Farmers and agri-cooperatives in EU (COPA-COGECA) ● European Timber Trade Federation (ETTF) ● Infrastructure and Environment Executive Agency (CINEA) ● Euroelectric ● Euromines ● Euronatur ● ANGLERS 	<ul style="list-style-type: none"> ● DG Environment ● Centre for Biodiversity (KCBD) of the European Commission ● European Environmental Agency ● KBA Secretariat ● Biodiversa+ ● WWF ● EUROPARC ● EuropaBON ● GeoBON ● IPCC ● IPBES ● SYKE ● ISPRA ● MITECO ● German Federal Agency for Nature Conservation (BfN) ● European Spatial Development Planning Network ● European Federation for Hunting and Conservation FACE ● Confederation of European Forest Owners
Low Interest/ Low Influence	High Interest/ Low Influence
<ul style="list-style-type: none"> ● Saami Council 	<ul style="list-style-type: none"> ● IUCN ● Birdlife ● Society for Conservation Biology ● Society for Restoration Ecology

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	<ul style="list-style-type: none">● The Bureau for Forest Management and Geodesy (BULiGL)● Netherlands Environmental Assessment Agency (PBL)● Confederación Hidrográfica del Guadalquivir (CHG)● Patrimoine Naturel (PatriNat OFB-MNHN-CNRS-IRD)● Leipzig Department of Environmental Protection (Umweltschutz Leipzig)● The Helmholtz-Centre for Environmental Research (UFZ)● Estación Biológica de Doñana (EBD-CISC)
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159 This categorization helps determine the key stakeholders, with high power and high interest,
160 that should be deeply involved in stakeholders elicitation processes to identify plausible and
161 supported Nature Future narratives that are compatible with the achievement of the objectives
162 of the EU Biodiversity Strategy 2030.

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164 **4)** In a second phase, we organised an in-person workshop with stakeholders to elicit their
165 perspectives on the future of nature. We held a three-day in-person workshop (Leipzig,
166 Germany, 8-10 May 2023). During this event, scientists of the NaturaConnect project were
167 introduced as internal stakeholders, representing several expertise within the conservation
168 sector . The workshop aimed to gather insights on the future of nature in Europe, using the
169 World Café method for structured dialogues led by moderators (Brown, 2010) (Appendix
170 2.3).

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173 The first World Café round, which focused on landscape changes, agriculture management,
174 and conservation motivations, was facilitated by showing pictures of different European
175 landscapes, selected according to the themes identified in the previous step. Participants moved
176 between tables that represented the different corners of the NFF triangle to envision future
177 European landscapes contrasting the three different NFF perspectives on nature. Subsequently,
178 the discussion moved into the previously defined themes (Appendix 2.3). **5)** This visioning
179 exercise was propaedeutic to develop the first draft of the narratives, by elaborating and
180 revising the outcomes with moderators of each workshop' session. After the workshop, indeed,
181 we refined the three narratives “Nature for Nature”, “ Nature for Society” and “Nature as
182 Culture”, focusing them on six main recurring topics: Urban systems, Forestry, Freshwater
183 Ecosystems, Energy, Agriculture, and Nature Protection and Restoration (Appendix 2.3). **6)**
184 Since gaps concerning preferences and different perspectives emerged, particularly on Nature
185 Protection and Restoration topics, we defined additional questions on nature futures to improve
186 the narratives (Appendix 2.4). **7)** A draft version of the narratives was presented during a 2-
187 hour public webinar (4 July 2023). It served to harvest additional feedback and insights,
188 through 15 interactive questions via Mentimeter (www.mentimeter.com), following each
189 narrative presentation (Appendix 2.5). **8)** After the webinar, the most frequent remarks and
190 new information were collected. Thus, both stakeholders' event inputs were analysed and
191 integrated to create a coherent second set of draft narratives. **9)** Finally, following a further
192 review by the experts group of the NaturaConnect project, **10)** we developed a final set of
193 narratives (Appendix 2.5). The study has been approved by the NaturaConnect committee
194 which has ensured the ethical requirements and that all people involved in the stakeholders'
195 event gave their informed consent for participation and to share the obtained outcomes.

196 We analysed the main differences and commonalities across the narratives and we
197 highlighted contrasts across the narratives concerning the six topics. Specifically, we analysed

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198 some specific aspects involving the six topics that were key in distinguishing the NFF
199 narratives: the dichotomy between land-sharing and land-sparing, the restoration approach, the
200 importance of maintaining the integrity of freshwater resources, the level of forest
201 management, the human presence in protected areas, the population flow and the urban
202 configuration, the agricultural strategies and the implementation of wind and solar energy.
203 Reflecting the importance of these aspects in each narrative, we attributed each a gradient of
204 preference from Minimum to Medium to Maximum.

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206 **3. Results**

207 The in-person stakeholder workshop was joined by 41 participants from 13 European
208 countries, including 13 external stakeholders and 28 conservation scientists and practitioners
209 from the NaturaConnect project. All participants represented institutions and stakeholder
210 groups of the European environment conservation (95,4%) hunting (2,3%) and land use
211 planning (2,3%) sectors.

212 The webinar brought together a group of 115 participants from 18 countries, all
213 European except one. The stakeholders who responded to the specific question (68 people)
214 gave 100 answers, about the sector they belong to. This means that some people are declared
215 to belong to more than one sector. The sectors are distributed as follows: nature conservation
216 (54%), land use planning, (13%), forestry (9%), social science (8%), policy and law (5%),
217 urban (3%), marine (2%), agriculture (1%), tourism (1%) and other sectors (4%). Based on
218 the webinar participants' responses (60%), 80% belonged to nature conservation
219 governmental or non-governmental organisations. However, it should be noted that 35% of
220 participants who participated in the webinar their affiliated entity and sector remained
221 unknown.

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224 Through the stakeholder elicitation and refinement by the expert group, we designed
225 three narratives that describe different nature futures in Europe, one per each corner of the
226 NFF triangle: Nature for Nature (Box 1), Nature for Society (Box 2) and Nature as Culture
227 (Box 3). Below we summarised the main content of each narrative by topic (Table 2) and we
228 highlighted the differences and commonalities among the narratives.

229 **Table 2:** Summary of the narratives. The main content of the narratives (in column) is described per topic (in rows). Note that the topic Nature
 230 Protection and Restoration includes a focus on conservation goals for each narrative, describing the Protected Areas (PAs) aim and use, and the
 231 restoration strategy. Restoration is also the main focus in the Freshwater Ecosystem row. Forestry and agriculture topics are focused on different
 232 land management approaches, while Urban Systems and Energy address infrastructures development that also involve people distribution.

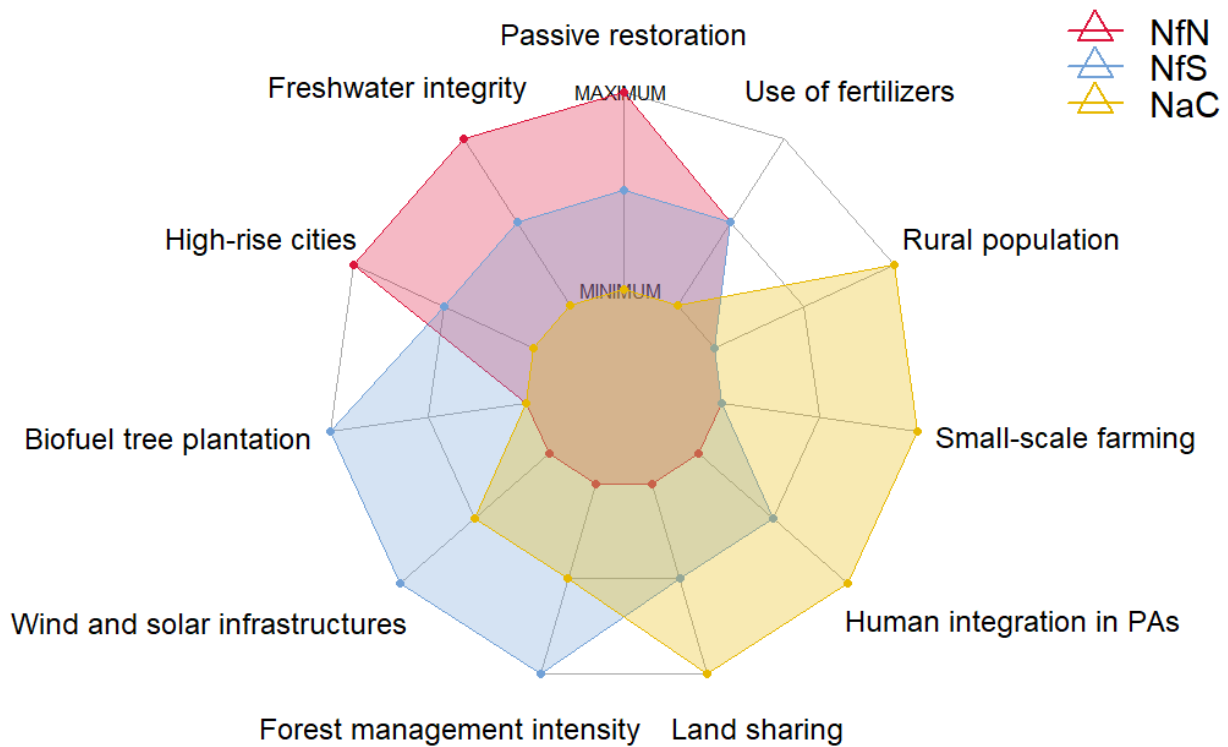
Topic	Nature for Nature	Nature for Society	Nature as Culture
Nature Protection and Restoration	<p>Emphasis on ecological integrity and resilience. Irreplaceable and particularly vulnerable species and ecosystems receive high priority.</p> <p>In protected areas (PAs), activities are minimised in line with biodiversity conservation objectives. In strictly protected areas no management and no intervention is carried out in sites with high ecological integrity.</p>	<p>Emphasis on Nature’s Contributions to People (NCP) provisioning and associated species and ecosystems.</p> <p>In PAs, there is moderate to high tolerance for human activities/ intervention related to Nature’s Contributions to People use. In strictly protected areas focus is on preserving ecosystems for which the processes and functions associated with NCP depend on minimal disturbance.</p>	<p>Emphasis on cultural landscapes, including high nature value farmland and associated species.</p> <p>In PAs, there is high tolerance for cultural human activities. In strictly protected areas focus is on culturally relevant species and ecosystems which require minimum disturbance.</p>
	<p>Passive restoration is enhanced. Structural and functional connectivity is improved for all species through Green and Blue Infrastructures.</p>	<p>Active restoration is enhanced. Ecosystems’ connectivity that supports NCP provision is improved, especially in peri-urban landscapes and across cultivated land through Green and Blue Infrastructures.</p>	<p>Active restoration is enhanced. Connectivity is improved for symbolic species and cultural landscapes, especially agroecological areas with hedgerows and natural patches, and cities through Green and Blue Infrastructures.</p>

Forestry	Land sparing approach with no logging in old-growth forests. Passive afforestation through natural succession enhances the complexity of forests.	Land sharing approach with forests managed to have multifunctionality, maximising NCP and biodiversity. Active afforestation with native species that provide NCP.	Land sharing approach with local communities managing forests to provide cultural services.
Freshwater Ecosystems	Restore freshwater ecosystems maximising ecological integrity by removing obsolete barriers for species connectivity and ecological flows.	Restore freshwater ecosystems that provide NCP and minimise barriers' impacts on biodiversity and NCP, such as flood mitigation.	Restore freshwater ecosystems with cultural/traditional value or areas linked to emblematic species.
Agriculture	Land sparing approach to save more space for biodiversity conservation.	Land sharing/sparing mixed approach. Large-scale farming and NBS to provide NCP.	Land sharing approach to better integrate nature with anthropogenic traditional activities of cultural value.
Urban Systems	High-rise compact cities but no sprawl with population flow from rural areas to cities.	Moderately compact cities that maximise access to NCP.	No high-rise compact cities and increased population flow from cities to rural areas.
Energy	Renewable Energy implementation avoids areas of conservation concern.	Renewable Energy Sources are planned to reduce land-take impacts on biodiversity and related NCP.	Renewable Energy plants are placed in isolated areas to avoid culturally important places and landscapes.

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233 **3.1 Differences among the narratives**

234 The main difference among the narratives is the preference towards a land sharing or
235 sparing approach, across several topics such as Agriculture, Urban System, Forestry and
236 Energy (Fig. 2).



239 **Figure 2.** Spider diagram showing the main differences among the Nature Futures for
240 Europe. The red, blue, and yellow polygons represent NfN, NfS and NaC, respectively. Axes
241 represent a gradient measured on an ordinal scale from Minimum to Medium to Maximum.
242 This gradient reflects stakeholders preferences for all NFF corners, on topics selected for
243 drafting the narratives (Nature Protection and Restoration, Agriculture, Urban Systems,
244 Freshwater Ecosystems, Forestry, Energy).

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246 In the NaC perspective, land sharing is preferred (Box 3), whereas, in NfN, land sparing is
247 favoured (Box 1). NfS requires a moderate gradient of land sharing to provide NCP (Box 2).

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248 Therefore, large-scale agriculture is practised in both NfS and NfN, and small-scale farming
249 resulted as preferred in NaC. Stakeholders found elements of ecological integrity as cross-
250 cutting elements in NFF, whereas in the other narratives it is not perceived as significant. In
251 this context, freshwater ecosystems protection and restoration seem to be crucial within the
252 NfN narrative, while being less considered in NfS and NaC where they reach the lowest
253 value. In the NfN perspective, human activities are minimal in PAs because access to these
254 areas is limited, but are expected to be moderate in NfS and maximal in NaC, where they are
255 located near human settlements to improve accessibility (Fig. 2). In NfN, passive restoration
256 is preferred and forests are less managed than in NaC and NfS. Development of high-rise
257 compact cities is at its maximum in NfN to make space for nature. A similar urban
258 development occurs in NfS. Conversely, in NaC, people move from large cities and peri-
259 urban areas to medium and small settlements in rural areas with low population density. In
260 NfN, ecological integrity and connectivity have priority over renewable energy sources such
261 as wind and solar farms. In contrast, nature has low priority over renewable energy sources
262 implementation in NfS, while being moderate in NaC. Fast-growing tree plantations for
263 biofuel production (e.g. poplars) are more encouraged in NfS than in the other narratives
264 (Box 2). The amount of space required for this activity results in no forest patches allotted for
265 biofuel in NfN and NaC (Box 1) (Box 3).

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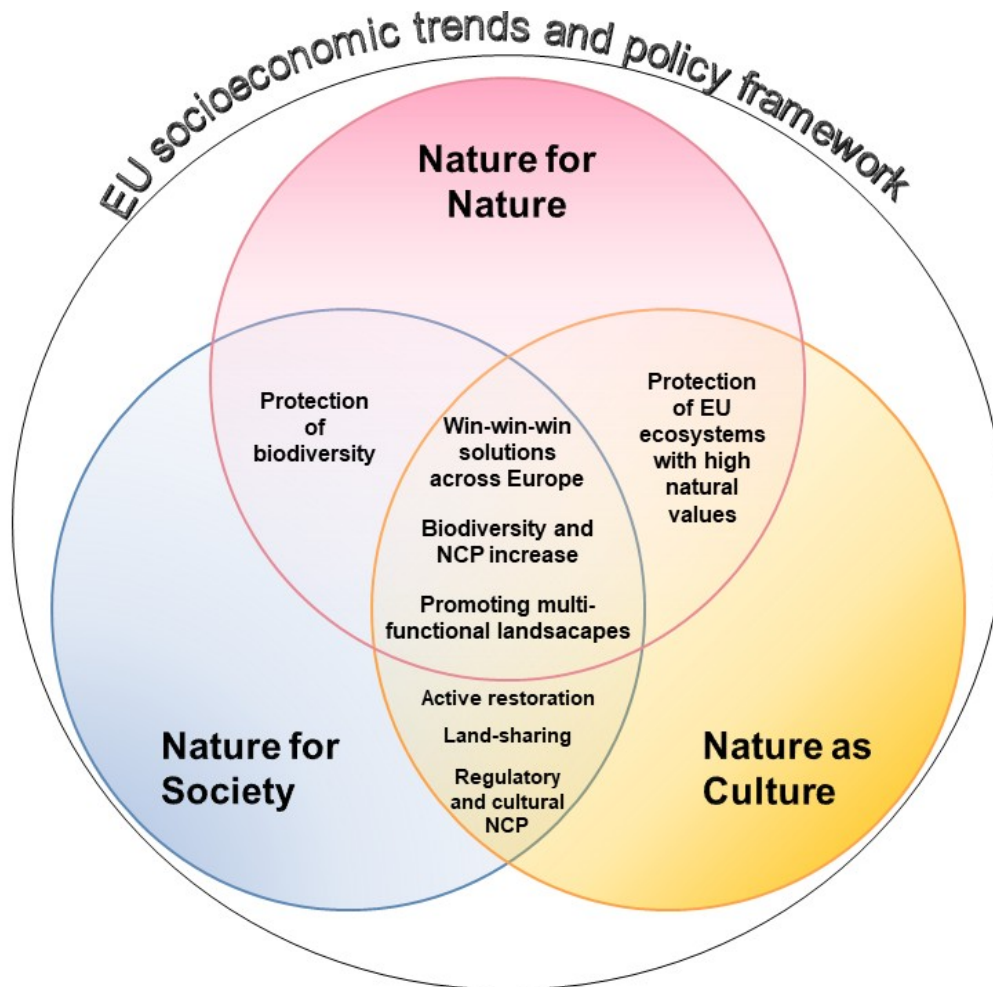
268 **3.2 Commonalities**

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270 Some common concepts emerged across the narratives, since they were all based on
271 the 2030 EU Biodiversity goals, and included mutually beneficial solutions that address
272 biodiversity conservation and NCP provisioning (Fig. 3).

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274 **Figure 3:** Venn diagram showing the commonalities (coloured in black) among the Nature
275 Futures for Europe. Overall, win-win-win solutions and an increase in biodiversity and
276 Nature's Contributions to People (NCP) are envisioned for all NFF corners.

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278 Restoration efforts can achieve multiple objectives for nature and people by enhancing
279 ecosystem integrity and connectivity, and simultaneously ensuring the practical uses and
280 cultural values of nature. For example, restored natural areas along rivers may provide
281 umbrella habitats and regulate flooding whilst also creating space for recreational activities
282 (Fig. 3). Infrastructure planning, including highways, railways, and renewable energy plants,
283 aims to improve coexistence between humans and nature for space efficiency, though
284 minimising impacts on species and ecosystems. Energy communities, which are organisations

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285 that rely on sharing energy among local citizens, public administrations, and enterprises (EC,
286 2023a), may reduce the need for linear energy infrastructures. The deployment of
287 photovoltaic panels on roofs could allow saving space outside urban areas. Urban greening
288 and gardening initiatives may reduce the human carbon-footprint and ensure environmental
289 sustainability, NCP, biodiversity and connectivity. The implementation of zero-emission
290 public transportation and bike pathways within and around cities is a shared measure to
291 mitigate climate change effects, contributing to the improvement of both nature and human
292 health.

293 Promoting multifunctional landscapes is central in NfS and NaC, indeed sustainable
294 management of agricultural and forest landscapes may support various functions
295 concurrently, such as the optimisation of biofuel production through the use of crop and
296 wood residues. Sustainable forestry is also beneficial in terms of carbon sequestration and
297 availability of recreational areas, and it supports the maintenance of biodiversity, and its
298 productivity, vitality, regenerative capacity, as well as the provisioning, over time, of material
299 and regulatory NCP.

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Box 1. Nature for Nature (NfN)

In the NfN narrative, the value of nature is intrinsic and independent from any direct benefits that people may gain from nature. The protection and restoration of the ecological integrity of ecosystems are therefore key priorities in this narrative and thereby land sparing approaches are pursued. Strict protection is envisioned for natural areas to preserve the integrity and resilience of nature within the European protected area network. Thus, human activities are minimised in PAs as access to these areas is restricted.

Conservation focuses on sensitive and irreplaceable species and habitats. Both structural and functional connectivity is improved for all species through Green and Blue Infrastructures. Restoring and ensuring the connectivity of PAs is a priority pursued to help recover the characteristic ecological flows of undisturbed ecosystems. Restoration of connectivity in freshwater ecosystems is essential in this narrative and obsolete dams are removed for this purpose. Natural forest dynamics is promoted, thus enhancing both structural and functional complexity and natural regeneration and turnover. Forest harvesting is reduced to a minimum, especially in old-growth forests and in strictly protected areas. To leave space for nature conservation, high-intensity agriculture is maintained to maximise production without expanding agricultural land. Precision farming is promoted to minimise impacts from agriculture. No increase in urban sprawl but high-rise compact cities development are deemed desirable. Renewable energy production, such as wind and solar, is established outside areas with high biodiversity values, also excluding buffer zones around PAs and other sensitive conservation areas. They are strategically placed in already degraded areas and high-intensity agricultural landscapes. Power lines are constructed along pre-existing infrastructures, and efforts are made to conceal them underground to minimise wildlife mortality and disturbances.



Box 2. Nature for Society (NfS)

In the NfS perspective, emphasis is placed on the instrumental value provided to people. As a result, ecosystems are protected and restored with the aim of boosting the provisioning of NCP. To allow this provisioning, PAs are located where both NCP supply and demand are high and human activities are moderate. Species conservation is a priority mainly when it is associated with the supply of a specific NCP. Ecosystems for which the processes and functions associated with NCP depend on minimal disturbance are strictly protected. Ecological corridors are designed and restored taking into account their capacity to provide multiple benefits to people, especially in peri-urban landscapes and across cultivated land through Green and Blue Infrastructures (EC, 2019). Overall, active management and restoration approaches are used to prevent natural hazards (such as fire and flood risk) or reverse their impacts, promote carbon sequestration and sustainable timber extraction in forests, guarantee good water quality and supply, and ensure wild fish supply in freshwater ecosystems. Moderate land sharing is necessary for providing NCP in NfS. High-intensity agriculture and farming are away from areas of conservation concern. However, to enhance the co-benefits related to NCP, such as increasing biodiversity that leads to a better provision of resources or services for society and providing agroecological landscapes for species and habitats of high conservation interest (e.g. farmland birds and Dehesas), agriculture is slightly de-intensified and often integrated with NBS (e.g., hedges, green linear elements, restoration of landscape complexity). Moderately compacted urban areas are planned to facilitate beneficial contact between society and natural features, implying some urban sprawl in peri-urban areas. The provision of renewable energy is given priority over nature; thus, dams are managed to have minimal impacts on biodiversity and NCP (e.g., flood regulation, sediment retention, water quality and control of invasive species). Among renewable energy sources, fast-growing tree plantations for biofuel production (e.g. poplar) are encouraged, and wind and solar power plants are planned to minimise potential impacts on the provision of NCP.

Nature for Society



Box 3. Nature as Culture (NaC)

The NaC narrative focuses on the relational values for nature, expressing personal and collective emotional connections that people have with nature. Therefore, human activities and presence within nature are tolerated more in this narrative than in the others. Strict protection focuses on culturally relevant species and ecosystems which require minimum disturbance. Overall, the protected area (PA) network is managed with a strong focus on maintaining culturally important practices, protecting heritage landscapes, and agroforestry and other human-modified systems with high natural value (Halada et al., 2011). These are done through initiatives such as UNESCO Man and Biosphere reserves (MAB) (Reed, 2019). Thus, traditional land use practices and experiences that connect people to specific landscapes are prioritised in PAs (e.g., Farm to Fork initiatives, wine routes, transhumance of livestock, high nature value farmland, biodiversity-friendly farming, pilgrimage routes, hiking and enjoyment of nature). Conservation efforts address species and habitats associated with culturally important activities, such as fishing or hunting, and the expansion of PAs aims to meet conservation objectives that preserve culturally valued species (e.g., migratory birds and fish, charismatic species), habitats (e.g. agroforestry systems, hay meadows), and ecosystem services. Landscapes of cultural, educational and/or historical importance and habitats of culturally important species are restored, and their connectivity is improved, with an additional aim to bring nature back to highly degraded areas, cities and agroecological areas through Green and Blue Infrastructures. Forests are managed by prioritising tree species with high cultural value. Ancient trees and other natural monuments are preserved. Freshwater ecosystems with a historical and cultural role, or those that are important for emblematic species, are also protected and restored, removing obsolete dams unless they have cultural importance. In agriculture, priority is given to the revitalisation of extensive and traditional agricultural practices in rural areas with high conservation and cultural value. These activities enhance the connection between nature and people that prefer living in rural areas, supporting the revitalization of small villages and regional towns. Renewable energy infrastructure is concealed from humans in order to preserve the aesthetics of the landscape.



304 **5. Discussion**

305 Here, we formulated three NFF narratives, through a co-design approach carried out
306 by scientists with a range of expertise who have elicited stakeholders' preferences. This
307 allowed us to produce scenarios that explore conservation and restoration priorities for
308 achieving the European biodiversity targets for 2030, and can be applied for modelling
309 positive futures for nature.

310 Our narratives highlight differences stemming from the three different sets of nature
311 values that the NFF describes. The gradient of land sharing vs land sparing (Kremen, 2015)
312 was the main axis for teasing the three NFF perspectives apart. This was evident across
313 several topics such as Agriculture, Urban System, Forestry, and Energy. The stakeholders'
314 preferences were oriented toward land sharing in NaC (Box 3), based on the general
315 expectation that land sharing that integrates people with nature can be beneficial in terms of
316 recreation activities, carbon sequestration, pollination, livelihood, and biodiversity. The land-
317 sparing approach is mainly useful to maintain the space allocated for spared reserves
318 (Kremen, 2015) as emerged in the NfN narrative, focused on strict nature conservation (Box
319 1). Land sharing cannot achieve the conservation of all species, especially those more
320 sensitive to human disturbance, and it has often been associated with lower species richness
321 compared with land sparing (Edwards et al., 2013; Cannon et al., 2019; Balmford, 2021).
322 Rural abandonment envisioned in the European NfN and NfS perspectives may lead to an
323 increase in biodiversity, especially due to the abandonment of previously intensively
324 managed land (Daskalova & Kamp, 2023). However, the opposite trend is already happening
325 in some European countries: regions of Central and Eastern Europe are experiencing large
326 human population flows from urban to rural areas (Toader et al., 2018; Despotovic et al.,
327 2020). Nevertheless, land sparing may be difficult to achieve in most of the European
328 context, as there is little land available to be fully 'spared' in the first place. In conclusion, the

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329 combination of context-specific land sharing and land sparing measures could be preferential
330 when aiming to enhance biodiversity (Grass et al., 2021; Sidemo-Holm et al., 2021), and
331 could be the best compromise to achieve sustainable targets for Europe.

332 Despite the differences, some common concepts emerged across the narratives based
333 on the 2030 EU Biodiversity goals and targets, including mutually beneficial solutions for
334 biodiversity and NCP (IPBES, 2016). Restoration efforts that enhance ecosystem integrity
335 improve utilitarian functions such as water and air purification, pollination, climate change
336 mitigation, and flood prevention, as well as the preservation of cultural values (Schindler et
337 al., 2014; Zerbe, 2022). We considered multifunctional landscapes crucial in the NfS and
338 NaC narratives (Fig. 4). Their importance recur in different sectors, such as agriculture and
339 forestry (Renting et al., 2009; Lindroth et al., 2012; Diez & Garcia, 2012), as it has been
340 pointed out across the NFF perspectives.

341 Efficient and carefully planned infrastructures, including renewable energy
342 production and urban greening, are win-win-win solutions in all three positive nature futures
343 (Fig. 4) to promote coexistence between humans and nature while minimising negative
344 impacts on species and ecosystems (Karteris et al., 2016). As envisioned in our NFF
345 narratives, Europe is moving towards renewable energy sources (Bórawski et al., 2019), in
346 order to adapt to the European Climate Law (EC, 2023b). The expansion of renewable energy
347 sources for Europe is essential to reduce net greenhouse gas emissions by at least 55% and
348 reach carbon neutrality by 2050 (European Parliament, 2021). Urban greening is fundamental
349 for human mental and physical health (Lee & Maheswaran, 2011) and for recreational and
350 aesthetic appreciation (Veerkamp et al., 2021). Enhancing green areas is also relevant for
351 cooling down cities, mitigating the effects of climate change, and reducing air pollution
352 (Pauleit et al., 2020; Veerkamp et al., 2021). Community-based renewable energy and
353 sustainable urban planning including zero-emission transportation, are examples of how to

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354 contribute to environmental sustainability, ecological connectivity, and improved human
355 health simultaneously (Kammen & Sunter, 2016).

356 Our NFF narratives are adapted to the European context, but consistent with the
357 interpretation given to the same framework in other studies (Pearson 2016; O'Connor et al.,
358 2021). However, compared with other narratives developed at global scale (Pereira et al.,
359 2020), in Europe the NaC perspective did not just focus on the relational value assigned to
360 certain areas —such as the UNESCO Man and Biosphere reserves (MAB) (Reed, 2019)—,
361 but also considered the historical value behind traditional practices associated with the
362 European landscapes, such as vineyards or olive groves (UNESCO, 2014) and European
363 Heritage sites (EC, 2024).

364 Narratives can be transformed into scenarios for environmental assessments, which
365 are recognised as powerful tools for exploring how different pathways of societal
366 development and policy choices could impact nature and the provision of NCP (Pereira et al.,
367 2020). Some land-use and biodiversity models have been explored to determine whether it is
368 possible to bend the biodiversity loss curve (Mace et al., 2018, Leclère et al., 2020). Although
369 some scenarios demonstrated the feasibility of a positive outcome in this sense, there are still
370 some limitations due to the challenges of further loss in several biodiversity-rich regions and
371 threats, such as climate change, that have not been addressed (Pereira et al. in press). NFF
372 scenarios provide more flexibility than previous ones, as they can reflect diverse values and
373 worldviews, which helps identify context-relevant interventions (Kim et al., 2022). This has
374 been done in Europe through scenario simulations which analyse synergies and trade-offs in
375 land systems based on different value perspectives (Dou et al., 2023).

376 Our narratives can be interpreted and used as an additional layer that provides nuance
377 and a representation of diversity in human-nature relational values to complement the
378 macroeconomic assumptions of the SSPs/RCPs framework. At the same time, the

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379 development of these scenarios is a step towards revising the commonly used set of SSPs
380 dominantly based on assumptions related to climate change mitigation and adaptation efforts,
381 with nature playing a central role alongside existing socioeconomic considerations (Rosa et
382 al., 2017).

383 Narratives can serve as the foundation for exploring the integration of land use and
384 nature conservation scenarios to achieve the global biodiversity strategy goals (Pereira et al.,
385 2020; Kim et al., 2023), and in the perspective of policy design in Europe, to achieve EU
386 conservation goals for 2030. Systematic conservation planning (SCP) has been used to
387 identify areas of conservation and restoration priorities for people and nature at both global
388 (Strassburg et al., 2020; Jung et al., 2021) and EU (O'Connor et al., 2021) levels. Our NFF
389 narratives can therefore be translated in settings for land use modelling and SCP and used as
390 inputs for identifying opportunities and constraints for conservation and restoration in
391 Europe. It may inform ongoing and upcoming conservation planning research, such as the
392 achievement of the TEN-N (EC, 2020a), complementing the existing EU PA network in
393 terms of species, habitats, and NCP, and to select suitable habitats within the future
394 distributions of species and ecosystems in Europe.

395 Concerning the engagement process, the involvement of scientists with expertise in
396 different fields offers the advantage of addressing all the topics covered by the narratives and
397 spurring the ability of research to take different perspectives into account. However, the
398 approach we adopted, especially accommodated visions and points of view of the
399 conservation sector. For this reason, this imbalance may have skewed the interpretation of
400 nature's futures, lacking perspectives from diverse fields. The lack of participation of industry
401 stakeholders may reflect low interest in the matter, a possible result of unawareness of their
402 importance for achieving conservation objectives (Sterling et al., 2017). Indeed, this is
403 something expected, because people that had a lower level of interest, as we highlighted in

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404 the mapping exercise, did not participate in the workshop. To address this challenge and
405 solve issues concerning the process, some specific measures can be taken into account. To
406 make the participatory process more balanced, efforts were made to address gaps emerged
407 during the workshop by organising a post-workshop webinar to include a broader cross-
408 section of society from different fields.

409 Overall, the communication between diverse fields may be convoluted due to sector-
410 specific terminology, leading to varying interpretations of the discussions. To enhance the
411 communication among stakeholders with different backgrounds, workshop notes were shared
412 with all participants after the in-person workshop. Prior to the webinar, information on aims,
413 NFF key-concepts, and technical terminology was provided to registered participants to
414 facilitate their participation and contribution to the webinar.

415 While our narratives reveal the need for a more inclusive participatory process, the
416 co-design approach carried out by conservationists envisages more constructive and
417 preventive measures for nature, reflecting a more positive coexistence between humans and
418 nature, which can be useful to model future scenarios and better steer EU policies towards the
419 achievement of the 2030 conservation goals.

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431

432 **Authors contribution**

433 Carlo Rondinini, Peter H. Verburg, Henrique M. Pereira, Piero Visconti, Nestor
434 Fernandez, Claudia Fornarini and Alessandra D'Alessio conceived the ideas and designed
435 methodology; they also contributed in collecting the information during the stakeholders'
436 events together with Anandi Sarita Namasivayam, Jeremy Dertien, Martin Jung, Francisco
437 Moreira, Louise O'Connor, Laura C. Quintero-Urbe, Martina Marei Viti; all authors
438 contributed to write, edit and review the drafts. Alessandra D'Alessio and Claudia Fornarini
439 led the writing of the manuscript. All authors gave final approval for publication.

440 **Conflict of Interest**

441 The authors declare they do not have any conflicts of interest regarding the article.

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