Document 1: Announcement of Opportunity

The Funding Organisations in Biodiversa+ Partnership have joined efforts to organise and fund an International call for transnational research proposals on

"Nature-Based Solutions for biodiversity, human well-being and transformative change (BiodivNBS)"

(1) INTRODUCTION

This joint call for research projects is launched by the European Biodiversity Partnership, Biodiversa+, co-funded by the European Commission. The call addresses topics identified under the Biodiversa+ Flagship programme *Better knowledge to develop, deploy and assess nature-based solutions*. Specifically, it focuses on **biodiversity and nature-based solutions (NBS) for biodiversity, human well-being and transformative change to achieve sustainability.**

The Biodiversa+ Partnership is one of the actions included in the EU Biodiversity Strategy for 2030 to 'make the bridge between science, policy and practice, and make nature-based solutions a reality on the ground' (https://environment.ec.europa.eu/strategy/biodiversity-strategy-2030_en). The Partnership's activities notably include co-funded joint calls for research and innovation projects, biodiversity monitoring, and science-based policy advising activities. 34 countries are contributing to the funding of this joint call (see the updated list of countries and participating Funding Organisations on our website: www.biodiversa.eu/research-funding/open-call/participating-funding-organisations/).

Box 1 – Definitions

Biodiversity

Biodiversity is the variability among living organisms from all sources including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part. This includes variation in genetic, phenotypic, phylogenetic, and functional attributes, as well as changes in abundance and distribution over time and space within and among species, biological communities and ecosystems.
Definition from diaz et al. (2015)

Nature-based solutions (NBS)

NBS are here defined as actions to protect, conserve, restore, sustainably use and manage natural or modified terrestrial, freshwater, coastal and marine ecosystems, which address social, economic and environmental challenges effectively and adaptively, while simultaneously providing human well-being, ecosystem services and resilience and biodiversity benefits.
Definition from Fifth session of the United Nations Environment Assembly UNEA-5.2; UNEA/EA.5/res.5

Transformative Change

This call builds on the notion of Transformative Change as defined in the IPBES Global Assessment: "Fundamental, system-wide reorganisation across technological, economic and social factors, including paradigms, goals and values needed for the conservation and sustainable use of biodiversity, good quality of life and sustainable development."
Definition from IPBES (2019)

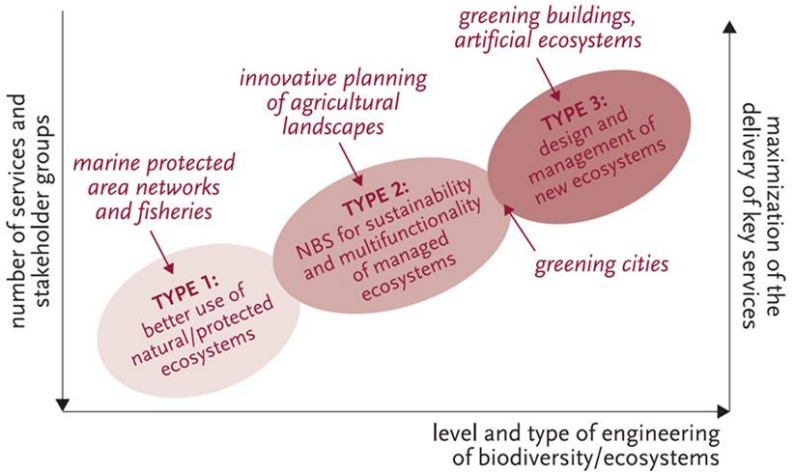

Fig. 1: Schematic representation of the range of NBS approaches as defined by Eggermont et al. (2015). Three main and complementary types of NBS are identified, differing in the level of engineering or management applied to biodiversity and ecosystems (x-axis), and in the number of services to be delivered, the number of stakeholder groups targeted, and the likely level of maximization of the delivery of targeted services (y-axis). Some examples of NBS are provided in this schematic representation.

Box 2 – Examples on use of the term Nature-based solutions

From Eggermont et al. (2015):
"It is important to specify which solutions should and should not be considered as NBS. We illustrate this with the development of green roofs and walls in cities.
Having in mind the sole objective of developing green surfaces in urban areas to mitigate the effects of global warming, green roofs or walls could be created using, e. g., clones from one or very few plant species, regardless of their biogeographical distribution. Such new structures would hardly contribute to increase biodiversity and the delivery of other ES [ecosystem services]. This may also lead to a poor resistance and resilience to future extreme events, increased management costs, and risk of biological invasions. Furthermore, without a coordinated approach at the city scale, firms would likely design green buildings in a case-by-case approach with a very uncertain effectiveness at city scale. Such an approach, which largely misses out on the objectives of sustainability, increased biodiversity, and effectiveness at relevant scale (here the city), would not fit the NBS framing. Similarly, rain gardens designed to manage storm water runoff that pay little reference to what plants are used and to other ES, fall short of NBS.
In contrast, within an urban planning approach at the city scale, a range of species could be selected for green roofs or walls based on their biogeography and key functional traits (Lundholm et al. 2015), which would address multiple goals such as cooling during summer, storm water capture, pollution abatement, increased human well-being, biodiversity enhancement, and better resilience to future hazards, while adopting adequate governance to properly tackle the issue at city scale [---] NBS thus broadens the ES framework, promoting and better relying on biological
diversity to increase the resistance and resilience of social-ecological systems to global changes and extreme or unexpected events and the delivery of a range of ES".

(2) CONTEXT

This call aims at supporting research on biodiversity to gain a better understanding of the tipping points and trade-offs and underlying mechanisms affecting Nature-Based solutions (referred hereafter as NBS and defined in Box 1, also see Box 2 for examples on use of the term NBS), and their successful implementation with respect to the benefits for nature, human well-being and societal transformation.

The multiple crises of climate change, biodiversity loss, pollution and social inequality are interlinked, and rapid transformative approaches are required to address them effectively (IPBES 2019; Dasgupta 2021). This calls for innovative solutions realising that people and nature are part of the same complex interconnected system. NBS () are gaining traction in science (e.g., Welden et al. 2021; Seddon et al. 2021) and in policy, including in the Sharm el-Sheikh implementation plan of the UN Framework Convention on Climate Change and the Kunming-Montreal Global Biodiversity Framework of the Convention on Biological Diversity.

NBS aim at benefitting human well-being by enhancing biodiversity and recognizing their interconnectedness. To fulfil the requirements of the definition (Box 1), actions have to be beneficial for biodiversity and must be designed and implemented with the full engagement and consent of indigenous people and local communities where appropriate. NBS can be a powerful tool to address global challenges. For example, in the context of climate change, NBS have the potential to deliver up to a third of the emission reductions that we need by 2030 (Griscom et al. 2017; Girardin et al. 2021; see also the examples in Box 2).

However, there can also be conflicting goals and trade-offs. As NBS enter into policy and are implemented by projects on the ground, there is a pressing need to clarify the specific objectives of each intervention and what is required to ensure effective implementation. Without this, poorly designed NBS could result in inconsistent and ungrounded implementation. Worse still, weak or mis-labelled NBS projects can water down the case for NBS – de-incentivising their use, eroding confidence for

funding, and misdirecting efforts (ILO et al. 2022). However, it has to be noted that there is ongoing work to create and implement these much-needed standards (IUCN 2020; NetworkNature 2022). Application of criteria such as the IUCN Global Standard for NBS (Fig. 2; IUCN 2020) provides an opportunity to create a global user community that helps guide the design, planning and implementation of NBS on the ground at different scales, accelerate policy development, create conservation science on NBS, ensure ecosystem integrity and keep biodiversity benefits at its heart.

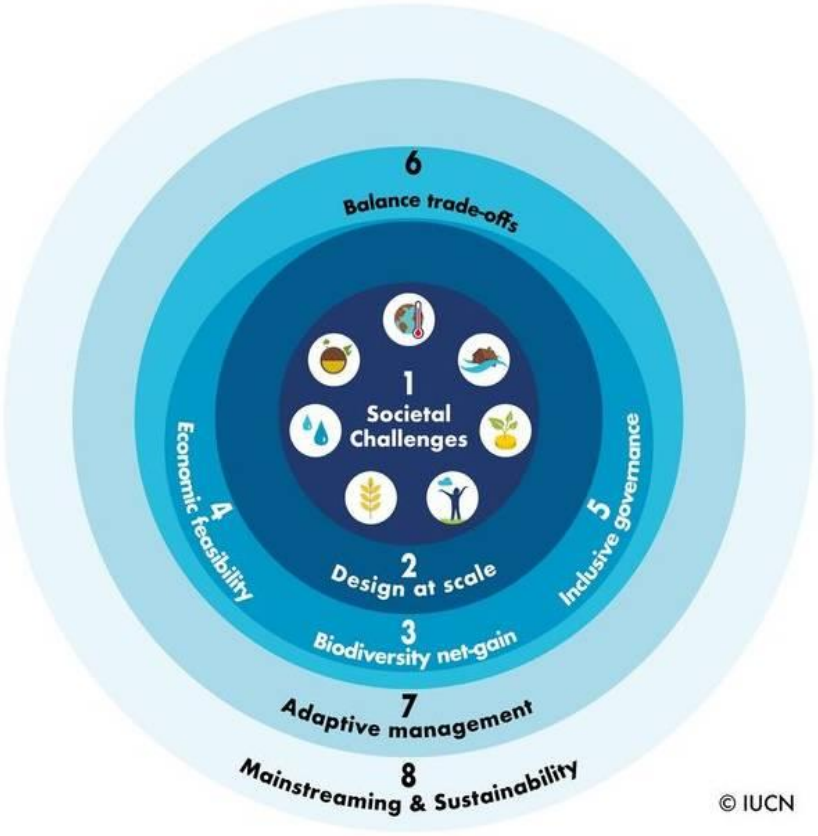

Fig. 2: Eight criteria of IUCN's Global Standard for NBS (IUCN

Interdisciplinary research is needed to overcome barriers and to upscale implementation of NBS across sectors and policies. The issue of scalability poses a significant challenge when it comes to the implementation and widespread adoption of NBS. While NBS has shown great potential in addressing various environmental and societal issues, the ability to scale up these solutions to a larger, more impactful level remains a complex task. Two key questions are: *what makes NBS work from different perspectives* (ecological, social, political, economic, legal, etc.), and *how do we address trade-offs between different dimensions of transformation?* In this context, it should be recognised that there are multiple pathways to achieving transformative change (Bulkeley et al. 2020).

Despite the steeply increasing number of research projects on the NBS topic, a recent mapping of the EU research, innovation and implementation landscape (El Harrak and Lemaitre 2023) reveals considerable bias. EU-level support focuses predominantly on NBS based on developing sustainable management protocols and procedures for the management of restored ecosystems (NBS type 2; ca. 50% of all projects) and on NBS that involve creating new ecosystems (NBS type 3; ca. 40% of all projects). In contrast, NBS involving existing natural or protected ecosystems (NBS type 1) remain largely understudied (for definitions see Fig. 1 in Box 1). Similarly, NBS in ecological environments other than forests, agricultural lands or urban areas received far less attention. Several key knowledge gaps and potential pitfalls remain related to effectiveness and enabling factors. There is also a lack of evidence-based narratives about tipping points and critical trade-offs as well as about synergies among societal challenges together with protection of critical biodiversity (Seddon et al. 2021).

(3) EXPECTED IMPACTS AND TRANSNATIONAL ADDED VALUE

Global scope

The call is not restricted in terms of specific environments nor geographic areas, encompassing all realms (terrestrial, marine, coastal and freshwater) and ecosystems experiencing various levels and sources of disturbances, including transition zones and interfaces (coastal, wetlands, urban-rural, forest-agriculture, etc.) and in integrated land/seascapes. The call covers research on NBS in all parts of the world. Research projects can thus include study sites also beyond Europe and its Outermost Regions and Overseas Countries and the other countries participating in the call as long as the research demonstrates clear transnational added value (see document 6 "Assessment Criteria" for more information on what transnational added value means).

The physical, biological and social processes associated with development and deployment of NBS take place at a range of spatial scales, from the local to regional and global. Therefore, a sufficient understanding of these processes relies on studies performed at multiple sites and scales, also taking their connections into account. These in turn need to explicitly consider the ways in which processes at one scale might drive or constrain processes at other scales, and how local results include commonalities that apply across regions and nations. In order to support effective actions for biodiversity protection, restoration, sustainable use and management across land and sea, the diversity and unique characteristics of each place and region must be thoroughly analysed in view of the local context, including biodiversity, ecosystems and socio-cultural conditions. Yet in addition, the interconnectedness and independence of regions often require considering the global context, both in terms of species distribution and ecosystem function and for example consideration of teleconnections of value chains and finances.

Methodology

Transnational collaboration in development and the inter-comparison of different models is one of the approaches to advance research on NBS. Learning and information sharing is also key to social adaptation, and project participants will benefit from a collaborative and participatory approach to the problem, bringing together different forms of knowledge and involving stakeholders and researchers. Inter- and transdisciplinary research projects are therefore encouraged to address these challenges. Proposals are furthermore welcome to demonstrate a consideration and understanding of the governance and economic structures that inform the planning/design, implementation and maintenance of NBS, and where relevant liaise with existing structures such as the Connecting Nature Enterprise Platform (https://connectingnature.eu/cnep).

Projects may cover a broad range of methodological approaches (comparative and experimental studies, synthesis research, systems analysis, local and community participatory processes and case studies, inclusion of traditional/indigenous knowledge, living labs, modelling, scenario development, quantitative and qualitative social science methods, etc., or a combination of these). Moreover, the call encourages innovative approaches and promising actions/tools that may not be currently labelled as NBS (e.g., grassroots initiatives or non-conventional nature-based solutions in indigenous practices and local knowledge). This can also include systemic assessments of the interplay between biodiversity conservation, sustainability and environmental justice issues. Researchers are invited to consider the question of 'NBS for whom' and how to weave diverse worldviews, alternative knowledge systems, and multiple values into their proposals.

Interdisciplinarity and transdisciplinarity

Integrated approaches and skills of natural sciences, social sciences and humanities, including economics and finance, are encouraged where needed to address the specific objectives of each research proposal. The call aims for interdisciplinary, transdisciplinary and cross-sectoral research projects demonstrating academic excellence, in particular in biodiversity research, as well as potential for societal and policy impact. Where relevant, projects should be developed in collaboration with diverse stakeholders including the private sector, governmental agents, civil society and under-represented groups such as indigenous or marginalised communities.

Given that increased investments are critical for NBS large-scale deployment and long-term success, development of knowledge to help promote the case for financial and societal investments in NBS can be considered under each of the three call themes mentioned below. Moreover, the involvement of the private sector in the proposals can help to ensure that the whole innovation chain is covered. However, only projects from basic research up to the pre-competitive research level can be funded under this call.

Research projects should provide relevant information for policy makers, authorities, institutions and practitioners in the private and public sector concerned with decision making, planning, designing and managing a broad range of environments and outreach to society. This includes to develop and evaluate co-designed research to bring citizens, research organizations, companies, local and regional authorities together to validate knowledge and technologies and scale up innovations in business (see: Biodiversa Guide on Stakeholder Engagement [https://www.biodiversa.eu/wp-content/uploads/2022/12/stakeholder-engagement-handbook.pdf]; Biodiversa Guide on Policy Relevance [https://www.biodiversa.org/1563/download] - note that this guide is currently being updated; and Biodiversa Citizen Science Toolkit [https://www.biodiversa.org/1810/download]).

It is expected that applicants will explicitly make clear the novelty of their research and how it adds to the existing knowledge base, including previously funded or ongoing projects. Projects are expected to deliver a significant contribution to scientific knowledge production. Redundancy with respect to on-going international, European and national projects on this theme must be avoided. Complementary research (for example with existing Horizon 2020 and Horizon Europe projects) is possible but must be clearly explained. Applicants are encouraged to use existing resources and infrastructures for their project, including the data and information from Earth Observation Programmes such as Copernicus, and the existing biodiversity research infrastructures (see: Biodiversa Mapping of Biodiversity Research Infrastructures [https://www.biodiversa.eu/wp-content/uploads/2022/12/mapping-biodiversity-research-infrastructures.pdf] – note that this document is currently being updated). Links with projects funded under the LIFE Programme are also encouraged.

(4) PRIORITIES OF THE CALL

The call aims at supporting research on biodiversity to gain a better understanding of the tipping points and trade-offs and underlying mechanisms affecting NBS, and their successful implementation with respect to the benefits for nature, human well-being and societal transformation.

The call encompasses exploring and assessing of NBS at all levels from local or regional to global, embracing and building on conceptualisations of multiple and plural values of nature as expressed in the recent *IPBES Values Assessment* (IPBES 2022). Main entry points are: i) how NBS

contributes to biodiversity benefits, and ii) the role of biodiversity in making NBS effectively address societal challenges and promote transformative change.

Key transversal knowledge needs and challenges include but are not limited to:

- Understanding and evaluating the **ecological, social and economic benefits** of NBS, and their synergies and trade-offs between multiple sustainability goals and multiple monetary and non-monetary values.
- Recognition of and allowing for **biodiversity dynamics of behavioural, ecological and evolutionary processes** over time and space.
- Assessing effectiveness and cost-benefit analysis of NBS in relation to the level of urgency in terms of **key ecosystems and biodiversity hotspots.**
- Addressing **technical challenges** associated with designing and implementing NBS, including challenges related to data collection and analysis, and the identification of appropriate sites and species.
- Better understanding of how NBS can **leverage transformative change** for the sustainable use of biodiversity as well as for other societal challenges.
- Recognizing the **transformative power** of NBS in various environments and different geographic areas, including in under-studied contexts such as areas in low-income countries characterised by informal urbanisation or rapid land-use change.
- Better understanding of **societal attitudes and diverse value systems** in which NBS are applied, with recognition of a diversity of people-nature relationships, highlighting ecological aspects while also acknowledging the cultural, social, political and economic aspects of NBS.
- Assessing the **political dimension** of NBS to encourage support from decision-makers, with development and assessment of adaptive governance models and demonstrating the effectiveness of NBS to address multiple societal and policy challenges.
- Recognizing and addressing **inequalities of rights and abilities**, as well as inadequate policies, regulations, and institutional frameworks, hindering the effective implementation of NBS.
- Analysing **user and stakeholder conflicts** for NBS implementation at different temporal and spatial scales.
- Developing innovative approaches and incentives to **upscale** NBS beyond local contexts, including through governance, economic and social innovation.
- Demonstrating strong NBS cases to encourage **investments to help build resilience** and sustain long-term projects, with the involvement of diverse stakeholders including local or governmental officers, civil society, non-governmental and private sectors.
- Addressing the need for **investment in co-design, training and capacity building**, and implementation of NBS, the need for understanding of potential cost-effectiveness and potential for driving new revenues, and the need for financing and innovative business models (ref EC study, currently being finalised).
- Exploring opportunities related to NBS offered by and for **citizen science.**
- Analysing the framing and **communication** of mitigation actions and NBS in view of how potential conflicts and trade-offs affect **public support** in different sectors of society and business.

CALL THEMES

A. Synergies and trade-offs of NBS in the context of human well-being
B. NBS mitigating anthropogenic drivers of biodiversity loss
C. The contribution of NBS for just transformative change

Note that these call themes are overlapping and non-exclusive, and each project can address one or several themes. **The role of biodiversity shall underpin the research in all themes** (Fig. 3), adopting 'do no harm' approaches and enhancing biodiversity benefits in accordance with the concept of NBS (as defined by UNEA-5, Box 1). Similarly, the pluralistic valuation approach (IPBES 2022) is central across all themes.

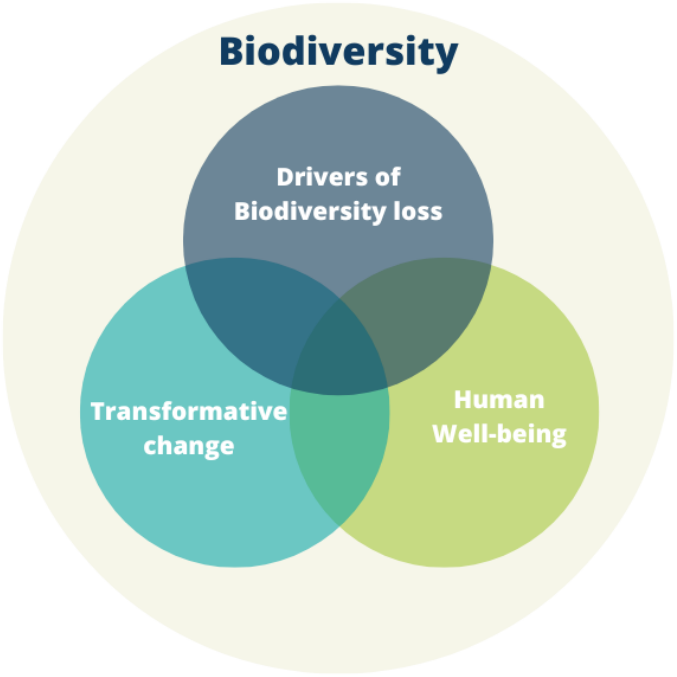

Fig. 3. Schematic scope of the call that is structured in three overlapping and non-mutually exclusive themes embedded in a biodiversity framework.

Theme A. Synergies and trade-offs of NBS in the context of human well-being

This theme focuses on multiple links between the different goals of NBS, with a focus on jointly improving the well-functioning of the ecological system with human well-being, including physical and mental health, food and water security, as well as risk avoidance/prevention. This approach motivates a need for holistic analyses, where systems analysis and interdisciplinary and transdisciplinary research inform the understanding of relative benefits across nexus goals, with social sciences and humanities research being integral to assessing costs and benefits. Evaluation of the role of NBS includes mobilization of indicators and designing monitoring schemes across multiple temporal and spatial scales.
Major knowledge and innovation needs under this theme include but are not limited to:

- Identify environmental, ecological, economic, and social synergies and trade-offs across sectors relevant for the theme, to be considered when developing, planning and implementing NBS.

- Identify, evaluate and promote best practices for improving – through NBS - ecological functioning of ecosystems for nature and people. This can include development of pilot projects, living labs, demonstration cases, etc.
- Evaluate integrated regional NBS strategies and land/sea spatial planning for biodiversity, water, food and health, with development and testing of management options for approaches to ensure equitable and fair access to benefits for people and nature generated by NBS.
- Analyse the potential for upscaling in space and time of successful NBS, with a focus on issues specific to the context of ecosystem conservation and human well-being.
- Explore benefits and risks of NBS regarding impact on biodiversity and the health of humans and domesticated species (e.g., livestock, crop plants, etc.). This can include comparison of technical and NBS measures of risk avoidance/prevention and demonstration in real cases.
- Analyse how NBS can offer smart and sustainable alternatives to complement or replace technical solutions to tackle major societal challenges.

Theme B. NBS mitigating anthropogenic drivers of biodiversity loss

This theme will address cross-sectoral approaches to direct and indirect drivers which negatively affect biodiversity (by loss or by change) including climate change, habitat destruction and fragmentation, invasive species, pollution, etc. Integrated responses that contribute to mitigation of negative drivers may offer a wider range of solutions with a greater likelihood of being successful than unilateral approaches. By conserving, restoring and sustainably managing biodiverse ecosystems which increase resilience, NBS can contribute to the regulation and buffering of direct and indirect drivers of biodiversity loss or negative change (see Box 3).

Major knowledge and innovation needs under this theme include but are not limited to:

- Understand the limitations and gaps, including in terms of available data and models, and potential of NBS to analyse how NBS at the landscape scale can achieve biodiversity net-gains or prevent net-loss and address simultaneously societal challenges in different land-use scenarios by minimizing trade-offs.
- Understand biodiversity dynamics as an integral part when designing NBS for mitigation to ecosystem pressures, with emphasis on genetic, functional and structural diversity under changing conditions. This may include understanding the contribution of biodiversity for NBS and mitigation through cross-system

Box 3 – NBS to mitigate drivers of biodiversity loss: example and challenges

For example, to contribute to achieving climate neutrality and resilience by 2050, NBS need to be implemented on a large scale to drastically reduce emissions and enhance carbon absorption, to reduce vulnerabilities to climate risks, and to enhance adaptation to the impacts of global change (Nabuurs et al. 2022). However, solutions may in some cases be harmful to biodiversity and thus by definition are not NBS. Understanding the co-benefits and trade-offs associated with mitigation of different drivers is key to support prioritization among the various sectoral policy options, and to simultaneously achieve multiple goals for sustainability and transformative change. NBS hold the potential to provide significant synergies for biodiversity, climate adaptation and mitigation as well as other sustainability objectives, for example through sustainable land management approaches. Different actions can be beneficial on different time scales. For example, benefits from conservation of key ecosystems and hotspots are immediate, while habitat restoration takes more time to deliver measurable results (e.g., the conservation of high carbon ecosystems immediately benefits climate change contrary to their restoration, IPCC 2023).

analysis of the relationships between biodiversity, ecosystem services and social systems as a basis to understand the potential for effectiveness, efficiency and resilience of NBS.

- Analyse interactions between different nature-based solutions, fostering cross-sectoral mitigation linkages.
- Understand and predict the importance of spatial and temporal dynamics for upscaling of NBS, including the analysis of connectivity and emergent properties of spatial networks, as well as analyses of cross-system domains (e.g., rivers and coasts, rural to urban/peri-urban, forests to agriculture fields, land to water) using modelling scenarios for environmental and sociological conditions.
- Analyse how the potential of protected areas for mitigation with respect to direct and indirect drivers of negative biodiversity change can be integrated into regional NBS strategies as part of integrated landscape and seascape approaches.
- Analyse how financial instruments, governance, and knowledge types (research, innovation, multiple sources of knowledge, education) affect the design and implementation of NBS and how they lead to positive outcomes for biodiversity and society. This includes the role of local institutional arrangements, and participatory co-design and co-governance processes, and assessing cost-effectiveness and economic viability of NBS delivering multiple benefits. This could also include their impacts on scaling-up of NBS.
- Analyse trade-off between functional and compositional stability over time in a biodiversity-NBS context, as long-term functional stability of an NBS may require adapting to changing conditions, which often is not the immediate aim of biodiversity conservation efforts.

Theme C. The contribution of NBS for just transformative change

This theme will address the contribution of NBS as drivers for just transformative change and just livelihoods, with specific regard to identification of barriers to transformation.
The theme includes an assessment of what elements of NBS may catalyse transformative change, including impact on the human-nature relation. It also includes evaluation of NBS investments (including non-monetary assets) and their impacts; the potential of NBS to mitigate, but also to trigger or exacerbate conflicts on land use; the link between NBS and business and finance sectors; and development of new mechanisms for nature-based enterprises and socio-economic indicators. In order to implement the NBS concept as a policy instrument, social acceptance at the local level is required. Other important aspects include the link between NBS and governance and policies, transdisciplinary approaches, and knowledge development to support evidence-based decision-making. The theme also covers the need to standardize evaluation of NBS, and the concepts of valuing ecosystem services/nature benefits to people, natural capital and ecosystem accounting, in support of biodiversity. In addressing these issues, it is important to build upon previous efforts and create synergies with ongoing research within the EU and globally (e.g., Kaleyeva and Gawrońska-Nowak 2021, and European Commission 2022).
Major knowledge and innovation needs under this theme include but are not limited to:

- Multiple benefits and trade-offs of NBS, exploring NBS contribution to achieving transformative change recognising the diverse values of nature. This may include exploration of novel designs for transformative NBS using participatory and inclusive practices, regional planning and political decision making, that account for multiple values and knowledge systems.

- Monitor and evaluate the impact and effectiveness of NBS through science-based assessments of their economic, social & environmental benefits, and evaluate complexities and uncertainties to guide risk assessments.
- Analyse how NBS and nature-based transformations are understood, valued and enacted across different worldviews and knowledge systems with respect to the biodiversity-climate-society nexus. This includes a special attention to the Global South and vulnerable people worldwide.
- Explore how NBS values can be taken up in long-term investment decision by private business actors and public actors, at a level that promotes societal transformation.
- Explore measures and governance models that can be used to ensure the just distribution of benefits and costs of NBS among stakeholders, and evaluate their effectiveness.
- Analyse how NBS policy and governance is contradicted or sustained by other types of policies, and the socio-economic context of NBS policy making (stakeholders, interest groups, economic class structure, social media, education, etc).
- Explore the effect and potential of NBS on large-scale land transformations, and the role of private sectors, financial investments, and governance structures.

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