ETC-BE Report 2024/2

Exploring the societal factors enabling to halt and reverse the loss and change of biodiversity

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European Environment Agency
European Topic Centre
Biodiversity and ecosystems

Cover design: EEA
Cover image designed by Freepik ©
Layout: Oda Ellingsen [NIVA]

Version: 1.0

Publication Date: 04 November 2024

EEA activity: Biodiversity and ecosystems

ETC-BE coordinator: Norwegian Institute for Water Research (NIVA)

ETC-BE partners:
Federal Agency for Nature Conservation (BfN), Association BIOPOLIS (Biopolis), Brilliant Solutions Engineering & Consulting (BRiS), Danish Centre for Environment and Energy, Aarhus University (DCE-AU), Deltares, Dark Matter Laboratories B.V. (DML), Ecologic Institute (Ecologic), Environment Agency Austria (EAA), Fresh Thoughts Consulting GmbH (FT), Global Footprint Network (GFN), International Council for the Exploration of the Sea (ICES), International Institute for Applied Systems Analysis (IIASA), French national institute for industrial environment and risks (INERIS), Italian Institute for Environmental Protection and Research (ISPRA), LESPROJEKT-SLUŽBY Ltd (LESP), Martin-Luther University Halle-Wittenberg (MLU), Sapienza University Rome (SAP), Seascape Belgium (SSBE), Finnish Environment Institute (SYKE), Thematic Center for Water Research, Studies and Project Development, ltd., German Environment Agency (UBA-DE), University Duisburg-Essen (UDE), Helmholtz Centre for Environmental Research (UFZ)

doi: 10.5281/zenodo.14033732

How to cite this report:
Galli, A., Sommerwerk, N., Mancini, M. S., Pihlainen, S.(2024). Exploring the societal factors enabling to halt and reverse the loss and change of biodiversity. (ETC BE Report 2024/2). European Topic Centre on Biodiversity and Ecosystems.

European Topic Centre on
Biodiversity on ecosystems
https://www.eionet.europa.eu/etcs/etc-be

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The authors would like to express a special thank you to Janica Borg (EEA), Frank Wugt Larsen (EEA), and Ybele Hoogeveen (EEA), for their guidance as well as their suggestions and constructive feedback throughout the process. A thank you is also due to Alexander Psomas (ETC BE) for his internal review and his valuable feedback for the finalisation of the text. Not least, we deeply thank Claudia Neitzel and Thorjørn Larssen (ETC BE) for their continuous and decisive support to our work at multiple levels.

Authors also express their gratitude to all the EEA and ETC BE experts that participated in the brainstorming sessions organised in 2023 for their critical inputs on such a vast topic, and for their comments on earlier versions of this report.

Executive summary

Since the second half of the 20th century, human activities have been growing exponentially, impacting the planet's surface and biophysical dynamics, leading to worsening biodiversity trends in Europe and a possible 6th mass extinction throughout the planet. Driven by unsustainable anthropogenic production and consumption activities, the currently ongoing biodiversity crisis is nowadays perpetuated by existing political and economic systems. Fundamentally rooted in the evolution of societal behaviour over time, this crisis is an intertwined environmental and human behaviour problem for which no major success can be obtained until human-induced pressures are decreased. Moreover, despite global and regional agreements (e.g., the Kunming-Montreal Global Biodiversity Framework, the EU Biodiversity Strategy for 2030) – and likely because of a historic focus on addressing the symptoms rather than the primary anthropogenic drivers of biodiversity loss – progress towards halting biodiversity loss have so far been limited; this puts into question what might actually be needed to successfully address these existential threats. Reversing the loss and change of biodiversity entails a profound transformation in our *needs and wants*, and in our perceptions of nature.

Against this backdrop, which points to the existence of critical knowledge blind spots – and given the overarching milestone of the EU Biodiversity Strategy for 2030 to ensure that "*Europe's biodiversity will be on the path to recovery by 2030*" – this ETC BE technical report conducts an initial scientific inquiry into the underlying societal factors that have so far hindered our capacity to halt and reverse the loss and change of biodiversity. The overall aim is not to review the Biodiversity Strategy and its targets but rather to step back and carefully dissect the society in which the BDS 2030 exists and is meant to be implemented, to anticipate – to the extent possible – whether the vision and goals set for 2030 in the BDS 2030 stand a chance to be achieved.

Such inquiry, however, is deliberately limited in its scope: while acknowledging the need to act at multiple levels and involve multiple actors – thus considering the role of individuals within the wider socio-economic paradigm –, this report focuses on the cultural, psychological and behavioural aspects of human individuals and self-organising collectives; it also touches upon the role of the wider institutional governance, as well as political and economic systems. Such focus is motivated by the fact that while psychology and behaviour research have been primarily focused on understanding what motivates people to social causes, only a few studies have so far analysed collective efforts for climate actions (e.g., Valkengoed et al., 2019; van der Linden et al., 2015) and major gaps remain in our understanding of collective efforts for biodiversity conservation (Nielsen et al., 2021). Moreover, despite a growing interest in behavioural conservation, studies have prioritised understanding individual behaviour change (e.g., McKenzie-Mohr et al., 2012), leaving our societal knowledge on how to foster collective action behind (see also Ewert, 2020).

By investigating existing case studies and attempting to answer guiding questions such as those below, this report sets out to help address some of the existing knowledge gaps and help inform transformative change efforts for halting and reversing biodiversity loss: "*What triggered individuals to act?*", "*Why and how do people get together in collective efforts to change larger systems and infrastructures?*", "*What role can structural/institutional interventions play in triggering change and/or easing collective action?*", "*How can momentum be kept over time?*".

Drawing upon EEA and ETC experts' consultations held in 2023 in the form of brainstorming sessions and through a narrative review of past literature conducted this year, the report provides an initial identification of eight (8) societal barriers to halting and reversing the loss and change of biodiversity that currently exist in our society (see Figure ES1, left-hand side area). In addition, the report builds upon the preliminary formalisation of a set of five (5) overarching levers that were originally identified from expert consultations as entry points for transformative change (see Figure ES2, right-hand side area, light blue boxes).

Then, three illustrative case studies were selected and critically investigated to understand how the barriers were handled and tackled in real-life situations. Starting from this analysis, the report hypothesises seven (7) more granular success factors that could help lifting such barriers and thus being the actionable factors of levers for triggering transformative change (see Figure ES3, right-hand side area, dark blue boxes). Finally, structural interventions - spanning from regulatory and right-based instruments to economic and socio-cultural (incl. education) instruments - from an institutional level are identified, which influence, favour and have the potential to upscale and advance multiple levers and success factors at the same time (See Figure ES4, right-hand side area, orange box).

The eight (8) barriers provisionally identified by this report are:

- **Knowledge gaps**: deficiencies in understanding biodiversity and ecosystems, hindering effective decision-making and policy formulation due to limited awareness, measurement systems, and shared understanding of their interlinkages, importance and impacts.
- **Misinformation**: the deliberate dissemination of inaccurate or misleading content by individuals, groups, or organisations, aimed at influencing public opinion or undermining understanding of critical societal and environmental challenges.
- **Utilitarian mindset**: a perspective emphasising economic expansion and resource utilisation, often at the expense of environmental conservation and sustainability, driven by the pursuit of political and economic stability.
- **Short-termism**: the tendency to prioritise immediate (often economic) gains over long-term (sustainability and societal) benefits, leading to challenges in addressing complex issues such as biodiversity loss and climate change.
- **Governance of complexity**: the challenge of managing intricate socio-ecological systems through governance structures that often lack the capacity to effectively handle complexity and dynamic changes caused by multiple environmental, social and economic drivers. This leads to a siloed approach and implementation gaps towards conserving biodiversity and halting its loss and change. Coping with uncertainty is key for ensuring that measures may be adapted and still be effective under varying conditions, despite large deviations in the predicted range of impacts.
- **Social norms**: the unwritten rules and expectations that guide human behaviour within a society or affinity group, influencing individuals to conform to accepted standards and unwritten norms to fit in and gain social acceptance, thus fulfilling the need of social connection and acceptance.
- **Perception of others**: the lack of a proper perception of what the members of a person's affinity group think or do, which makes individuals feel uncomfortable expressing their opinion and hinders the individual and collective confidence that change is possible.
- **Filtering of information**: the cognitive process by which individuals selectively process and interpret information based on their existing beliefs, experiences, and social identities, often leading to biased perceptions and dismissal of conflicting ideas.

The five (5) overarching levers of transformative change are:

- **Offering an Alternative Narrative**: Provide a compelling and positive story to facilitate a smooth societal transition.
- **Levelling-out Power Imbalances**: Address and reduce the existing power disparities within our societies.
- **Enhancing Knowledge**: Increase the understanding among EU actors of the mutual relationships between biodiversity and society.
- **Understanding Societal Acceptance**: Deepen our insight into how societal acceptance is shaped, formed, and transformed.
- **Equipping Governance Structures**: Provide governments and institutions with the proper governance structures to manage increased complexity effectively.

The seven (7) hypothesised success factors, initially derived from the case studies are:

- **Shared, vision-driven approach**: a strategic method emphasising the formulation and communication of a shared vision among involved stakeholders to motivate and guide collective action towards a common goal. It involves articulating a compelling vision of the desired future state, which fosters enthusiasm, commitment, and alignment among stakeholders, ensuring focused, coherent and impactful efforts.
- **Informed Citizenry**: societal actors who possess actionable, "care-why" knowledge and awareness about relevant issues, such as biodiversity protection, restoration and sustainable use of nature and its resources. This success factor highlights the strategic efforts to harness the awareness and support of informed citizens to mobilise support effectively, optimise impact, and navigate complex political and public spheres with clarity and precision.
- **Keeping momentum**: A methodical breakdown of goals into manageable stages, balancing challenge with achievability, to facilitate progress, celebrate achievements, and maintain motivation.
- **Clear *modus operandi* and efficient collaboration**: the process of establishing and maintaining frameworks within a group, a network of individuals, or organisations to achieve common goals. It involves early-stage agreements (e.g., on roles and responsibilities), addressing potential relationship and/or power dynamics, negotiating and documenting agreements, and respecting them throughout the collaboration.
- **Broad, decentralised alliances**: collaborative partnerships formed among diverse stakeholders, including organisations, companies, associations, and parties, with similar but not identical goals or objectives, which are shared and treated equally. These alliances reach across traditional silos and are essential for pooling resources, expertise, and support to address complex challenges and achieve common goals, often amplifying the reach and impact of initiatives or campaigns.
- **Evidence-based decision-making**: using comprehensive and regularly collected data on the status of biodiversity and ecosystem health (incl. data on the primary human activities driving biodiversity loss, when possible) to inform policies and strategies aimed at protecting and restoring biodiversity. This approach ensures that decisions are grounded on empirical evidence, enhancing their effectiveness and sustainability.
- **Adequate biodiversity funding**: refers to the availability and retrieval of financial resources required to support initiatives aimed at preserving biodiversity, protecting species, and safeguarding habitats. To have greater effects on economic drivers and their influencing/controlling forces, it could even expand to including sustainability criteria in the buying practices of retailers.

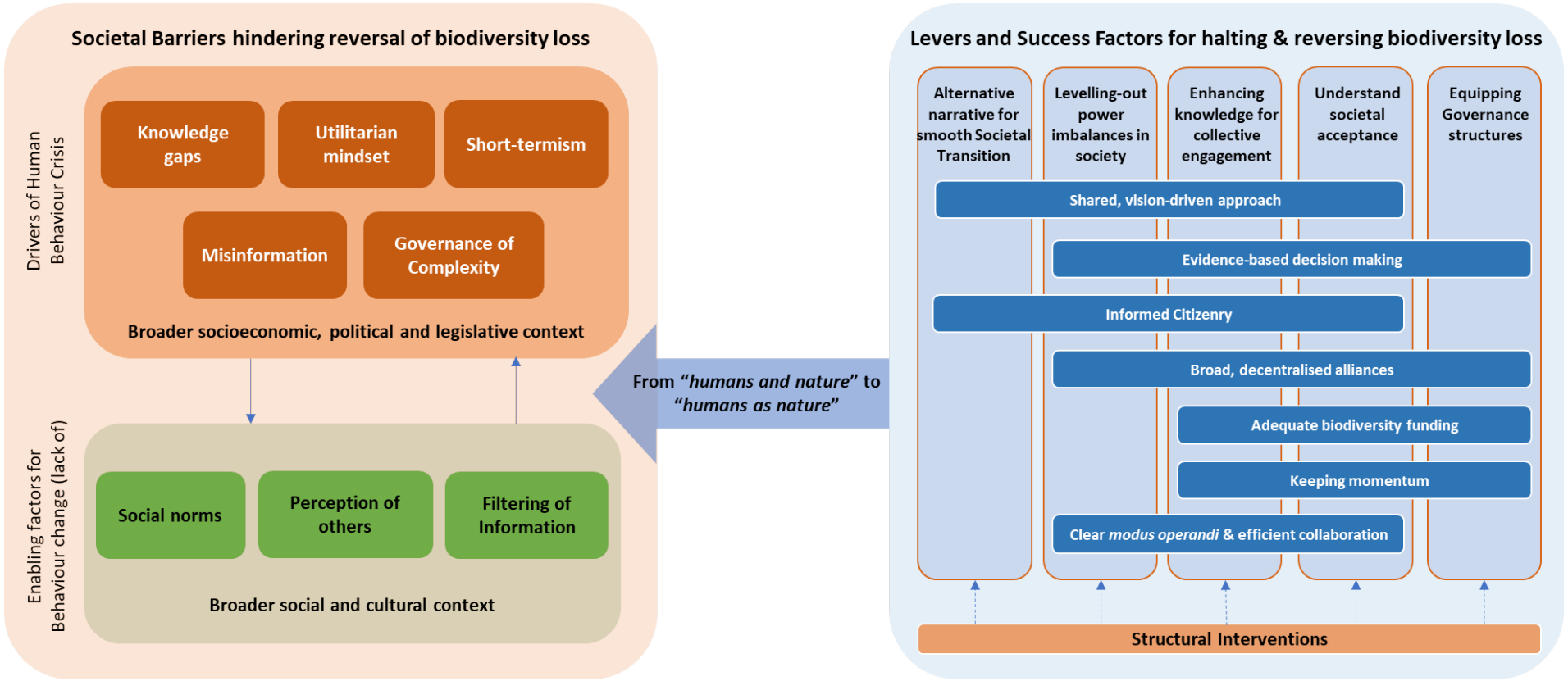
By linking the more detailed success factors to the broader levers, a first attempt is made to detach success factors from the sole case studies analysed in this report. Success factors are thus investigated in their wider value, which may hold true at a systemic level. Such hypothesis is, however, subject to further testing and investigation in other contexts. Likewise, the identified overarching levels need further investigation and research towards assessing their systemic value and transversal meaning for transformative change in the society.

In addition to levers and success factors, this report touches upon structural interventions that can be made at institutional and economic level. Structural interventions are dealt with in this report as a category of its own, as they have the potential to support, influence and sustain all of the levers and success factors identified. Structural interventions are carried out by policy instruments, which represent the means through which governments set out to affect citizens' and companies' incentives in their decision making.

Finally, the report provides a preliminary insight on the many connections existing between the identified barriers and hypothesised success factors: each barrier can be tackled by multiple success factors in many ways. At the same time, success factors reveal to be interdependent as they influence each other. How their resulting force is capable of the overall tackling of the barriers remains to be investigated. We also discovered the links of policy instruments (as structural interventions) to barriers and success factors. The identification of barriers, levers and success factors, as well as their connections, is a preliminary result of this report, which concludes with many critical questions to delve deeper into these issues, thus providing a way forward for additional research and discussion.

Although exploratory, the findings of this report provide insights into what might work better as well as what has not worked. It identifies significant knowledge gaps and formulates hypotheses that may offer comprehension into more effective approaches moving forward. It has become evident to us that without addressing these deeper societal drivers, effective biodiversity initiatives at scale are highly improbable. We hope this report will offer valuable insights for researchers and experts, as well as the staff of think-tanks and NGOs working on systemic change and societal transformation on a European or global level. We expect that the key findings from this report can also offer useful material in the support of awareness campaigns and in educational contexts, thus indirectly targeting civil society at large.

Figure ES5 (drawn from Chapter 5, Figure 5-1). Overview of the societal factors (barriers, levers and success factors) for halting and reversing the loss and change of biodiversity. It shows the interplay and connection between the eight (8) societal barriers (left-hand side) and the levers for halting and reversing biodiversity loss and change (right-hand side). Levers are grouped into five (5) overarching entry points of transformative change (light blue boxes), within which seven (7) success factors (dark blue boxes) are hypothesised. In addition, structural interventions from the institutional governance (orange box at the bottom) are also investigated as instruments able to support and influence both levers and the success factors within them. Overall, levers, success factors and structural interventions pave the ground for the required shift in the life frame of human-nature relationship from "humans and nature" to "humans as nature" (central blue arrow) to be able to halt and reverse the loss and change of biodiversity.



1. Introduction

1.1. Biodiversity: what it is & why it is important to humans

According to the CBD, biological diversity (i.e., biodiversity) consists of "*the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes* (e.g., habitats) *of which they are part; this includes diversity within species, between species and of ecosystems*"[1] (see also EC, 2013). As humans are deeply connected to the natural world, they can be considered integral components of biodiversity. Nature, in turn, embodies different concepts for different people, spanning from categories such as biodiversity and ecosystems within the context of science, to categories such as Mother Earth, Pachamama and systems of life in other knowledge systems (IPBES, 2019a,b). Following the predominant, science-based approach used in Europe, the term nature is used in this report to collectively refer to biodiversity and ecosystems.

Serving as the inherited biological assets of the Earth, nature plays a vital role in satisfying human needs – starting from the most basic such as food, water, shelter – while also regulating crucial nutrient and water cycles, contributing to the provision of biological resources, influencing climate and helping clean pollution from the environment (EEA, 2019a; EC, 2013; IPBES, 2019a,b). Nature contributes to the life and wellbeing of humans as healthy ecosystems are a prerequisite for the continuous flow of the ecosystem services that human societies need to survive and flourish (IPBES, 2019a; EEA, 2020a), and that businesses and finance depend on to generate cashflows and benefits (TNFD, 2023). Meanwhile, human activities have a profound impact on the health and wellbeing of humans themselves, as well as on that of other animals and the ecosystems they co-habit (OHHLEP, 2022); through their anthropogenic assets (e.g., knowledge, technology, built-up infrastructures and other forms of man-made capital), humans also use nature and contribute to its management so that a "*good life is achieved by a co-production of benefits between nature and societies*" (IPBES, 2019a). Market natural capital – i.e., the goods and services produced by ecosystems, which have a market value since they are exchanged in markets – interacts with manufactured and human capital to produce market benefits; market and non-market benefits from nature, in turn, contribute to national wealth[2] (in terms of GDP), especially in low- and middle-income countries (World Bank, 2021).

Tight, mutual relationships thus exist, have existed, and will always exist between humans and nature – i.e., the *human-nature* relationships – although the dynamics of such relationships have evolved over time and will keep evolving. Of particular relevance for this report is the evolving interconnection between human *needs and wants* – i.e., our value systems – and the way(s) in which humans – as individuals and as societies – *see and value* nature. The way a society values nature is not independent from the economic paradigm within which that society is nested. Building on the conceptual framework of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services – IPBES (see Díaz et al., 2015; IPBES, 2019a,b, Pascual et al., 2023) – and on recent research by Kim et al. (2023), and Bastien-Olvera et al. (2023), three main perspectives on how humans *see and value* nature can be identified (see Figure 1-1); they set the basis of our journey into understanding the multiple dynamics of the *human-nature* relationship and how they have changed over time:

[1] See https://www.cbd.int/convention/articles/default.shtml?a=cbd-02.

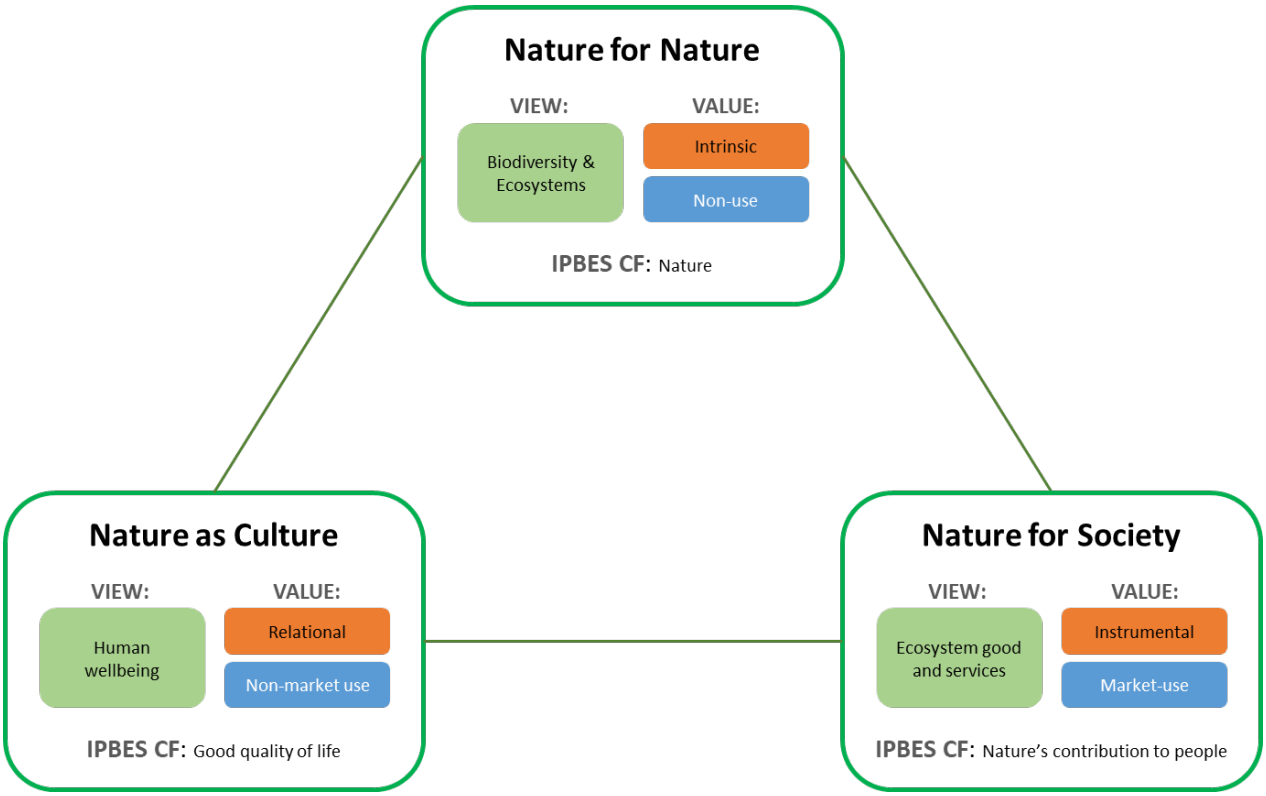
[2] It should be highlighted that – according to Bastien-Olvera et al., (2023) – climate-change-induced variations in the distribution of ecosystems are predicted to affect the provision of both market (-1.3% in GDP by 2100 compared to 2018,) and non-market benefits to people (-9.2% in GDP by 2100 compared to 2018); these variations – according to the IPBES (2022) – might be further exacerbated by the increased, climate-induced risk of extinction of a broad array of species that might play an important role in the functioning of ecosystems.

- Nature for Nature: under this perspective, living nature is seen and valued by humans simply for what it is and does (Chan et al., 2016; Kim et al., 2023): the non-human world consisting of living organisms, their diversity, and their interactions among themselves and with their abiotic environment; it includes all dimensions of biodiversity, species, genotypes, populations, ecosystems, the biosphere, ecosystem functioning, communities, and biomes (IPBES 2019b). Nature is thus valued for its existence and for its intrinsic value and contributes to the wellbeing of humans by holding non-use values (Bastien-Olvera and Moore, 2021; Bastien-Olvera et al., 2023) – i.e., the values that originates from the sole existence of biodiversity and ecosystems, independently of any direct human use or consumption (e.g., inherent existence, maintenance of Earth system processes, engine for evolution).

- Nature for Society: under this perspective, nature is seen and valued by humans for the benefits that biodiversity and ecosystems provide to people (e.g., supporting crop production and climate regulation) (EEA, 2021; IPBES, 2022; Kim et al., 2023). Nature thus solely contributes to the livelihood of humans by providing instrumental, market use values (Bastien-Olvera et al., 2023) – i.e., the goods and services that are exchanged in markets (e.g., harvested timber from forests).

- Nature as Culture: under this perspective, nature is seen and valued by humans for the relationships that individuals and communities have historically established with their surrounding environment, its landscape and the emblematic species inhabiting it (Kim et al., 2023). Nature thus contributes to the wellbeing of humans by providing relational, non- market use values (Bastien-Olvera et al., 2023) – i.e., goods and services that are not usually exchanged in markets (e.g., forest-related recreational services, water resources, non-timber forest products and the inherent value of protected areas). Moreover, these relational, non- market use values shape beliefs about how nature works, and affect the way in which individuals perceive and interact with nature, and approach solving environmental problems (Milfont and Schultz, 2016).

Figure 1-1 Three perspectives on the human perception and valuation of the role of nature. Perspectives are named after Kim et al. (2023), while values are labelled after IPBES (2019a) and Kim et al. (2023) – for the orange boxes – and Bastien-Olvera et al. (2023) – for the blue boxes. Text in the green boxes refers to the science-based view of nature that is predominant in the Western knowledge system and, together with the IPBES Central Framework (CF) label, is derived from IPBES (2019a).



Irrespective of the relationships humans have with nature and the importance of such relationships for their health and wellbeing (Soga and Gaston, 2020), biodiversity is nowadays declining faster than at any other time in human history (Butchart et al., 2010; Ceballos, et al., 2015, 2017; Tittensor et al., 2014) and many scientists (e.g., EEA, 2023a,b, Hickel et al., 2022; IPBES, 2022; Merz et al., 2023; Pörtner et al., 2023) agree that the main culprit behind such a massive decline in biodiversity and its ecosystems' degradation relates to our current, collective reliance on the "Living from nature" life frame (IPBES, 2019a,b): over time, our individual and societal value systems – i.e., the human *needs and wants* – have progressively changed, shifting from a holistic vision of "Human as nature" to a split perspective of "Human and nature", and possibly turning Nature for Society into the predominant perspective, at least in Western societies.

Human activities might have not been originally meant to deliberately harm biodiversity; they were rather intended at satisfying the evolving needs and wants of people and societies by quickly providing them with large quantities of goods and services at a low economic cost. Therefore, the marked impacts on nature and biodiversity that we are witnessing nowadays can be described as negative environmental externalities of our human actions (Nielsen et al., 2021), because the harmful impacts to biodiversity have not been considered when deciding on the actions. Moreover, the loss and change of biodiversity are nowadays perpetuated by the existing political and economic systems, both at regional and global level. As a matter of fact, our societal context – and the way it has "*evolved*" under the push[3] of industrialisation, urbanisation and technological innovation (see also Merz et al., 2023) – has made living a climate- and

[3] On the surface, we might say that this shift has been eased by 1) urbanisation, 2) industrialisation and 3) technological innovation. However, they are simply the manifestation of more profound inner/hidden changes in human needs and wants, which are explored in section 3.1.

biodiversity-compatible life (i.e., living sustainably) simply unappealing and uncomfortable (when not impossible) for most people (Amel et al., 2017). Whether the planet can manage to sustain a good quality of life for a population of almost 9 billion people while human impacts on biodiversity are lowered and reversed remains a "wicked problem[4]" (Rittel and Webber, 1973), and one of the core societal questions of our time. The ecological systems upon which current and future generations rely for their health and wellbeing are in crisis, and this report debates that such crisis is fundamentally rooted in the evolution of societal behaviour over time (see Chapter 3) (see also Amel et al., 2017; Cowling, 2014; EEA, 2023a). On a positive note, momentum is growing in the research field of "social innovation" – despite a deeper focus on *human-nature* relationships might still be missing to understand large-scale transformations (Olsson et al., 2017) – and a shift in the collective consciousness of the value of biodiversity and nature is likely already ongoing across current generations (Garcia-Gonzalez et al., 2024).

Despite global and regional agreements (e.g., the Kunming-Montreal Global Biodiversity Framework – GBF; the EU Biodiversity Strategy for 2030), there is an obvious lack of progress towards stemming biodiversity loss, pointing to the possibility of us facing critical knowledge blind spots about what might be needed to successfully address these existential threats. In other words, current scientific inquiries may be pursuing less essential questions in the biodiversity domain, while ignoring the more critical ones, such as the underlying societal behaviours that are driving biodiversity loss. Historically, this has led humans to place a prevailing focus on addressing the symptoms of biodiversity loss (e.g., by working on the "down-stream" creation of protected areas), rather than its primary (and "upstream") anthropogenic drivers (Lazarus et al., 2015). Furthermore, many of the societal remedial measures have so far displayed limited ambition, reacting to immediate circumstances with the aim of merely mitigating negative impacts in the short term, rather than proactively addressing the root causes of unsustainability over the long term (i.e., biodiversity mainstreaming).

There is an increasing recognition (e.g., by the CBD and the IPBES) that slowing down and reversing ecosystem degradation and the loss and change of biodiversity pass by addressing and mitigating their underlying key drivers (see Chapter 2.3), which in turn will require profound and widespread individual and collective behaviour changes (e.g., Vlasceanu et al., 2024); the latter will need to be aided by structural/institutional interventions to be able to last over time (Nyborg et al., 2016; Otto et al., 2020; Pörtner et al., 2023) (See Figure 1-2). Understanding the necessary interventions across multiple actors and scales (i.e., individual, collective and institutional) requires to first understand the reasons why human *needs and wants* – i.e., our value systems – have evolved through time (see Chapter 3).

Shedding light on critical knowledge blind spots could make a significant difference to our ability to react to the biodiversity trends. Identifying where these knowledge blind spots may be and what kind of hypotheses may need to be developed and tested is therefore at the core of this report.

[4] A wicked problem is a problem difficult to solve, with no single solution, due to unknown, contradictory, and shifting requirements.

1.2. Rationale, focus and perspective of this report

The loss and change of biodiversity – whether at European or global level – is increasingly seen as an intertwined environmental and human behaviour problem (Amel et al., 2017; Cowling, 2014; EEA, 2023a; IPBES, 2019a,b), in which no major success in ecosystem recovery and biodiversity conservation can be obtained until clear signs of decreased pressures are visible. This is the rationale that lies underneath this report – i.e., its *Results Chain* – and implies that no EU biodiversity strategies, nor legally binding legislative frameworks, can be adequate and fit-for-purpose unless they actually reduce these pressures (Figure 1-2) Pressures, in turn, do not decrease without decisions (with challenging consequences) to regulate socio-economic activities that, among others, drive climate change, ecosystem degradation and biodiversity loss.

In other words, as human activities are responsible for driving ecosystem decline and the loss and change of biodiversity – and given that threats to biodiversity usually result from multiple behaviours by multiple actors over large spatial and temporal scales (Amel et al., 2017; Nielsen et al., 2021) – reversing current trends will require profound and persistent behaviour changes across actors (e.g., producers, consumers and policymakers), scales (i.e., individually and collectively), and timeframes (i.e., short and long term) (Cowling, 2014; Mascia et al., 2003), as well as a rethinking and restructuring – via structural/institutional interventions[5] – of the dominant socio-economic system in which these actors operate (See Figure 1-2).

As a matter of fact, socio-economic activities and consumption patterns cannot be changed unless the widespread, self-interest-driven value systems that encourage, support, and reinforce overly consumptive, wasteful, and polluting lifestyles are radically transformed by humans as individuals and, most importantly, collectively as society (Amel et al., 2017). More heterodox thinkers would argue that humanity will not be able to solve the intertwined environmental and behavioural crises – i.e., the polycrisis (Morin and Kern, 1999) – without substantially revamping the capitalist market economy (and the political systems and lobbies supporting it) by adopting, for instance, transformative post- growth and degrowth approaches (Hickel et al., 2022a,b; Monbiot, 2019; Pelling et al., 2012; Vogel et al., 2024). Irrespective of sharing this view, it can be safely argued that both the causes and the opportunities to solve the ongoing polycrisis are rooted in the existing plurality of *human-nature* relationships, which are primarily referred to in this report as the interconnections between the human *needs and wants*, and the (resulting) way(s) in which individuals and societies *see and value* nature[6] (see section 3.1 for further details).

[5] According to Nyborg et al., (2016), individual and collective behaviour and socio-political infrastructures are intertwined and hard to disentangle; at the same time, behavioural changes (individual and collective) need to be coupled by simultaneous institutional changes to be able to last over time (Nyborg et al., 2016; Otto et al., 2020).

[6] As noted in Section 1.1, the way a society values nature is not independent from the economic paradigm in which it is nested.

We acknowledge that the *human-nature* relationships, which we propose to investigate through the lenses of multiple actors and scales, is just one of several existing perspectives (see for instance EEA, 2018) to discuss and understand transformative change to halt biodiversity loss and change. This latter is defined by the EEA[7] as "*the type of change that is required to achieve major systems reconfigurations […]. This means a fundamental, transformative, and cross-cutting form of change that entails major shifts and reorientation in systems goals, incentives, technologies, social practices and norms, as well as in knowledge systems, and governance approaches*".

BOX 1: Analytical approaches to transformative change in socio-ecological systems (Source: EEA, 2018):

1) "Resilience" approach: building on system dynamics and the concept of "adaptive cycle", this approach suggests that socio-ecological systems are often characterised by cycles of disruption and reorganisation;
2) "Pathways" approach: this approach relies on the conception of alternative strategies or development trajectories to meet certain visions and goals, thus recognising that multiple ways exist to meet such visions and goals;
3) "Spheres of transformations" approach: it emphasises three crucial domains (practical, political and personal) for fostering change in socio-ecological systems. It recognises the significance of actors and experimentation in driving transformations, while emphasising the key role of the personal domain, aligning closely with the socio-economic perspective.

Of the three analytical approaches to transformative change in socio-ecological systems described by the EEA (see Box 1), the *human-nature* relationships framing embraced in this report aligns more closely with the latter ("*Spheres of transformations*"), which recognises the role of actors and emphasises the importance of the personal domain (e.g., changing values and worldviews); yet, compared to such approach, the *human-nature* relationships framing further stresses the need for collaboration across multiple actors and scales, and the importance of aligning the values of individuals with that of the societal identity group individuals belong to. As such, we have opted for using this perspective as it:

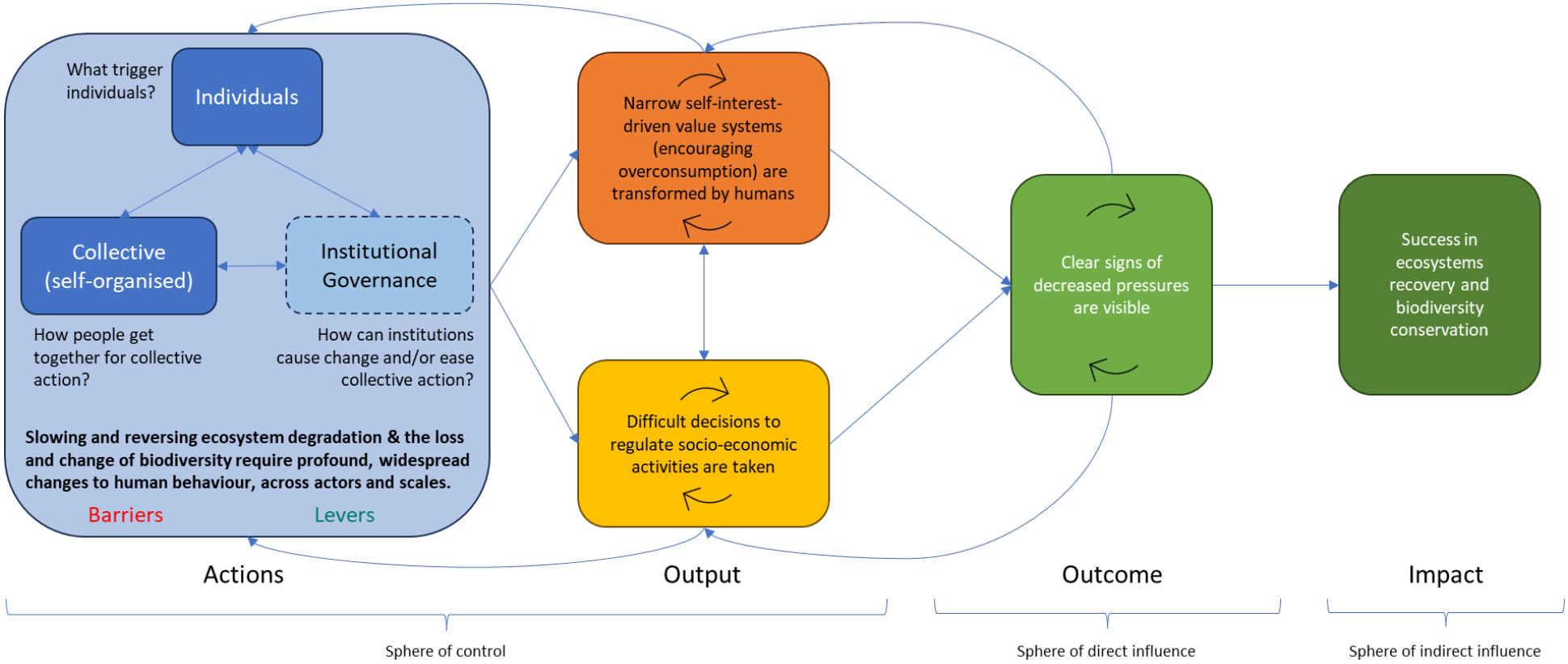
- is relatively simple, frames a "big picture" system perspective, and emphasises the importance of valuing nature,
- allows connecting the biodiversity challenge with the underlying causes of biodiversity loss,
- is coherent and aligned with the DPSIR (Driver-Pressure-State-Impact-Response) framework (EEA, 1999) and its main adaptations to the biodiversity context (e.g., BIP, 2010, IPBES, 2019a,b, Post 2020 GBF),
- allows treating individual actions and mindsets in combination with collective responses and policy actions, and
- recognises that biodiversity conservation is a human endeavour: a societal challenge that is initiated and designed by humans to modify human behaviour and achieve a socially desired impact (Mascia et al., 2003).

At the same time, this perspective has some specific features as it

- is primarily place-based (i.e., it addresses human-nature interactions in local settings) calling for the need of polycentric modes of governance,
- places a limited focus on technological innovation, and
- provides a limited insight on the bio-geo-physical dimension of transformative change and – within the social dimension – in the role of power, politics and interests.

[7] See https://www.eea.europa.eu/articles/building-the-foundations-for-fundamental-change.

Figure 1-2 "Results chain" of the theory and narrative approach used in this report. Given the complexity of the issue, halting and reversing biodiversity loss (or rather setting up the societal factors enabling to do so) necessitate an iterative progress, which is visually represented by the multiple feedback loops, and which is less linear than what the figure might visually imply. It also requires understanding the different roles that multiple actors can play at various scales. While three key actors – individuals, self-organised collectives, as well as the institutional governance, and the political and economic system within individuals and self-organised collectives operate – are identified, the focus of this report is predominantly on the cultural, psychological and process barriers to change biodiversity-harmful behaviours at individual and societal levels, and less on top-down systemic interventions and policy actions.



1.3. Scope of this report

The EU Biodiversity Strategy for 2030 (hereafter BDS 2030) is a comprehensive, ambitious and long-term plan to protect nature, and reverse and restore the degradation of ecosystems within and beyond the EU-27 region. This strategy takes a comprehensive and more ambitious approach to biodiversity conservation than the previous ones (e.g., the EU Biodiversity Strategy for 2020 (EC, 2011)). Nonetheless, the inability of the previous strategies in reaching their goals requires taking a step back and carefully dissecting the society in which the BDS 2030 exists and is meant to be implemented, to anticipate – to the extent possible – whether the vision and goals set for 2030 in the BDS 2030 stand a chance of being achieved.

As part of the 8th Environment Action Programme[8], an assessment of progresses towards key objectives of the BDS 2030 is set annually and includes four indicators. Furthermore, all targets listed in the BDS230 are tracked via online tools[9] (EEA, 2023b; Viti et al., 2024). As such, the scope of this report is not to conduct a detailed review of the BDS 2030 and its targets, but rather it aims to provide a more general, underlying investigation of the wider societal behaviour factors that are preventing to halt and restore the loss and change of biodiversity, given the BDS 2030's overarching milestone to ensure that "*Europe's biodiversity will be on the path to recovery by 2030*" (EC, 2020).

Delivering on this scope requires understanding why human needs and wants (i.e., our value systems) evolve in the way they do, and how they have changed through time. It requires a holistic understanding of the determinants of human behaviour[10] (Nielsen et al., 2021), including understanding what trigger individuals, what trigger their participation in collective actions, and how institutional interventions (e.g., via policy instruments) can bring about changes and/or trigger individual and collective actions. This report will thus cover the ways in which societal behaviour change does or does not happen (i.e., the "*how*") by identifying the barriers that impede transformative change as well as the levers that can trigger change and their actionable success factors.

To identify the main barriers to halting and reversing the loss and change of biodiversity that currently exist in our societies, and hypothesise the levers and success factors that could help lifting such barriers, a 3-step approach was used:

1. A series of brainstorming sessions involving EEA and ETC BE experts were organised in 2023 (see Annex 1 for further details[11]); these sessions led to the identification of an initial set of barriers and levers for halting and reversing the loss and change of biodiversity, and the recognition of the need to complement these initial findings with a literature review;
2. A narrative review was conducted during January-February 2024 (see section 3.1); its findings were used to integrate and amend the outcomes of the brainstorming sessions conducted in 2023, thus leading to a tentative final list of identified barriers (see section 3.2). Meanwhile, levers were looked at through the identification of actionable factors of success in real-life situations (see point below); a more in-depth conceptualisation of their own rationale thus remains a key area for future research.

[8] Decision (EU) 2022/591 of the European Parliament and of the Council of 6 April 2022 on a General Union Environment Action Programme to 2030. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32022D0591

[9] See the online EU biodiversity strategy dashboard and the EU biodiversity Strategy Actions Tracker

[10] At the heart of all social theory is the contrast between humans as motivated almost exclusively by narrow self-interest and humans as motivated by concern for others or for society as a whole (NRC, 2002).

[11] Within the context of the 2023 Action Plan of the ETC BE (Task 1.1.5.2), three online brainstorming sessions were organised during the first semester of 2023, to get insight on the perceived key societal barriers to reversing the change and loss of biodiversity. These sessions were followed by two rounds of written consultation (via surveys and emails) in the second semester. The full list of the experts who took part in these sessions alongside details on the structure and outcomes of the expert workshops are reported in Annex 1.

3. A critical investigation of a shortlist of case studies, which constitute illustrative examples of actions and changes within socio-ecological systems (see Chapter 4 and Annex 3), and which were used to investigate how the identified barriers were tackled within the case studies, allowing us to hypothesise success factors.

Beside the initial inquiry of this report, finding true and univocal solutions for such crisis might be unrealistic; rather, multiple, place-specific entry points for interventions (targeting different habitats and species) might need to be identified, employing a multi-layered, multifaceted and fuzzy intervention logic, with potential inconsistencies across issues, sectors and scales. Still, we expect our identification of the societal barriers that prevent halting and reversing biodiversity loss, and the subsequent investigation of how they have been tackled in the case studies – i.e., our hypothesised success factors – to provide useful insight that can be referred to, tested, and leveraged in future efforts aimed at mitigating and reversing the ongoing biodiversity crisis.

This ETC BE report targets researchers and experts, as well as staff of think-tanks and NGOs working on systemic change and societal transformation on a European or global level. We expect this report to be also useful in support of awareness campaigns and in educational contexts, thus indirectly targeting civil society at large. As it places the need to curb biodiversity loss in the societal framework, we hope this report can be of relevance to the new European Commission when it will be drafting its workplan for the next 5-year period (2024-2029).

1.4. Limitations of this report

While acknowledging the need to act at multiple levels and involve multiple actors as reported in Figure 1-2, this report sets out to focus on the psychological and behavioural aspects of human individuals and the self-organising collectives. As such, we refer to behaviour changes as the type of changes that are needed at the wider societal level – i.e., "societal behaviour" – rather than solely targeting individuals. The connections between the biodiversity crisis and institutional governance, as well as the political and economic system, however, are beyond the scope of this report, although they are touched upon in section 4.3. Such a narrow focus is intended to give adequate coverage to cultural, psychological and process barriers and success factors, as these merit an inquiry of their own. Accordingly, the focus of the case studies' investigation (see Chapter 4 as well as Annex 3) is also based on bottom-up rather than top-down success factors. For further details on the biodiversity governance, readers are encouraged to look at Visseren-Hamakers and Kok (2022), while the economics of biodiversity is covered in depth in the Dasgupta Review (Dasgupta 2021). The well-established biodiversity policy framework of the EU[12] has been assessed in detail for example by IEEP[13], and it is thus also excluded from the scope of this report.

Moreover, while we recognise that understanding "*what*" interventions, policies and actions are necessary to reduce the impact of human activities on biodiversity is key to appreciate and frame effective individual and collective actions (see also Heimlich and Ardoin, 2008), developing a grand master plan of the actions needed to bend the curve of biodiversity loss goes beyond the scope of this report; several studies have already investigated these actions (e.g., Leclère et al., 2020; Mace et al., 2018), and a comprehensive identification of the options for achieving the 2050 Vision for Biodiversity of the Convention on Biological Diversity's Kunming-Montreal Global Biodiversity Framework is at the core of the upcoming IPBES Nexus Assessment[14].

[12] See https://knowledge4policy.ec.europa.eu/biodiversity/eu-policies-global-biodiversity-governance_en
[13] See https://ieep.eu/eu-biodiversity-policy-and-instruments/
[14] See https://www.ipbes.net/nexus for further info on this report.

Finally, in the quest for societal behaviour factors that would enable reversing the loss and change of biodiversity, we then deem fundamental to shed light on the similarities, yet the differences between the biodiversity and the climate crisis. Both these intertwined crises are ultimately rooted in unsustainable production and consumption practices, and several climate-related remedial actions will benefit biodiversity, and vice-versa (Mahecha et al., 2022; Pörtner et al., 2023); yet, these crises differ in their conceptual complexity, geographical and spatial explicitness [15], direct connection with concerned sectors[16], and – ultimately – in their public perception and awareness[17]. Moreover, while a clear target for mitigating climate change has been politically agreed (UNFCCC, 2015), and can be measured (e.g., IPCC, 2021; Liu and Raftery, 2021; Raftery et al., 2017; Rogelj et al., 2016) and acted upon (Akenji et al., 2021), finding an equivalent biodiversity target is challenging as biodiversity does not yet have unequivocal and aggregable units for a single measurement that may be readily communicated to galvanise political will and public support (e.g., Rounsevell et al., 2020; see also the 4 indicators of biodiversity in the 8th EAP). Likewise, it's easier to identify and geographically locate the drivers of climate change compared to the drivers of biodiversity loss and change, thus easing the definition of remedial actions (and their monitoring) to mitigate climate change. This might also explain why the climate debate is more advanced and has already led to the definition of an univocal climate mitigation target.

1.5. Structure of this report

To deliver on its intended scope, the reminder of this report is structured as follows:

- Chapter 2 *Evolving needs, changing impacts: an overview of the current context* offers an overview of societal development trends, and the environmental impacts associated with the changing needs & wants of humans; it then summarises the implications of such changing needs & wants for biodiversity through the lenses of the 5 drivers of biodiversity loss. This chapter helps better understand the socio-economic dynamics affecting the loss and change of biodiversity.

- Chapter 3 *Towards halting and reversing biodiversity loss: learning from failures* provides – through a narrative review – a cohesive story/narrative to investigate the evolution (or rather the involution) of the human-nature relationships, focusing on the evolving interlinkage between human "*needs & wants*" (and how and why they have changed over time), and the way in which humans "*see & value*" nature; this chapter then concludes with an attempt to identify key societal barriers to halting and reversing the loss and change of biodiversity.

- Chapter 4 *Enabling to halt and reverse biodiversity loss* builds on the preliminary identification of a set of 5 overarching levers for transformative change and then dig into the actionable factors of success. It provides a critical investigation of a carefully selected shortlist of illustrative examples of actions and changes within socio-ecological systems throughout Europe. This investigation disentangles what made the identified case studies work; guiding questions behind this exercise were "*What triggered individuals to act?*", "*Why and how people got together in the collective effort to change larger systems and infrastructures?*", "*What was the role of*

[15] Both land sparing (predominant in global rainforest conservation and in North America) and land sharing (preferred by the European focus on traditional human-influenced landscapes), for instance, are valid within certain contexts and spatial scales. At system level, they are unlikely to intuitively make up for a unique approach.

[16] While climate change targets – expressed in measurable, aggregable and fairly intuitive units, such as GHG emissions in CO_{2eq} – can be linked to the performance of the most immediately concerned sectors (i.e., energy and mobility), actions to tackle the biodiversity crisis are not yet critically linked to the performance of the most immediately concerned sectors (i.e., bioeconomy).

[17] While climate change targets – expressed in measurable, aggregable and fairly intuitive units, such as GHG emissions in CO_{2eq} – can be linked to the performance of the most immediately concerned sectors (i.e., energy and mobility), actions to tackle the biodiversity crisis are not yet critically linked to the performance of the most immediately concerned sectors (i.e., bioeconomy).

structural/institutional interventions in triggering change and/or easing collective action?", "*How can momentum be kept over time?*". By analysing the case studies through the lenses of the societal barriers identified in Chapter 3, this chapter offers a preliminary set of hypothesised success factors to unlock effective change in halting and reversing (to some extent) the loss and change of biodiversity. In addition, the chapter reflects on necessary structural interventions at institutional and economic level, which support and enable all levers and success factors.

- Chapter 5 *Conclusions and Way Forward* summarises the main conclusions (i.e., the learning outcomes of this report), and offers a set of critical, open research questions, which offer a springboard for future research and discussion. In addition, the chapter discusses how the investigation of structural/institutional policy interventions can help mitigate the fuzziness of tackling the biodiversity crisis.

2. Evolving needs, changing impacts: an overview of the current context

2.1. Societal development trends

The evolution of human needs and wants brings about consequences and changes in how we see, value and use nature. Human history has evolved marking out a variety of changes that, despite differing in their origin, meaning, geographical scale and timescale, are increasingly interlinked as the world became globalised and interconnected. These changes can be described as global megatrends when they unroll in the long term, slowly forming but significantly impacting the world (EEA, 2019a,b).

Starting from the European industrial revolution in the second half of the 18th century, major trends like technological advancements, economic growth, and improved standards of living have been determinant factors of change; these trends reinforced each other and intensified at the global level, resulting in an unprecedented growth in population, economic output, and resource use as of the mid- 20th century – a period also known as the Great Acceleration (EEA, 2023a; Steffen et al., 2015a). Global population doubled in just 40 years – from 3 billion people in 1960 to 6 billion people in 2000 – and reached nearly 8 billion in 2022 (UN DESA, 2022). Urban areas rapidly expanded, and people progressively moved from rural areas to cities, which passed from hosting 30% of humanity in 1950 to 55% in 2018, with projections reaching up to nearly 70% by 2050 (UN DESA, 2019).

As population, urbanisation and affluence grew, so did resource demand. Global energy consumption grew 25 times since 1800 (EEA, 2019b), mainly dominated by fossil fuels: coal consumption, for instance, reached a near all-time high of 161.5 exajoules; fuel oil consumption increased back to nearly 200 exajoules after the COVID-induced drop of 2020 (see Ripple et al., 2023); and the global, annual production (and subsequent consumption) of highly carbon- and resource-intensive meat products (Galli et al., 2023; Poore and Nemecek, 2018) increased to an all-time high of 45 kg per capita (Ripple et al.,2023). Per capita man-made capital (e.g., manufactured goods) doubled in the 1992-2014 period (Dasgupta, 2021), leading the magnitude of the material output of human activities to surpass that of the global living biomass by 2020 (Elhacham et al., 2020); meanwhile human capital (such as health, knowledge, and skills) increased globally by 13% on a per capita basis. The global use of materials – including metals, fossil fuels, minerals and biomass – increased 10 times from 1900 to 2009 (EEA, 2019b) and more than 3 times over the last 50 years (UNEP, 2024), reaching 70 billion tons in 2010 (Schandl et al., 2018), 90 billion tons in 2017 (Hickel et al., 2022a) and 100 billion tons in 2020 (UNEP, 2024), while the global economic output increased by nearly 12 times from 1950 to 2016 (EEA, 2019a).

These widespread increases in resources' use have been primarily driven by growing affluence, consumption patterns, and international trade flows (Schandl et al., 2018; Wiedmann et al., 2020). Yet, a relative decoupling has also occurred globally as of the beginning of the 21st century, seeing an economic

growth rate which was faster than the rate of consumption of natural resources: in 2002, about 25% less material input was needed compared to 1980 to produce one unit of Gross Domestic Product (GDP), thus hinting to an increase in resource productivity (UNEP, 2011; Haberl et al., 2020). Also, in the last decade, some high-income countries managed to achieve an absolute decoupling as per the carbon budget, by increasing GDP while decreasing carbon emissions (Vogel and Hickel, 2023). Nevertheless, such efforts are still insufficient and they fall short of the massive decoupling – including that from resource use and environmental impacts (EC, 2023) – required to meet the climate and equity commitments of the Paris Agreement, for which decoupling rates would on average need to increase by a factor of ten by 2025 (Vogel and Hickel, 2023; Haberl et al., 2020).

The global trends manifest differently at regional and local levels, highlighting geographically-specific patterns and inequality issues (Steffen et al., 2015). For Europe, trends can be well delineated, for a wide range of areas (EEA, 2019b). Originating from the industrial revolution – which was propelled by Western European countries through policies of colonialism, invasion, and extensive resource extraction (Hickel et al., 2021) – the Great Acceleration has been largely dominated by high-income countries, which in 2010 held 74% of the global GDP despite representing a mere 18% of the global population (Steffen et al., 2015), and which depend on resource appropriation from abroad for their wealth (Hickel et al., 2022a). Despite a stagnant population since the start of the 21st century, urbanisation in Europe (EU-27) has surged – with nearly 75% of the EU population living in urban areas in 2021 (Eurostat, 2022) – as people moved to cities in search of better economic opportunities.

Economic growth in Europe was largely boosted by international trade when the region started operating as a single market comprising 27 member states with a unified external border (Eurostat, 2023)[18]. Between 2002 and 2022, the European international trade increased – except for a downturn in 2009 caused by the global economic crisis – in both imports and exports, resulting in a net trade surplus[19] from 2012 until the post-COVID years; since 2020, however, imports have been increasing much faster than exports (Eurostat, 2023). Consequently, despite a reduction by 30% of the net GHG emissions in the 1990-2022 period (EEA, 2023b), the EU consumption Footprint increased by almost 4% from 2010 to 2021 surpassing its domestic footprint (which decreased by 12% between 2010 and 2018); this indicates that environmental pressures and habitat degradation are being displaced by Europe to other parts of the world (Sanyé and Sala, 2023; EEA, 2019b; Galli et al., 2023; Sala et al., 2019). From a consumption viewpoint, food represents the main driver (30%) of the total European citizens' Ecological Footprint, despite a slight decrease (20%) over time (2004-2014) in the average per capita food Footprint (Galli et al., 2023).

Trade and regional specialisation have offered several socio-economic benefits (EC-DG for Trade, 2022), enhancing resource efficiency and production (Zimmermann and Rapsomanikis, 2023). Trade in agricultural commodities and food products, for instance, has grown eight-fold since the 1950s, reducing regional food security risks, providing world consumers with sufficient, safe and nutritious food, and generating income and employment for workers (e.g., farmers, traders) along the supply chain[20] (Zimmermann and Rapsomanikis, 2023; van Berkum, 2021). Still, trade exposes importing countries to climate- (EEA, 2021) and resource-related (Galli et al., 2015) shocks, contributing to global resource use (e.g., land and water) and biodiversity loss (Lenzen et al., 2012).

[18] Currently, Europe accounts for 16% of world imports and exports. See European Commission, DG for Trade. EU position in world trade. Available at https://policy.trade.ec.europa.eu/eu-trade-relationships-country-and-region/eu-position-world-trade_en#email.

[19] In the trade balance, trade surplus (positive balance) is the situation in which exports are higher than the imports. In contrast, the balance is negative when imports are higher than exports and the situation is called a trade deficit.

[20] About a third of global agricultural and food exports are traded within global value chains spanning at least three countries (EC, 2021; Zimmermann and Rapsomanikis, 2023).

While Europe is self-sufficient and a net exporter of some agricultural products (e.g., cereals and vegetables), it heavily relies on imports for seafood and fish products (EEA, 2019b), tropical food products (e.g., cocoa, bananas, and coffee), animal feeds (e.g., soybeans and maize) (Sporchia et al., 2023), commodities for secondary processing (e.g., palm oil, beet, and sugar cane) (EEA, 2021), as well as raw materials (including chemicals, metals, and products for IT devices and the green transition like PV cells), traditional energy inputs (i.e., coal, petroleum oil, and gases), and food-related biological capacity (Galli et al., 2023).

Despite the profound enhancement in the living standards and well-being of millions of people brought by the global trends of the Great Acceleration, there is growing evidence that such human prosperity has come at the expense of the Earth's stability (Barnosky et al., 2012; Bjørn et al 2018; Davis et al., 2016; Richardson et al., 2023; IPCC, 2022, 2023; Steffen et al., 2015; Wiedmann et al., 2020). Moreover, the combined increase in human population, human activities, resource use, economic growth and per capita affluence led, in the 20th century, to the most rapid transformation of the *human-nature* relationship in the history of mankind, shaping societal values and behaviours while posing tremendous pressures on Earth system (IPBES, 2022). While the urban-industrialised world created a resource-efficient system in terms of material and energy needs and uses, resulting in prosperity and increased quality of life for world citizens (when urban space is properly managed and planned – see EEA, 2015), urbanisation also contributed to creating a highly anthropogenic and anthropocentric system, likely twisting the human sense of belonging to nature (Amel et al., 2017), and exacerbating changes and declines in life-supporting ecosystems.

2.2. Environmental and biodiversity impacts of societal development

As the size of human activities across the whole planet – i.e., the human metabolism – has been continuously growing (Lin et al., 2018; Steffen et al., 2015a), 20 out of 35 vital signs[21] hit record extremes in 2022: as shown by Ripple et al. (2023), global average carbon dioxide concentration in the atmosphere reached 420 ppm, along with methane and nitrous oxide being at record levels, causing approximately 1°C of global warming above pre-industrial levels, and is expected to likely exceed 1.5°C by 2040 (IPCC, 2021); global tree cover loss rate declined by 9.7% to 22.8 million hectares per year; ocean acidity and glacier thickness fell to record lows, while sea level rise and ocean heat content rose to record highs.

Our planetary system has been pushed into dangerous instability – i.e., outside a safe operating space – as six of the nine critical processes that contribute to the well-functioning and resilience of the Earth, are being transgressed (Richardson et al., 2023; EEA, 2023b). These include biosphere integrity, climate change, novel entities (i.e. new chemicals and anthropogenic materials introduced in the Earth system), biogeochemical flows (specifically of phosphorous and nitrogen), freshwater change, and land system change. Not least, a gradual decrease in the strength of the Atlantic meridional overturning circulation (AMOC) has been recently noted, pointing to yet another possible tipping point (van Westen et al., 2024). Destabilisation of the AMOC would abruptly affect the global climate regulation by drying the Amazon, disrupting monsoons in East Asia and increasing heat in the Southern Ocean, ultimately accelerating Antarctic ice loss (Ditlevsen & Ditlevsen, 2023; Lenton et al., 2019). In the Southern hemisphere, recent

[21] According to Ripple et al. (2023), the 35 signs are: 1) human population, 2) total fertility rate, 3) ruminant livestock, 4) per capita meat production, 5) World GDP, 6) global tree cover loss, 7) Brazilian Amazon forest loss, 8) coal consumption, 9) oil consumption, 10) gas consumption, 11) solar/wind consumption, 12) air transport, 13) Total institutional assets, 14) CO_2e emissions, 15) per capita CO_2e emissions, 16) GHG emissions covered by carbon pricing, 17) carbon price, 18) fossil fuel subsidies, 19) Governments that have declared a climate emergency, 20) carbon dioxide, 21) methane, 22) nitrous oxide, 23) Surface temperature anomaly, 24) Earths energy imbalance, 25) ocean heat content change, 26) ocean acidity, 27) sea level change relative to 20-years mean, 28) minimum Artic sea ice, 29) Greenland ice mass change, 30) Antarctica ice mass change, 31) glacier thickness change, 32) area burned in the US, 33) global tree cover loss due to fires, 34) billion-dollar floods in US, extremely hot days relative to 1961-1990.

research has identified a close connection between the Antarctic Circumpolar Current (ACC) strength and the glacial cycles, suggesting that ACC flow speed increases during warmer glacial periods and thus supporting preliminarily long-term future projections that see the ACC speeding up due to a human-caused warming climate, with consequences on the stability of Antarctica's ice sheets, global ocean circulation and global climate (Lamy et al., 2024).

Applying the planetary boundaries framework to a sub-global level (e.g. at EU level) poses the challenge of allocating regional/local definitions and shares of global safe operating limits. However, attempts are being made in the EU to test the approach on a number of selected planetary boundaries by applying a consumption-based approach (aka the environmental footprint perspective) (EEA, 2020b). Preliminary results show that Europe is in a state of overshoot for two out of three accounted planetary boundaries, including biogeochemical flows (both nitrogen cycle and phosphorous cycle), and land system change. Freshwater use has not been overshot despite an increase in European consumption of blue water by 25% in the period 1995-2015 (EEA, 2020b). Additionally, 16 environmental impacts of EU-27 citizens' consumption pattern have been mapped against 9 ecological processes' thresholds (Sala et al., 2020; Sanyé and Sala, 2023) revealing that the EU environmental footprint is far transgressing the safe operating space for ecotoxicity in freshwater, particulate matter, climate change, and use of fossil resources; also, the impact categories of the use of resources (minerals and metals) and the eutrophication in freshwater reach the uncertainty area of the planetary boundaries[22] (also see Sanyé and Sala, 2023).

The utilisation of land serves as the cornerstone of agriculture and, consequently, forms the basis – along with coastal areas – upon which human civilisation has been established (DeFries et al., 2004; Foley et al., 2005). The interplay between the features of land and human management decisions is crucial in determining the productivity and sustainability of agro-ecosystems (FAO, 2021). It is also instrumental in monitoring the extent and intensity of human utilisation of ecosystems, natural resources, and biodiversity, as exemplified by measures such as the Ecological Footprint and the Human Appropriation of Net Primary Production (HANPP), respectively:

- Looking at the overall extent of the human demand, Ecological Footprint and biocapacity Accounts (Wackernagel et al., 1999) indicates that the human enterprise – with its multiple demands for natural resources and ecosystem services – has surpassed the Earth's carrying capacity since the 1970s and has kept doing so, demanding in 2023 the resources and ecological services equivalent to 1.7 planets (Lin et al., 2018). This situation, known as Ecological Overshoot, has led to the accumulation by humans of an ecological debt with the planet that is as large as what the planet's ecosystems could regenerate in approximately 20 years[23]. As Nature's supply relies on the stock of natural assets, drawing on natural capital beyond its regenerative capacity inevitably leads – in the long run – to unsustainable depletion of nature's stock. This depletion is estimated to have decreased by 40% the per capita availability between 1992 and 2014 (Dasgupta report, 2021). This has also inevitably led to changes and losses in global biodiversity (Butchart et al., 2010; Galli et al., 2014).
- Looking at the intensity of human demand during the 20th century, HANPP results show a slower rate of increase compared to population growth (Haberl et al., 2007). However, this trend is expected to intensify due to ongoing global population growth and the expanding use of bioenergy, as well as the implementation of bioeconomy initiatives (EC, 2018; Mancini et al., 2023). Additionally, through activities such as agriculture, forestry, fishery and marine exploitations, and infrastructure development, humans extract or impede more Net Primary Production (NPP) than they directly utilise for biomass-based goods (Paudel et al., 2023).

[22] See EEA data and maps at https://www.eea.europa.eu/data-and-maps/figures/comparison-of-16-climate-and and EC Consumption Footprint Platform at https://eplca.jrc.ec.europa.eu/ConsumptionFootprintPlatform.html

[23] Overshoot's 50-year persistence has led to a massive ecological debt. It would take Earth – if left untouched –20.5 years to regenerate what humans have depleted. See https://www.footprintnetwork.org/resources/footprint-scenario-tool/

Despite the reported improvements in the intensity of the human exploitation of the planet and the presence of global agreements and regional processes, 77% of the Earth's terrestrial surfaces and 87% of the oceans have been fundamentally altered by human activities (Pörtner, 2021), and 85% of global wetland areas have been lost (IPBES, 2019a,b); meanwhile, only about 3% of the planet's terrestrial regions are ecologically intact (Plumptre, et al., 2021). Together, these ecosystem changes have triggered exceptionally rapid changes and declines in global biodiversity (Butchart et al., 2010; Tittensor et al., 2014; WWF, 2022), potentially initiating a sixth mass extinction (EEA, 2019a; Ceballos, et al., 2015, 2017).

According to the IPBES Global Assessment Report, the average abundance of plant and animal life has fallen by 20% over the past century (IPBES, 2019a,b). Similarly, the Living Planet Index has shown an average 69% global decline in the relative abundance of monitored species populations from 1970 (LPI=1) to 2018 (LPI=0.31), although with differences across regions and species (WWF, 2022): in Europe and Central Asia, for instance, wildlife population has declined by 18% in the same period.

As a result, an estimated 1 million animal and plant species (of an estimated 8 million existing globally) are now facing the risk of extinction within the next few decades, with the rate of this decline accelerating rapidly if no immediate action is taken to mitigate the drivers of biodiversity loss (IPBES, 2019a). According to The IUCN Red List global, this threat already encompasses 44,000 species[24], including species classified as critically endangered, endangered or vulnerable (IUCN, 2024). The European continent is a hotspot of biodiversity as with its variety of landscapes and climates it is home of an impressive number of species and habitats (EEA, 2020a): it includes around 20k species of plants, more than 800 species of birds and mammals, 300 species of amphibians and reptiles, 1800 species of fishes and 300k species of invertebrates (IUCN, 2024). However, Europe alone holds the world's lowest level of biodiversity intactness (WWF, 2022) as 25% of the assessed species are classified as threatened with extinction (IUCN, 2024). More precisely, the latest assessment on the status of Nature in Europe (EEA, 2020) relative to the 2013-2018 period reports that more than 60% of the animal and plant species covered by the Habitat Directive (EU, 1992) is in a bad (21%) or poor status (42%) of conservation, 27% is in good status (the highest proportion for reptiles and vascular plants species groups), while the remaining 10% is unknown (mostly referred to species of the marine environment). As per the habitat's perspective, the situation is that the majority of them are in a bad (36%) and poor (45%) conservation status (mostly coastal areas and grassland), with only 15% in good status and 4% unknown. Bird populations have a dedicated directive (EU, 2009) and are thus assessed separately: nearly half of the species (47%) are in a good conservation status, while 40% is in poor or bad condition quite evenly distributed (20% and 19%, respectively); the remaining share is an unknown status because of lack of reliable data.

These numbers undoubtedly indicate that biodiversity is declining and – interlinked with climate change – it represents one of the most critical challenges of an ongoing polycrisis. In fact, climate change and the loss of biodiversity are closely interconnected and interdependent through mechanisms of links and feedback loops (EC, 2020). They mutually reinforce each other and affect ecosystem functioning, negatively impacting people's quality of life (IPBES, 2022; Pörtner et al., 2021). Climate change exacerbates the risks to biodiversity loss and ecosystem degradation, both of which are already triggered by human activities. In turn, the destruction of ecosystems and biodiversity undermines nature's ability to regulate greenhouse gas (GHG) emissions, protect against extreme weather, and contribute to climate adaptation support (Pörtner et al., 2023; IPBES, 2022). Hence, tackling these two crises simultaneously is imperative, and requires related policies that work in synergy (Pörtner et al., 2021) and consider the similarities and the differences between them. Yet, climate change is too frequently pointed at by scientific papers and media coverage of policy debates as the main and primary threat of the overall environmental crisis (Caro et al., 2022), somehow "*subsuming not only all other ecological crises in the collective cultural imagination but also the existential fate of the species and the planet*"[25].

[24] This figure represents 28% of the overall species assessed by the IUCN Red List (nearly 157 thousand in total).
[25] See: https://www.nytimes.com/2022/12/21/opinion/climate-change-biodiversity-crisis-cop15.html

2.3. Drivers of ecosystems' degradation and biodiversity decline

Human activities have triggered a vicious circle as the decline in the world's biodiversity destabilises the planet (Steffen et al., 2015), impacts the health of animals, plants, and the wider environment (OHHLEP, 2022), putting the foundations of the health and wellbeing of future generations at risk (Diaz et al., 2019; O'Neill et al., 2018; Pörtner et al., 2021). Through time, human activities were intended at satisfying peoples' and societies' needs and wants by quickly providing them with large quantities of goods and services at a perceived low economic cost; the consequent surge in natural resource demand has increased environmental pressures arising from the extraction, consumption and end-of- life management of such resources; these processes were reinforced by the international trade (OECD, 2018).

Part of the massive work of the latest IPBES Global assessment report (IPBES, 2019a) has been focused on formalising the interactions occurring between the human sphere and nature through the analysis of different categories of drivers that affect nature and its contribution to people. As also reiterated by the EU 2030 Biodiversity strategy (EC, 2020), the largest global impacts stemming from the consequences of human actions are aggregated into 5 categories of direct (anthropogenic) drivers[26] – 1) Changes in land and sea use, 2) Direct exploitation of natural resources, 3) Climate change, 4) Pollution, and 5) Invasion of alien species – whose trends for the European region are briefly depicted below:

- **Land use change** is one of the major trends, of which agricultural activities and urbanisation are the most frequently reported pressures for habitats and species (EEA, 2020a) as they occupy about 80% of Europe's land surface[27]. Despite the emerging of sustainable agricultural and forestry practices[28] as well as the increasing coverage with protected areas (IPBES, 2018), intensification and specialisation of conventional agricultural management remain the current predominant practices in Europe, which severely affect many terrestrial habitats, most notably grasslands, heath and scrub, and freshwater habitats along with the related species groups living therein, including vascular plants, molluscs, arthropods, reptiles and breeding birds (EEA, 2020a). Similarly, intensified forestry practices have replaced almost all of Europe's natural forests, where only 5% of forests have six or more tree species. Furthermore, the increased use of forests as a source of renewable biological materials[29] leads to a cascade effect in the decline of forest area and a reduction (estimated to be around 20%) in their capacity of carbon sequestration (EEA, 2020a). Urbanisation – e.g. the extension of urban areas and artificial surfaces – is the dominant group of pressures for marine and coastal habitats and mostly stem from human activities like sports, tourism and leisure activities (EEA, 2020a).

- **Exploitation of natural resources** encompasses both biotic (e.g. marine fish/shellfish) and abiotic resources (e.g. minerals). In the EU, the demand for marine wild capture fish and shellfish tends to keep on exceeding their 'maximum sustainable yield', thus the commercial fisheries sector is characterised by overfishing and a decline in fish/shellfish catches as well as other impacts on marine ecosystems (e.g. species killed through by-catch and ghost fishing, seabed habitats lost or damaged due to bottom-contact fishing gear, etc.) (EEA, 2019c). Extraction of minerals is favoured by trade liberalisation and increasing world market prices (IPBES, 2018). An example are the raw materials for the rapid development of the ICT sector and increasingly higher

[26] At the EEA, such drivers are referred to as (multiple disaggregated) pressures in relation to the DPSIR (Driving forces, Pressures, States, Impacts, Responses) framework (EEA, 2019a).

[27] See https://www.eea.europa.eu/en/topics/in-depth/land-use?activeAccordion=4268d9b2-6e3b-409b-8b2a-b624c120090d&activeTab=fa515f0c-9ab0-493c-b4cd-58a32dfaae0a

[28] See for instance the increasing share of organic farming area in the decade 2012-2021 (from 6% to 10%, respectively). See https://www.eea.europa.eu/en/analysis/indicators/agricultural-area-used-for-organic

[29] See EC Knowledge Center of bioeconomy at https://knowledge4policy.ec.europa.eu/bioeconomy/topic/forest-bioeconomy-cc-mitigation_en#%3A~%3Atext%3DThe%20forest%2Dbased%20bioeconomy%20contributes%2Cmore%20carbon%2Dintensive%2C%20materials

replacement rate of technological devices (EEA, 2019b). Finally, supply and distribution of freshwater lead to an excessive extraction of this resource. Although being a severe driver, depletion of natural resources is not immediately apparent as it is masked by global trade, which boosts the increasing global demand for resources (EEA, 2019b).

- **Climate change** poses direct and indirect impacts on species and habitats. In Europe, its role as contributor of biodiversity change is growing rapidly and it is going to be one of the most determinant drivers in the future (EEA, 2020a; IPBES, 2018). Europe is the fastest-warming region and extreme events are becoming more frequent posing considerable impacts on all ecosystems – including terrestrial, freshwater and marine environments (EEA, 2024a; EEA, 2023c). Civil society is increasingly witnessing – when not directly experiencing – temperature rises, loss of ice volume, rising sea levels, changes in precipitation patterns and, generally, more frequent and intensive extreme climate events (IPCC 2022), all of which generate cascading risks in all socio-economic systems throughout Europe (EEA, 2024a; EEA, 2023b; EEA, 2019a). According to the latest EU State of Nature (EEA, 2020a), the most relevant pressure for habitat and species is related to modification in precipitation patterns specifically causing drought and decreases in precipitation (reported to account for more than 49% within the climate change category); this is followed by temperature changes (almost 22%) and increases in precipitation (11%). Species like amphibians, molluscs, some mammals (e.g. bats) and birds are particularly sensitive to changes in temperature and precipitation, which affect their reproduction and foraging capacities. Likewise, habitats like bogs, mines and fens are particularly affected by longer periods of drought, along with croplands (causing crop failures) and forests (compromising their carbon sequestration capacity and intactness for wildlife) (EEA, 2023b). Coastal areas are more impacted by changes in sea levels and wave exposure. Although GHG emissions (e.g., one of the main indicators of climate change mitigation) show an overall descending trend falling by almost 31% from 1990 to 2022, a further acceleration of reduction rates is required by Member States to meet the 2030 climate target of -55% of emissions from 1990 levels (EU, 2021).

- **Pollution** refers to emissions in the atmosphere of pollutants (e.g. GHGs) and particulates (e.g. particulate matters), as well as chemical contaminants (e.g. nutrients as nitrogen and phosphorous) and deposition of solids (e.g. plastic waste) into soils, aquifers water bodies and seas[30] (IPBES, 2019; IPBES, 2018). In the last two decades, European regulation have reduced some pollution (e.g. acidification) in terrestrial ecosystems, but other pollutants with time-lag effects (e.g. pesticide, ammonia and organic pollution) still represents a threat to biodiversity, particularly impacting water bodies (EEA, 2019b; IPBES, 2018; EEA, 2022a). In Europe's seas, the phenomena of acidification and de-oxygenation are increasing and – combined with sea warming – make marine biodiversity more vulnerable and reduce ecosystems' resilience (EEA, 2023c). In the EU, almost half of the pressures related to pollution are caused by agriculture practices (specifically, 48%) affecting air, water and soil; other pressures come from mixed sources of pollution (28%) and then urbanisation (21%) (EEA, 2020a). Air pollution is the largest environmental risk for human health, particularly in urban areas (EEA, 2022b), but it also has negative impacts on both terrestrial and aquatic ecosystems degrading their quality and reducing biodiversity by exposing vegetation, land and water bodies to key air pollutants (e.g., ozone, nitrogen and sulphur oxides, ammonia, heavy metals) (EEA, 2022a).

- **Invasion of alien species** threatens native species and ecosystem services and is favoured – deliberately or accidentally – by the expansion of trade network, industrialisation and globalisation of our economies (Kemp et al., 2020), higher human mobility, continuous habitat degradation and climate change (IPBES, 2019; EEA, 2020a). In Europe, this represents a growing threat to native animals, plants and ecosystems causing billions of euros worth of damages every year (EEA, 2019a). Invasive alien species of European concern are regulated by the EU Regulation

[30] In the marine environment, underwater noise is an additional source of human-induced pollution (EEA, 2019c)

(EU, 2014) but they represent "just" 20% of the pressure reported by Member States, while the greatest impact (nearly 54%) is reported for invasive alien species other than European concern, which are species recently introduced and established in the wild but excluded from the Regulation (EEA, 2020a)[31]. Although pressures caused from Invasive alien species are not distributed homogeneously across Europe, impacts are generally relevant for habitats like dunes and sclerophyllous scrubs as well as for groups of species of amphibians, fish, vascular plants and birds (EEA, 2020a). The marine habitat is particularly sensitive to this pressure, maritime transport being the main pathway of introduction: 640 new species have invaded European waters since the first records began back in 1970, with introduction rates ever increasing since then[32]. Overall, the trend of numbers of invasive alien species – as well as their rate of invasion – is overall increasing, mostly in the western and central parts of Europe, in all habitats.

The IPBES framework does not prioritise the five drivers in any specific order, making it challenging to assess which has the greatest impact on all dimensions of biodiversity and therefore requires the most urgent mitigation actions (Jaureguiberry et al., 2022). However, through an extensive literature review and comprehensive statistical analysis, Jaureguiberry and colleagues (2022) established a dominance hierarchy among these drivers. The dominance score of each driver varies slightly depending on geographical regions, ecosystem realms (terrestrial, freshwater, and marine), and the essential biodiversity variables considered. For Europe, and specifically for terrestrial and freshwater realms, an overall ranking emerges, with land/sea use change identified as the primary driver of biodiversity loss in the region, closely followed by direct exploitation of natural resources. Climate change ranks third, followed by pollution and invasive alien species (Jaureguiberry et al., 2022). It should be noted that rankings of the main pressures on habitats and species from the latest State of Nature in the EU (EEA, 2020a[33]) may differ from that of the IPBES framework, although a full comparability is not applicable due to the differences in the framework structure (e.g. State of Nature splits the pressures in-between habitats and species while the IPBES assess them all together; then the EEA provides a wider range of pressures rather than classifying them in just 5 categories as IPBES).

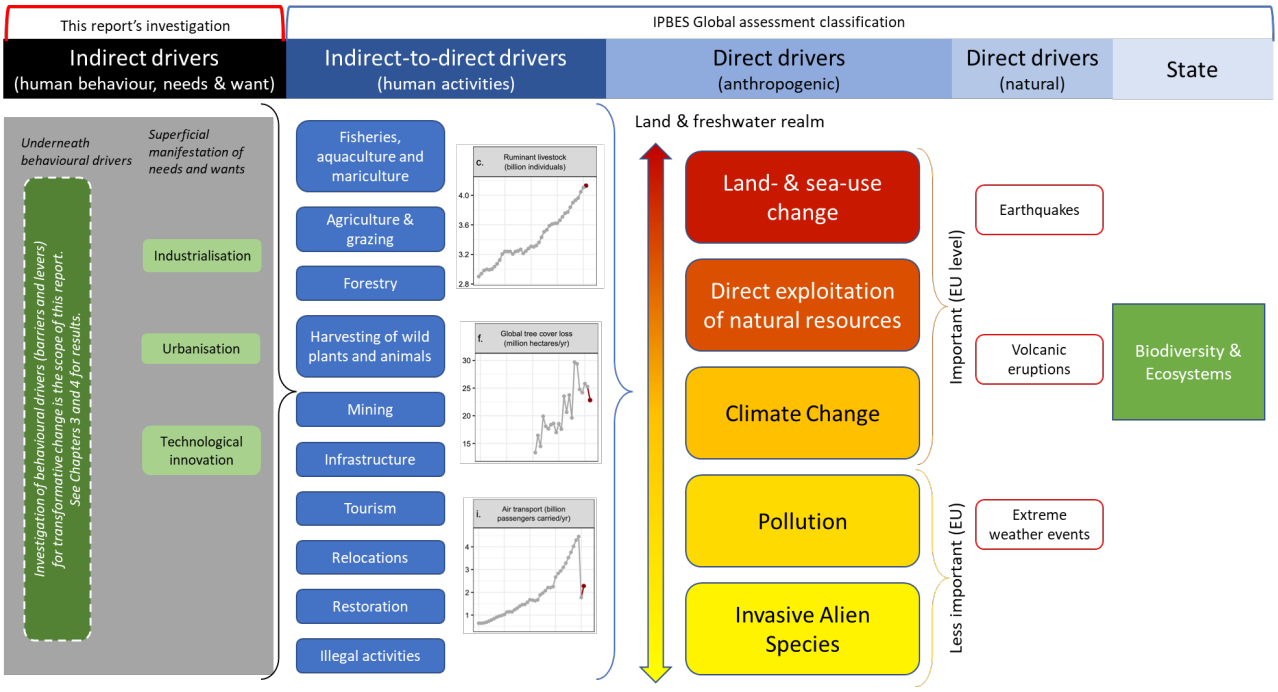
These anthropogenic direct drivers exist in addition to the natural drivers that may occur out of human control or full predictability (i.e. volcanic eruptions, earthquakes, and extreme weather events)[34]. Anthropogenic direct drivers (hereafter simply direct drivers), in turn, are fuelled by an array of human actions that may have intentional and unintentional impacts on nature (indirect-to-direct drivers). Such actions occur to meet human demand for basic needs (food, water and shelter) as well as for non-material well-being (i.e. physical, cultural, aesthetic, psychological value) and include activities like agriculture, fisheries, forestry, mining, infrastructure, tourism, relocations (i.e., transportation of goods and people), and illegal activities (see Figure 2-1). All these activities and their evolution during the 20th century contributed to the significant and rapid growth of the Great Acceleration era (Ripple et al., 2023; see also section 2.1).

Both the direct drivers and the human activities are the results of several underlying societal causes that can be demographic, sociocultural, economic, technological, or relating to institutions, governance, conflicts, and epidemics. The IPBES framework refers to them as indirect drivers and proposes a

[31] Remaining pressures in this category are related to the problematics of native species (19%) and disease, pathogens and pests (nearly 8%) (EEA, 2020a).
[32] See Marine Non-indigenous species an Europe's seas at https://www.eea.europa.eu/en/analysis/indicators/marine-non-indigenous-species-in.
[33] See also https://tableau-public.discomap.eea.europa.eu/views/sonpressuresandthreats/Pressuresandthreats?%3Adisplay_count=n&%3Aembed=y&%3AisGuestRedirectFromVizportal=y&%3Aorigin=viz_share_link&%3AshowAppBanner=false&%3AshowVizHome=n
[34] The natural drivers are not more discussed in this report.

classification into 5 macro-categories[35] (IPBES, 2019a). Such indirect drivers of ecosystem degradation and loss and change of biodiversity – as outlined in the IPBES framework – are not further investigated in this report. Rather, we would argue that such indirect drivers depend on other factors that are more subtle and complex at the same time, pertaining to different fields of overall human development and its conceptualisation, which this report aims to investigate (Figure 2-1– see also Chapter 3 for further details) by identifying the barriers that impede transformative change (Chapter 3) as well as the "enabling societal factors", i.e., the levers that can trigger change (see Chapter 4).

Figure 2-1 Drivers impacting the biodiversity and ecosystems state. The schema is developed by the authors building on the IPBES Global Assessment report (IPBES, 2019) and following the result chain developed in this report. The colour shading of the anthropogenic drivers is derived from Jaureguiberry et al., 2022 and indicates the dominance hierarchy of the direct drivers in land and sea realms within Europe and Central Asia region, following a red to yellow descending predominance; oceans and other regions have a different driver hierarchy. Indirect-to-direct drivers (blue boxes) are human activities directly or indirectly impacting Nature and are drawn from IPBES (2019). Graphs next to blue boxes are drawn from Ripple et al., 2023 and aim at providing a visual representation of the trends in time series (1980-2022) of some human activities listed on the left (specifically, from top to bottom: ruminant livestock, billion individuals; global tree cover loss, million hectares per year; air transport, billion passengers carried er year). Finally, identification of the indirect drivers in the grey rectangle is based on the findings of this report.



[35] The IPBES classification of the five macro-categories of indirect drivers entails: 1) values, 2) demography, 3) innovation and technology, 4) economy and trade, 5) governance (IPBES, 2019a).

3. Towards halting and reversing biodiversity loss: learning from failures

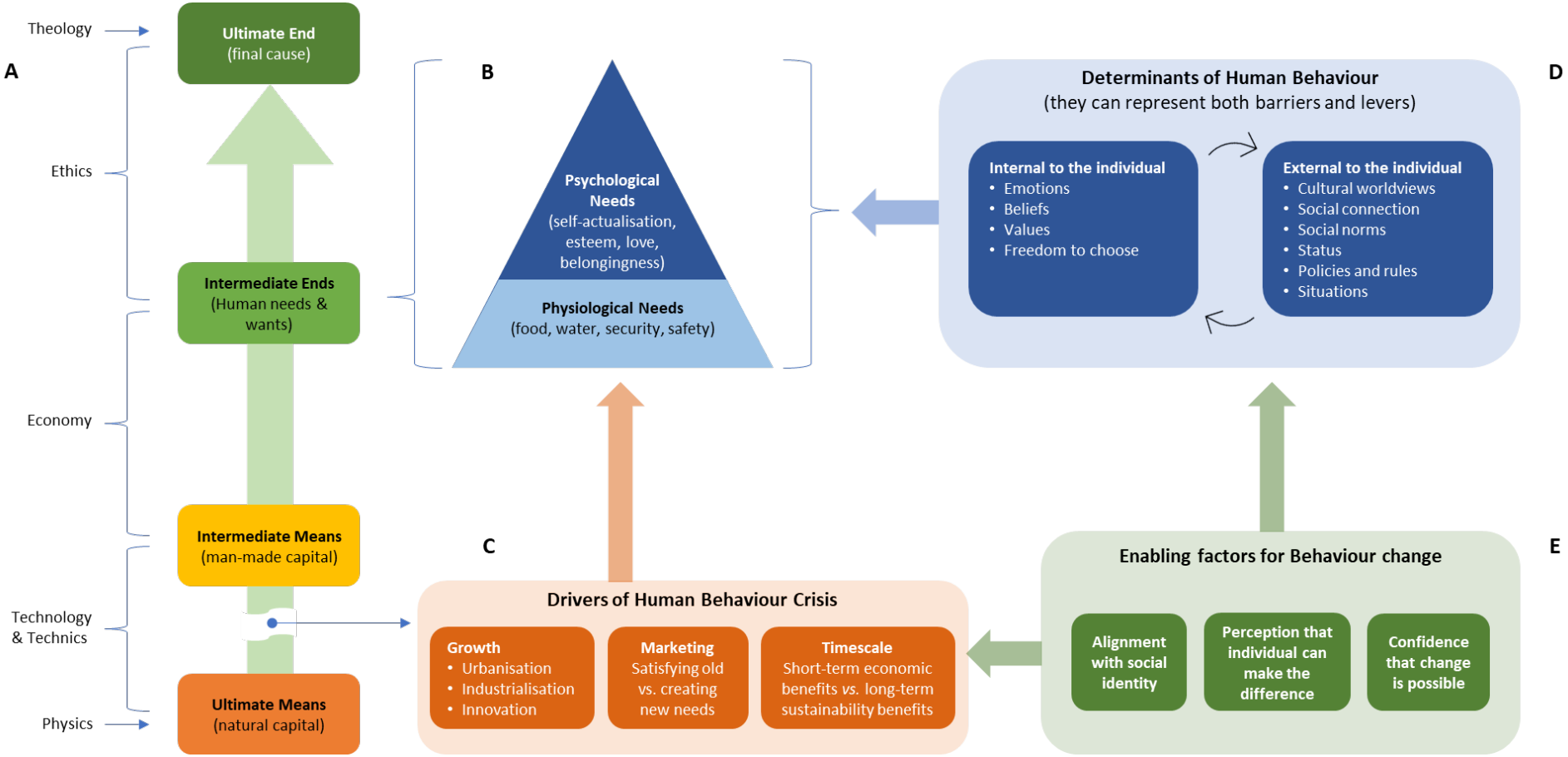
3.1. How evolving human needs and wants have wreaked havoc on biodiversity

Human activities have been historically driven by the necessity to satisfy the *needs and wants* of human societies and their members. Such *needs and wants*, however, aren't fixed; they rather evolve through time. According to Maslow (1943), five macro-categories of basic needs can be identified, which are related to each other and can be arranged in a hierarchy of necessities (i.e., a pyramid). When the most necessary need (located at the basis of the pyramid) is sufficiently well satisfied, the next higher need emerges in motivating the conscious life, in a progression from physiological and safety needs (e.g., food, water, security, safety) to psychological needs (e.g., belongingness, love, esteem and self-actualisation) (see Figure 3-1, panel B). It is worth noting that Maslow described man as "… *a perpetually wanting animal*" whose behaviour – as an individual and at the broader societal level – is determined by a mix of motivation, biology, culture, and situations (e.g., the societal context in which humans live). He also noted that "*conscious, specific, local-cultural desires are not as fundamental in motivation theory as the more basic, unconscious goals*"; we will come back to this latter notion later-on in this report (see Chapter 4).

By design, human activities are intended to satisfy the *needs and wants* of people – i.e., their "ends" – by leveraging scarce "means" to provide people with as many goods and services as possible (i.e., what is needed and beyond, as discussed below in this section), at a low economic cost, and in the shortest possible timeframe. Economics is the discipline studying human behaviour as the relationship between means (often scarce and characterised by multiple, alternative uses) and ends (Robbins, 1932), whereas the societal pursuit of continuous economic growth is a human-constructed paradigm (Laurent et al., 2021), around which the global economy and most political systems have been, and still are, structured (Hickel et al., 2022). This paradigm is driven by maladaptive human behaviour[36] (Merz et al., 2023), it relates to a Nature for Society perspective (one in which nature is seen and valued as a source of capital – e.g., EEA, 2023a. See also Chapter 1.1.), and sees people's *needs and wants* revolving around increasingly growing income and consumption levels (Costanza, 2023; Hickel et al., 2022), and utility maximisation as the main determinants of human wellbeing (Daly and Townsend, 1993; Victor, 2022). However, although often perceived as predominant, self-interest is just one way to look at human motivation (guided by egoistic values), which is opposed by the view of humans as motivated by concerns for the wellbeing of other humans (i.e., humanistic values) and other species (i.e., biocentric values), or for society as a whole (NRC, 2002; Stern et al., 1993; Stern and Dietz, 1994).

[36] Maladaptive behaviour is defined as a behaviour that interferes with an individual's set of activities or ability to adjust to and participate in particular settings (Gray, 2013). In the context of this report, maladaptive behaviour refers to the behaviour triggered by a socio-economic model striving to create and meet burgeoning demand, rather than fairly and judiciously apportioning supply, and the human inability to consciously drive large-scale behavioural change (Merz et al., 2023) to adjust to the environmental impacts deriving from it.

Figure 3-1 The "nature means"- "human needs and wants" framework. Source: developed by the authors building on Amel et al., (2017), Daly (1977), Maslow (1943), and Merz et al., (2023). The rationale behind this Figure is to provide an overview of multiple related concepts and how they fit together in providing a comprehensive overview of the societal challenge of reversing biodiversity loss, while at the same time breaking the challenge down into manageable, solvable elements. This framework is intended to complement the IPBES Conceptual Framework.



By placing *Economics* within a wider context and grounding it in the natural sciences and humanities, Herman Daly's Ends-Means Continuum (Daly, 1977) offers interesting lenses through which to look at the world and the various disciplines designed to understand it (see Figure 3-1, panel A); it also helps us better understand the evolution of the *human-nature* relationship and – we hypothesise – the possible origin of a disconnection between the two. Classical economics embraces a relatively narrow scope, as it solely refers to the means and ends that are intermediate (Victor, 2022). More precisely, the means considered by mainstream economics are primarily labour and manufactured/man-made capital (see Dasgupta, 2021), which themselves derive from the highly organised energy and matter that are provided at no cost by our planet's natural capital (Daly, 1990; Georgescu-Roegen, 1971), and by the ecosystems and biodiversity of which it consists; this natural capital constitutes the ultimate means of our societies, the actual assets of our economies. Technology (i.e., the application of scientific principles to produce a manufactured good) and technics (i.e., the way of doing things) allow converting our planet's ultimate means into the intermediate means intended to satisfy human *needs and wants*. Meanwhile, the ends considered by mainstream economics (see Figure 3-1, panel A and B) are also intermediate (e.g., physiological material needs for food and water, as well as psychological immaterial needs for love and esteem) in that they serve the higher objective of an ultimate end, a higher good that might be related to Aristotele's "final cause" (Victor, 2022), and which is needed to choose among intermediate ends (Daly and Farley, 2004).

Conversely, according to Daly (2014), Economics should sit "*in between, and serves to balance desirability (the lure of right purpose) with possibility (the constraints of finitude)*" (Victor, 2022); consequently, an Economics fit for purpose in the Anthropocene (EEA, 2021) – or more simply a "sharing" wellbeing economy that produces value to people while reducing output and costs (e.g., EU Wellbeing Economy Coalition, 2023; Fioramonti et al., 2019; Ivanova and Büchs, 2023; Laurent et al., 2021) – could be demonstrably more effective in ensuring that humans cooperate to live well (end) within the limits of the planet (means). The transition to such a global steady-state economy (i.e., a wellbeing economy) (Daly, 1990) would also positively impact biodiversity conservation as a few studies have found that the number of species listed as endangered increases with population density and GDP per capita (see for instance Czech et al., 2012; Sol, 2019; EEA, 2021). Although increases in GDP per capita can sometimes be positively correlated with conservation efforts such as the increase of the extent and biodiversity coverage of protected areas (Dietz and Adger, 2003), the rate of biodiversity loss did not appear to slow-down in the recent past (Butchart et al., 2010). A possible reason for this failure in halting biodiversity loss and change is that our societal responses have been mostly symptom-related, meaning that it is predominantly focused on addressing the state of biodiversity (e.g., by putting in place more protected areas for preserving habitats), rather than directly addressing the primary anthropogenic drivers of biodiversity loss, that is caused-focused (Lazarus et al., 2015; Saunders et al., 2006). This supports the Result Chain behind this report (see Figure 1-2): a focus on the socio-economic activities that "indirectly" drive biodiversity loss (e.g., Dietz et al., 2007 – see also Chapter 2), especially in regions where a strong growth in population and affluence is expected (Sol, 2019).

Yet, the historical focus of mainstream economics on intermediate means and ends, and the assumption that ultimate means are essentially abundant to the extent that they can be safely ignored in economic analysis (Kerry Smith, 2017; Victor, 2022) has led to a worldview in which the economy is seen as doubly disconnected from nature: on one side, it is disconnected from the ecological assets that form its very basis and, on the other side, it is disconnected from the sink services that such assets provide for its waste outputs; mainstream economics refers to these neglected impacts as externalities (Endres, 2011). The incapacity to perceive and grasp resource limitation, pollution effects and biodiversity impacts, which was triggered by the displacement of environmental impacts and tele-coupling mechanisms (e.g., Galli et al., 2014, 2023; Liu et al., 2018; Weinzettel et al., 2013; Wiedmann and Lenzen, 2018), in turn, led people to accept the idea of unlimited growth (Merz et al., 2023), making the management of large common-pool resources increasingly difficult (Pisor et al., 2023).

Moreover, most societal actors (e.g., companies, investors, lenders) nowadays perceive the short- term economic benefits (or costs) associated with most environmentally damaging behaviours to be much more compelling than their long-term and hard-to-detect environmental costs (or benefits). Simply put: long-term sustainability concerns are overshadowed by short-term economic gains, especially when dealing with a common-pool resource that doesn't belong to anyone like biodiversity (Ostrom, 2009; NRC, 2002). Alongside the externalisation of environmental costs, the massive spread of perverse subsidies, among others, has also contributed to screwing-up our value systems and further exacerbated this situation, leading most actors to inadequately account for nature in their policies, strategies, and decisions (TNFD, 2023). Seeing the *Economy* as separate from *nature* – as argued by ecological economists – can thus be assumed to be the foundation of humanity's damaged relationship with nature and the ecosystems and biodiversity it consists of. Environmental economists, meanwhile, would argue that the neglection of environmental impacts is (just) a market failure called *externality*, which can be solved by internalising the damage costs of the environmental impacts (e.g., by creating a price for biodiversity loss by taxes or market-based instruments). Whether one embraces the view of ecological economists or environmental economists, successfully halting, reversing and recovering the change and loss of biodiversity imply, at a minimum, a) confronting the existing barriers to incorporating nature's diverse values into economic/financial accounting (CCI, 2016; Kopnina et al., 2024; OECD, 2021; TNFD, 2023) and decision-making processes (Pascual et al., 2023), and b) identifying intervention mechanisms to rebalance long-term sustainability concerns and short-term economic concerns (e.g., sustainability-based value creation for stakeholders – see Hörisch et al., 2014). Moreover, as mentioned in a recent open letter[37] to the European Commission by leading economists, the choice of macro-economic models used to inform decision-making isn't neutral as it rather influences the outcomes of the recommendations emanating from the used models (e.g., Hines, 1988; Saravanamuthu, 2004) – thus calling for a "*renewed modelling toolbox*" that embed ecological economics principles and – we believe - factor the value of biodiversity into economic accounting.

The growth paradigm and the timescale issue identified above (i.e., short-termism) can thus be considered two key drivers of what Merz et al. (2023) have recently named the "human behaviour crisis", alongside the manipulation of human behaviour by modern marketing[38] (see Figure 3-1, panel C, as well as section 4.1 for further details). Merz and colleagues have specifically used this term to refer to the "*innate suite of human behaviours that were once adaptive in early hominid evolution, but have now been exploited to serve the global industrial economy*". If, on the one hand , industrialisation, urbanisation and technological innovation (in short, industrialised urban living) can be said to have eased the way in which individual and societal behaviours – and subsequently the *human-nature* relationship – have "evolved" over time (see Amel et al., 2017; Kahn and Hasbach, 2012), on the other hand, it must be recognised that the emergence and widespread diffusion of industrialised urban living is in fact the manifestation of more profound inner changes in human *needs and wants*, which have been twisted into a "maladaptive behaviour" by the mix of growth paradigm, short-termism, and market manipulation. Industrialised urban living, in turn, feeds the disconnection between humans and nature (e.g., by keeping people increasingly removed from nature).

As delineated in Chapter 2, the environmental consequences of human activities have started to accelerate since the aftermath of World War II (Commoner, 1971; Steffen et al., 2015a). Such a period marked a cornerstone in marketing too, when psychoanalysis and marketing techniques started to be combined to investigate how to engineer consent (Bernays, 1947). As indicated by Merz et al. (2023), marketing was no longer solely aimed at satisfying existing needs by promoting functional products, for instance, when people truly (and physiologically) needed them, but turned into the sophisticated art of attaching

[37] See https://docs.google.com/document/d/15HW2PgJBIhMo-3dShSVQNeQ6OEuKl4R8NwqCZgOHhmI/edit

[38] According to Merz et al. (2023), the three drivers of the behavioural crisis are 1) economic growth, 2) marketing, and 3) pronatalism, as they impact the three determinants of overshoot: consumption, waste and population. Our view of the human behavioural crisis slightly differs as we consider short-termism as the fourth driver and deemphasise, at least in the visual representation (Figure 3-1) the role of pronatalism.

psychological meaning (e.g., esteem, status, identity, attractiveness) to products (Belk, 1988), thus creating new needs for people and ultimately de-linking economic – or more precisely business – growth from people's mere physiological needs and wants. The psychological needs and motivations, as we will see in the following section, play a key role in enabling behaviour change.

3.2. Identifying and understanding societal barriers

Most conservation scientists nowadays acknowledge that the challenge of addressing the biodiversity crisis lies in the ecosystems and "production landscapes" where humans work and live (Cowling, 2014; Saunders et al., 2006), and upon which they rely for life support (Amel et al., 2017; IPBES, 2019a,b). Ecosystems' degradation and the change and loss of biodiversity are intertwined environmental and human behaviour problems (also interlinked with climate change) as they relate to the fact that humans meet their *needs and wants* in ecologically disruptive ways (e.g., via overly consumptive, wasteful, and polluting lifestyles) (Amel et al., 2017). More precisely: as in all species, human population grows until natural feedback kick in; different from other species, however, humans have managed to postpone (via e.g. agriculture and technology) or geographically displace (via trade) such natural feedback, leading to ever increasing populations, resource use, and threats of systemic feedback.

In the previous section, we leveraged existing literature in an attempt to shed light on the main mechanisms behind the evolving *needs and wants* of humans (and their associated activities), the possible origin of the *human-nature* disconnection, and the known drivers (or amplifiers) of such a disconnection (Figure 3-1), as this can help design choices and strategies that are positive for halting biodiversity loss. In a human-dominated world (Vitousek et al., 1997), success in ecosystems recovery and biodiversity conservation and restoration necessarily passes by proper management of socio- economic activities and socially-acceptable behaviour change mechanisms that can help tackle anticipated future challenges and avoid natural feedbacks. As such, designing solutions to reduce pressures on biodiversity requires first identifying existing barriers and potential enabling factors across multiple actors (e.g., consumers, producers and policymakers), scales (i.e., individually and collectively) and timeframes (Cowling, 2014).

Decades of research (e.g., Amel et al., 2017; Buxton et al., 2021; Nielsen et al., 2021) have highlighted that a mismatch exists between being aware of, and sharing an issue (being it biodiversity conservation – for what concerns this report – climate change or anything else), and acting upon it[39]: educating people, providing them with better data and ultimately increasing their awareness do not necessarily result in behaviour changes, nor does the use of moral arguments, as disconnections exist between what people say and do (Saunders et al., 2006). While our values are sometimes reflected in some of our behaviours, the strength of the value-behaviour association is variable, being strongest for infrequently performed behaviours (e.g., voting in a national election) and weakest for routine or habitual behaviours such as daily choices and consumption activities (Marteau, 2017). Moreover, people tend to prefer information that aligns with their preexisting worldview as new information is processed through the filters of personal beliefs, first-hand experiences, and social identities (Carmichael et al., 2017; Kahan et al., 2012; Vlasceanu et al., 2024). In extreme cases, individuals and decision-makers might also consider to be sufficiently knowledgeable so that they deem new information and scientific evidence unnecessary in guiding their decisions (Ntshotsho et al., 2015; Sutherland and Wordley, 2017).

As nicely summarised by Amel et al. (2017), "*Change is hard. Human beings are reticent to change their behaviour even under the most compelling of circumstances, and environmental dangers do not tend to arouse the kind of urgency that motivates individuals to act*". This is likely due to the mismatch (see for instance, Amel et al., 2017; Cowling, 2014; Merz et al., 2023; van Vugt et al., 2014) between humans' ancient Pleistocene brains – which developed to prioritise the clearly visible dangers of the present over

[39] According to Amel et al. (2017), while most people might approve sustainable behaviours, they tend to behave unsustainably.

the uncertainties of the future (short-termism) – and today's industrialised world – in which human brains are not adequately equipped to detect and act upon invisible and gradually worsening problems such as the loss of biodiversity, which are perceived as psychologically distant (Weber, 2016), irrespective of being geographically close or afar. According to Saunders et al. (2006), "*Humans have difficulty thinking about things that are temporally and spatially distant*".

So, how to trigger societal behaviour change? Maslow's hierarchy of needs (1943) would suggest that humans' motivation and wellbeing depend on the psychological needs of feeling competent, esteemed, socially connected, and free to make choices as much as they depend on basic physiological and safety needs (Amel et al., 2017). The need for social connection is perhaps the most influential psychological need that humans have (Nyborg et al., 2016) as acceptance by the other members of one's community and alignment with such community's identity, values and social norms[40] are rooted in the history and tradition of humans[41] (see Figure 3-1, panel E). Social norms – according to Amel et al. (2017) – thus limit individuals' behaviour as the simple idea of doing something different from what others in a person's affinity group do (descriptive norms), or seem to approve (injunctive norms), can negatively impact a person's psychological needs and wants (e.g., by creating discomfort, embarrassment, or shame). Meanwhile, people recognising themselves as members of groups (social identities), tend to act in ways that benefit or impress others in their group (Sauders et al., 2006; Tajfel and Turner 1986).

Moreover, given the strong ties between individuals and their social context, behaviour change can happen and stand a chance to last over time and modify social norms (i.e., systemic transformation) only when changes in the behaviour of individuals influence broader systems and go hand in hand with changes at the wider, collective level (e.g., via proactive participation in public dialogues or formal and informal community gatherings), under the aid of top-down, structural/institutional governance interventions (Amel et al., 2017; O'Brien, 2015). When this happens, some predict that a "social tipping point" (Nyborg et al., 2016; Otto et al., 2020) is reached[42]. In other words, the promotion of lifestyle and behavioural changes (e.g., preferring trains over planes for trips within Europe) shall be turned into a community effort (e.g., the wrongly-labelled "flight-shame" movement that spurred in 2019), supported by more systemic/structural interventions (e.g., structural investments in railways' and trains' improvements and tariffs' reformulation). Policies and broad structural interventions can trigger individual changes, amplify them at community level thus easing the emergence of social tipping points (Nyborg et al., 2016).

In any collective, however, the entity itself is not the actor and the onus to initiate and implement change is on individuals (Amel et al., 2017). As such, for people to initiate and contribute to systemic transformations – i.e., to change their personal behaviours and to get involved in public, collective efforts to influence structures and systems – three key enabling factors are necessary (see Amel et al., 2017; Bamberg et al., 2015; Geiger and Swim, 2016; Nyborg et al., 2016): 1) alignment of the sought- after change with the community's social norms and identity, 2) perception that each and every individual can make the difference, and 3) confidence that solutions are possible (see Figure 3-1, panel E). Educational and awareness raising activities, as well as outdoor experiential activities aimed at reconnecting people with nature, are also key triggers (Barragan-Jason et al., 2023; Clayton et al., 2017; DeVille et al., 2021; Meyer, 2015; Raatikainen et al., 2024; Zelenski et al., 2015; Ziegler et al., 2020).

Of the above three enablers, the first– alignment of the sought-after change with the community's social norms and identity – is particularly worth investigating as human behaviour is after all affected by forces that are both internal (i.e., of the individual) and external (i.e., of the individual within the wider society)

[40] A social norm is "*a predominant behavioural pattern within a group, supported by a shared understanding of acceptable actions and sustained through social interactions within that group*" (Nyborg et al., 2016).

[41] As reported in Amel et al. (2017), "*For ancestral humans, acceptance by the group meant access to shared resources and protection*".

[42] The tipping point occurs when sufficient positive social feedback emerges, causing the new behaviour to become cool and ultimately normal.

(Amel et al., 2017), which we refer to as determinants of human behaviour (see Figure 3-1, panel D). Among the internal determinants are emotions, beliefs, values and freedom of choice; meanwhile, among the external determinants, are cultural worldviews and expectations of others' behaviours and attitudes (Young, 2015), (the need for) social connection and social norms, status, policies and rules, as well as situations. Such internal and external determinants – we hypothesise – can represent both levers or barriers for behaviour change, depending on whether they are aligned or misaligned among themselves.

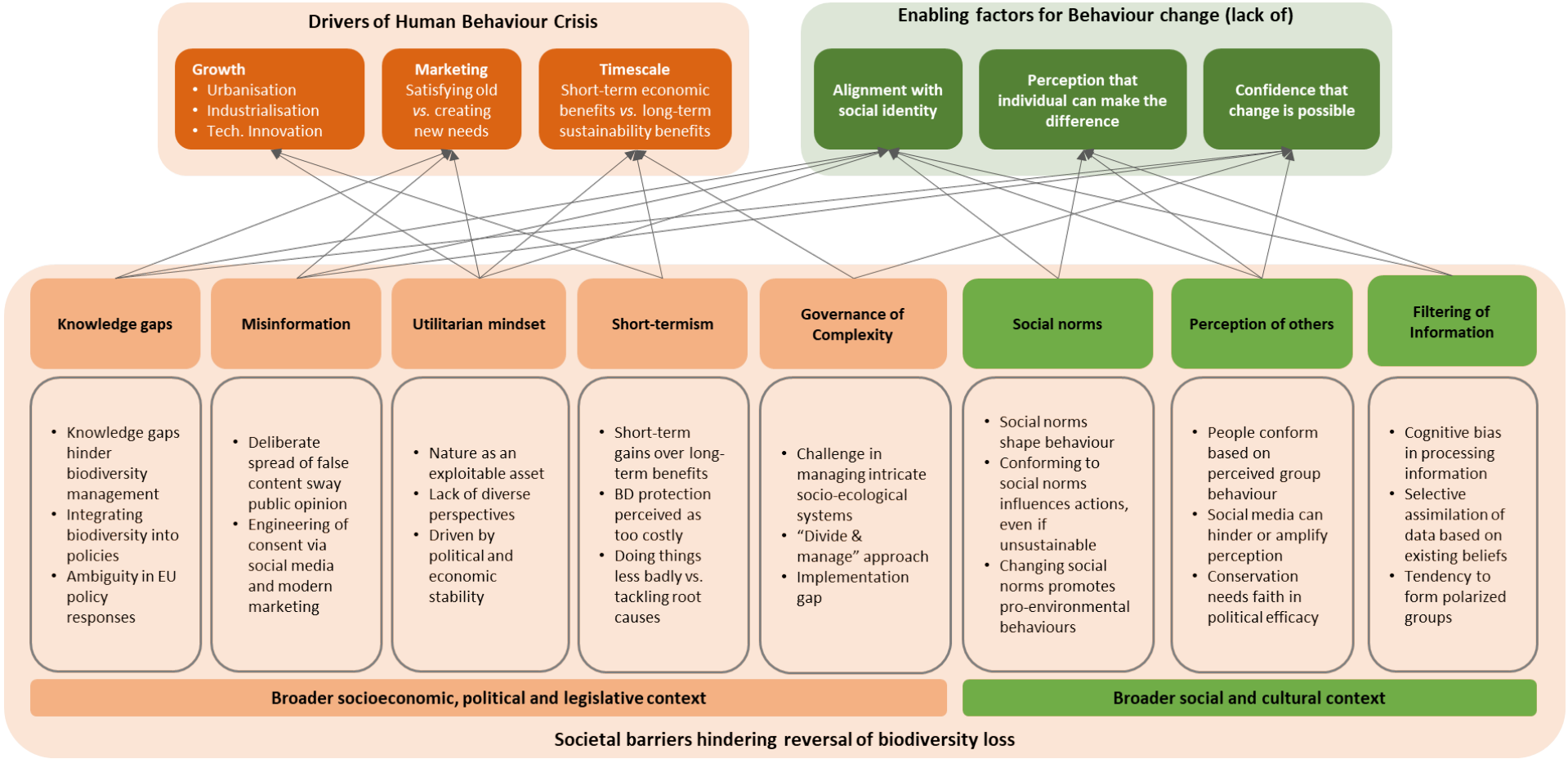
As such, building on the narrative review reported in this chapter, we attempt at identifying and delineating eight (8) distinct barriers within our societies, which somehow impede to halt and reverse the loss and change of biodiversity (refer to Figure 3-2). These barriers encompass cultural, social, psychological/behavioural, and procedural aspects. They comprise both actual impediments – roadblocks hindering action realisation – and a deficiency in enabling factors for behavioural change. These eight barriers exhibit significant overlap with the psychological barriers to biodiversity conservation recently identified by Bosone et al. (2022); they, however, expand on this latter study as they don't simply look at the role of individuals, but rather do that within the wider societal context (see Table 3-1).

Table 3-1 List of the societal barriers to halting the loss and change of biodiversity identified in this study, and the psychological barriers identified in previous studies.

Cultural, social, behavioural, and procedural barriers to halting the loss and change of biodiversity	Psychological barriers to biodiversity conservation
Source: this study	**Source: Bosone et al. (2022)**
• Knowledge gaps • Misinformation • Utilitarian mindset • Short-termism • Governance of complexity • Social norms • Perception of others • Filtering of information	• Change is unnecessary or ineffective • Individuals' lack of knowledge • Conflicting goals and aspirations • Tokenism (individuals already making enough efforts) • Interpersonal relations (with peers) • External Attribution of conservation responsibilities

Collectively, these barriers contribute to societal impasse, hindering our ability to alter our ways of living. This impasse is exacerbated by the perceived conflict between humans' psychological needs for safety, security, and a just, stable world (Maslow, 1943), and the increasingly frequent reports of deteriorating climate, biodiversity, and human well-being (Dickinson, 2009). These eight societal barriers to reversing biodiversity loss can be categorised into two main macro areas, facilitating the distinction between barriers stemming from the broader socioeconomic, political, and legislative context, and those associated with the socio-cultural context. Each category is detailed in the following subsections.

Figure 3-2 Societal barriers hindering reversal of biodiversity loss. The eight identified barriers can be grouped into two main clusters: barriers belonging to the broader socioeconomic, political and legislative context and barriers related to the socio-cultural context. Moreover, these barriers may manifest as either roadblocks that impede action realisation or a lack of enabling factors for behaviour change. Arrows are used to connect the eight identified societal barriers with the "Drivers of Human Behaviour Crisis" and the "Enabling factors for Behaviour change" identified in Figure 3-1 (see Chapter 3).



3.2.1. Knowledge gaps

Knowledge gaps, or the lack thereof, signify the numerous deficiencies within our knowledge system, affecting our decision-making processes concerning biodiversity and ecosystems, collectively referred to as "nature". The way individuals understand and engage with nature has shifted towards prioritising a Nature for Society perspective (see Chapter 1), where nature is predominantly perceived and valued as a source of capital (e.g., EEA, 2023a). Consequently, contemporary human societies, particularly in industrialised Western countries, possess limited awareness regarding: 1) the significance of biodiversity and its conservation for human life, 2) the local and global impacts of human activities on biodiversity and ecosystem functioning, including tele-coupling mechanisms (see section 2.2), and 3) a universally accepted, SMART[43] and easy-to-understand system for measuring and monitoring the value of biodiversity and its utilisation by various human groups, determined geographically or socially.

As humans tend to protect and restore what they understand and value (Amel et al., 2017), the limited comprehensive knowledge acts as a significant barrier to effectively managing common-pool resources like nature, hindering efforts to reverse biodiversity loss and change. Additionally, individuals may lack the knowledge needed to address environmental issues such as biodiversity conservation and restoration, or climate change mitigation and adaptation (Bosone et al., 2022). Addressing these knowledge gaps, sharing newly acquired knowledge openly (Poisot et al., 2019), and scaling up actions based on such knowledge, particularly through the science-policy interface, are crucial for integrating biodiversity into economic and financial policies, as well as evidence-based decision-making processes (Sutherland and Wordley, 2017).

3.2.2. Misinformation

Misinformation (also referred to as disinformation) refers to the deliberate dissemination of inaccurate or misleading content by individuals, groups, or organisations, to influence public opinion and/or undermine understanding of critical societal and environmental challenges such as for instance biodiversity, climate change, and sustainability. This barrier is exacerbated by at least two main "factors": social media and modern marketing. According to Cinelli et al. (2021), "…*social media may limit the exposure to diverse perspectives and favour the formation of groups of like-minded users framing and reinforcing a shared narrative.*"; within such eco-chambers, social media users tend to select information that adhere to their system of beliefs and to form polarised groups (Del Vicario et al., 2016) (see also section 3.2.8). Meanwhile, the evolution of modern marketing (Merz et al., 2023), exploits human survival instincts to create psychological needs, thus fostering maladaptive, growth- prone behaviours (see section 3.1 for further details).

Additionally, misinformation intersects with the knowledge gaps barrier (see section 3.2.1), as it can be used to muddy the waters, thus hindering evidence- and science-based decision-making processes. As noted by Buxton et al. (2021) and echoed by Bennett and Roth (2019), addressing biodiversity loss requires not just technical solutions, but also changes in thought, politics, education, and human behaviour. Institutional and structural actions are therefore essential to counter misinformation and promote meaningful individual and collective behavioural changes. To this end, an impartial evaluation of the accuracy of claims is needed, not just those made by opponents of certain policies, but also those made in support of the policies themselves. In other words, a neutral, unbiased, and evidence- based assessment of whether the information being disseminated is factually correct or misleading is needed, regardless of its source (see also section 3.2.8).

[43] SMART = Specific, Measurable, Achievable, Relevant, and Time-bound.

3.2.3. Utilitarian mindset

A growth-centred, utilitarian mindset viewing nature as a renewable, exploitable asset (Nature for society) has become deeply rooted among societal stakeholders. Driven by the need for political and economic stability (Millward-Hopkins et al., 2020), such a mindset causes a profound resistance to change our way of living (EEA, 2023a; Hickel et al., 2022b), thus undermining the creation of the necessary enabling conditions for biodiversity and ecosystems preservation. Economic growth, along with factors like marketing, pronatalism, and short-termism, stands as a key driver of the "human behavioural crisis" (see section 3.1) (Merz et al., 2023). Ultimately, the widespread predominance of such a mindset has led to a dearth of diverse perspectives (see Figure 3-1, section 3.1), worldviews, and knowledge in conservation science and decision-making processes (e.g., Buxton et al., 2021), which are rather highly needed (Hedlund-de Witt, 2014). Modern marketing further influences this barrier by incentivising daily unsustainable practices via for instance the creation of new needs (Merz et al., 2023 – see also section 3.1); as a result, our societies – especially in the Western world – are inextricably dependent on an excessive, ever-growing quest for resources. As Hickel and colleagues (Hickel et al., 2022b) assert, "the global economy is structured around growth — the idea that firms, industries and nations must increase production every year, regardless of whether it is needed."

3.2.4. Short-termism

Short-termism, prevalent particularly in Western societies, entails prioritising short-term gains over long-term benefits (Costanza, 2023; Hickel, 2022a,b; OECD, 2020). These short-term gains typically revolve around power and economic revenues, which are prioritised by market, governance and investment mechanisms (see section 3.1); meanwhile, the long-term benefits encompass concerns for biodiversity, climate, other humans and society as a whole (i.e., wider sustainability and societal benefits aimed at maintaining natural capital and human wellbeing). The prevalence of short-termism may be attributed to humans evolving in an environment where imminent dangers were sudden and readily apparent (Amel et al., 2017; Cowling, 2014; Merz et al., 2023; van Vugt et al., 2014), rendering gradually worsening issues such as biodiversity loss and climate change – and their long-term repercussions – psychologically distant rather than immediate threats (Weber, 2016).

According to the OECD (2020), "*the speed and depth of the economic crisis* [caused by the Covid-19 outbreak] *have shown that a core principle of the global economy – prioritizing short-term economic growth and efficiency over long-term resilience – can have huge societal costs*" such as raising inequalities, and uneven loss of employment across and within countries (see also ILO, 2020). The same core principle fuels climate change, environmental degradation and biodiversity loss, which in turn are already (unevenly) hitting local communities and harbour further systemic vulnerabilities for the global economy (OECD, 2020). *Short-termism* and *Utilitarian mindset* are highly interconnected barriers, to the extent that several of the current remedial measures (e.g., to combat biodiversity loss and climate change) perpetuate an "old paradigm": they are centred on the rationale of doing unsustainable things "less badly"[44] in the near-term by adapting to the new circumstances, rather than setting-out to permanently address the root causes of unsustainability by proactively and profoundly transforming our *needs and wants* – and the way in which we *see and value* nature – on the basis of such new circumstances (Marshall et al., 2012) (i.e., improving the fuel efficiency of the vehicles used for urban mobility as opposed to re-thinking the planning of cities to reduce mobility needs).

Wellbeing, inclusiveness and long-termism must be placed at the core of such necessary shift (EEA, 2021; EU Wellbeing Economy Coalition, 2023; Fioramonti et al., 2019; Hariram et al., 2023; Laurent et al., 2021; OECD, 2019, 2020), ultimately leading to re-thinking and re-designing our societies and their ultimate ends (see also EEA, 2021; Olsson et al., 2017). However, achieving this shift requires a deep understanding of

[44] Interventions limited in ambition, which act here and there but are far too small to make an impact.

individual and collective responses to change (Marshall et al., 2012). In the EU, short- term solutions like substituting fossil fuels with biomass alternatives risk exacerbating biodiversity loss (see Leclère et al., 2023).

Together with the lack of an agreed system to measure and monitor the value of biodiversity and the impacts caused by its use by humans (which we have referred to as a knowledge gap in the biodiversity field), short-termism and the growth-centred, utilitarian mindset are putting biodiversity-related issues very low on the list of political priorities, leading to challenges in governing biodiversity across sectors, temporal and spatial scales.

3.2.5. Governance of complexity

Governance of complexity refers to the challenge of managing intricate socio-ecological systems through governance structures that are often inadequate (in their set-ups) to effectively handle complexity (Pörtner et al., 2023). Decision-making processes are characterised by short-term thinking (see section 3.2.4) and a tendency to simplify complex issues through siloed approaches (Galli, 2015; Mahecha et al., 2022; Pörtner et al., 2023) rather than looking at them systemically and approaching to respond to sustainability challenges by appreciating their uncertain and complex nature, including experimentation, systems thinking, participation, precaution, anticipation, and care (EEA, 2024b). This leads to underfunded biodiversity conservation efforts (Waldron et al., 2017) and limited political weight for conservation departments compared to other governmental sectors and governance structures (Smith et al., 2003).

Transitioning from a "divide and manage" governance approach, which addresses individual issues separately, to a more interconnected sustainability framework is crucial to understand the *big picture*[45] of socio-ecological challenges (Chambers et al., 2022; Clapp and Dauvergne, 2005; Kim et al., 2023). This involves integrating biodiversity and climate governance, as recognised for the first time by the COP28 Global Stock Take decision emphasising the importance of conserving, protecting and restoring nature and ecosystems to achieve the Paris Agreement's goals (UNFCCC, 2023). Fragmented approaches risk missing the bigger picture and result in small, localised policy impacts in a globally interconnected[46] world (Liu et al., 2018). To address this, cross-scalar (e.g., Cotta et al., 2022) and polycentric (Ostrom et al., 1999) governance systems and policy responses are needed, but the current numerous policies (e.g., different directives for different challenges) often lack alignment (i.e., incoherent governance), and may favour power imbalances between those designing the policies, and the local communities being impacted by such policies (e.g., Lovera-Bilderbeek and Lahiri, 2021).

Moreover, an "implementation gap" adds to the above governance challenges, characterised by a failure to effectively implement conservation policies and management plans, procrastination of harmful incentives (e.g., subsidies), and a tendency to dilute ambitions in legislation (Sutherland and Wordley, 2017). Such implementation gap is interconnected to the way in which decision-makers filter information (see also section 3.2.8), which often leads to the omission of scientific evidence in decision-making processes (what Sutherland and Wordley, 2017 call "evidence complacency").

Furthermore, there is a lock-in situation at EU level where knowledge on how to manage ecosystem and biodiversity issues is approached through siloed systems that impede cross-cutting mechanisms of actions that may leverage the synergies or potential trade-offs between the goals of protection and restoration (e.g., those listed in the BDS 2030), and those of socio-economic development (e.g., those listed in the Forest Strategy 2030, Renewable Energy Directive, Common Agriculture Policy, Farm to Fork Strategy, and

[45] Or rather the multiple big pictures if a plurality of perspectives, worldviews and agendas is considered.

[46] In the increasingly globalised world of today characterised by global flows and tele-coupling mechanisms, consumption activities in one place cause the displacement of land and resource use (e.g., Galli et al., 2014, 2023; Weinzettel et al., 2013), and of impacts on biodiversity (e.g., Kitzes et al., 2016; Koslowski et al., 2020; Lenzen et al., 2012; Wiedmann and Lenzen, 2018) throughout the planet.

Circular Economy action plan) outlined in the European Green Deal (EGD) and related policies. Findings from reports produced in 2023 within the ETC BE Task 1.2.7.1 (Leclère et al., 2023) and Task 1.2.7.2 (Mancini et al., 2023), for instance, suggest the existence of trade-offs between short-term strategies aimed at substituting fossil-based products with innovative, bio-based alternatives to decarbonise the EU economy (via climate mitigation) and the long-term adverse effects of biomass extraction on biodiversity and climate resilience. While further research is required to address the existing siloed knowledge in aligning EU policies' ambitions, the potential conflicts within policy frameworks underscore a likely ambiguity in collective policy responses. This mismatch in policy ambitions holds true at the global level, as a review of international biodiversity and sustainability policies found that most of these policies advocate for economic growth, despite the fact that the cumulative impacts spurring from continuous economic growth contribute to accelerating biodiversity loss (Otero et al., 2020). Changes in individual mindsets (see also section 3.2.3) can bring about effective actions, but such changes need to be supported by coherent policy responses (see also section 4.3 on the structural interventions).

3.2.6. Social norms

Misalignment of individuals' attitude with social norms refers to the mix of knowledge, skills, attitudes, motivations and commitment and the complex dynamics among them, which lead to behaviour change (e.g., Bujold et al., 2020; Heimlich and Ardoin, 2008; Saunders et al., 2006). Changing our way of living implies changing behaviour. Still, human behaviour is driven by factors that are both physiological and psychological, and which are both external and internal to the individual (Amel et al., 2017; Nyborg et al., 2016): the need for social connection is likely to be the most influential psychological needs driving human behaviour (Cialdini et al., 2005) and social norms thus limit human behaviour as the simple idea of doing something different from what others (in a person's affinity group) are doing (descriptive norms), or appear to approve (injunctive norms), can lead to intense feelings of discomfort, embarrassment, or shame. As a result, while most people approve sustainable behaviour to fulfil their needs for safety and security, and their desire for a just and stable world (Amel et al., 2017), they might behave in an unsustainable way to adhere to social norms (Nyborg et al., 2016), thus fulfilling the need for social connection and acceptance by the others in society. As nicely put by Amel and colleagues (Amel et al., 2017), "*humans behave according to the norms of their affinity groups so as to fit in, and also to display this social identity to the world*".

An individual living in a social context in which sustainability is highly valued is thus more inclined (and likely) to act sustainably as these two psychological needs are aligned. Meanwhile, behaving sustainably might be hard for those individuals belong to affinity groups for which being "green" is not a peculiar trait (Bliuc et al., 2015; Carmichael et al., 2017; Haidt, 2012). A key implication of the importance for individuals to feel part of a community is that changing community perceptions and social norms (e.g., through government- mediated policy interventions) around certain pro-environmental behaviours (i.e., mainstreaming biodiversity- and climate-compatible life options) must go hand in hand with – or even be preferred over – activities and campaigns nudging individuals (by targeting their values), if we are to stand a chance to achieve behaviour changes (Amel et al., 2017; Marteau, 2017; Nyborg et al., 2016). The key role of social norms, and the limits of mere educational interventions are supported by a recent review study: in their search for effective interventions in promoting climate mitigation actions and pro-environmental behaviours, Bergquist et al. (2023) found that "… *interventions based on social comparisons or financial incentives were the most effective, while education or feedback was the least effective*". Moreover, while interventions aimed at driving pro-environmental behaviours might be insufficient to fully reduce resource demand and lower human pressures on nature, they are likely to unconsciously ease the public acceptance of policies aimed at reducing consumption [47] (Marteau, 2017). Behavioural

[47] Human behaviour is influenced by two systems – one conscious and the other unconscious – that operate in parallel and are most often synergistic. Sometimes, however, these two systems are antagonistic; in these cases, behaviour is

responses and the effectiveness of interventions, however, do vary among social and cultural contexts (Nielsen et al., 2021; Schultz, 2014) as well as across audiences and target behaviours (Vlasceanu et al., 2024), thus rendering the quest for a blueprint for social innovation unrealistic. Ultimately, when personal values and social norms are misaligned, it is easy to fall into a "tragedy of the commons" situation, in which egoistic values prevail (i.e., free rider problem – see Ostrom, 1999, and Annex 2).

3.2.7. Perception of others

Perception of what others will do links tightly with the adherence to social norms and the importance of the social identity of the affinity group (Nyborg et al., 2016). While the simple idea of doing something different from what others in a person's affinity group do (descriptive norms), or seem to approve (injunctive norms), can limit a person's behaviour (Amel et al., 2017), a proper perception of whether others in a person's affinity group or community share the same opinion – i.e., the extent to which people's views are aligned – can make people feel comfortable expressing their opinion (Geiger and Swim, 2016; Matthes et al., 2018); this likely increases individuals' and collectives' confidence that change is possible, thus favouring behaviour changes (Amel et al., 2017). Given the connection and communication opportunities that they offer – and beside their support to citizen science (Chowdhury et al., 2023a,b), social media are powerful tools for shaping our societies and their behaviours as they can either misinform individuals and collectives on biodiversity issues[48] (thus hampering biodiversity conservation efforts) or ease their realisation that many others acknowledge the biodiversity and climate crises (or other environmental issues), and are concerned about, and acting upon, it (Folke et al., 2021; Pearson et al., 2016; Wu et al., 2018). Moreover, previous studies have indicated that political activism about conservation requires the belief that political action is necessary, influences others, and can actually change environmental outcomes (Roser-Renouf et al., 2014). Once again, this calls for the need to intervene at the individual, collective and institutional level to stand a chance to trigger behaviour changes that will last over time (i.e., social tipping points).

3.2.8. Filtering of information

Filtering information refers to the way in which humans react to the information they receive. As a matter of fact, changing behaviour is influenced – alongside many of the drivers seen so far (see also Chapter 3.1) – by the way in which humans receive and process novel information. According to Amel et al (2017), the human brain does not neutrally receive information, but it rather privileges information that supports its preexisting worldview(s). Such behaviour is clearly seen in social media debates where users tend to form polarised groups of like-minded individuals (i.e., eco-chambers) and select information that adheres to their system of beliefs (Del Vicario et al., 2016).

As such, new information is processed through the filters of personal beliefs, first-hand experiences, and social identities (including social-media identities), and ideas are dismissed or assimilated on the basis of a quick but biased understanding of whether they line-up with what is already perceived to be true. According to Amel et al. (2017), in the world of today, characterised by too much information, this quick fact-checking is an evolutionary strategy that builds on the need to favour cognitive efficiency. In extreme cases, this evolutionary strategy might be amplified by, and coupled with, preconceptions and misconducts leading to "evidence complacency" – i.e., a way of working and taking decisions in which, despite availability, evidence is not sought or used (Sutherland and Wordley, 2017). Individuals and decision-

driven by the faster, impulsive, non-conscious system (Marteau, 2017). As such, effective strategies for reducing consumption might involve targeting the impulsive system, for instance by making biodiversity- or climate-friendly options the default, most visually prominent options (e.g., BFF et al., 2023).

[48] See https://www.theguardian.com/environment/2021/mar/21/climate-fight-is-undermined-by-social- medias-toxic-reports

makers, for instance, might consider to be sufficiently knowledgeable thus not needing the aid of novel information and scientific evidence in guiding their decisions (Ntshotsho et al., 2015); they might also deem available evidence to not be relevant to their decision or the issue at stake (Walsh et al., 2015), or to require too much effort to be checked (Kool et al., 2010).

4. Enabling to halt and reverse biodiversity loss

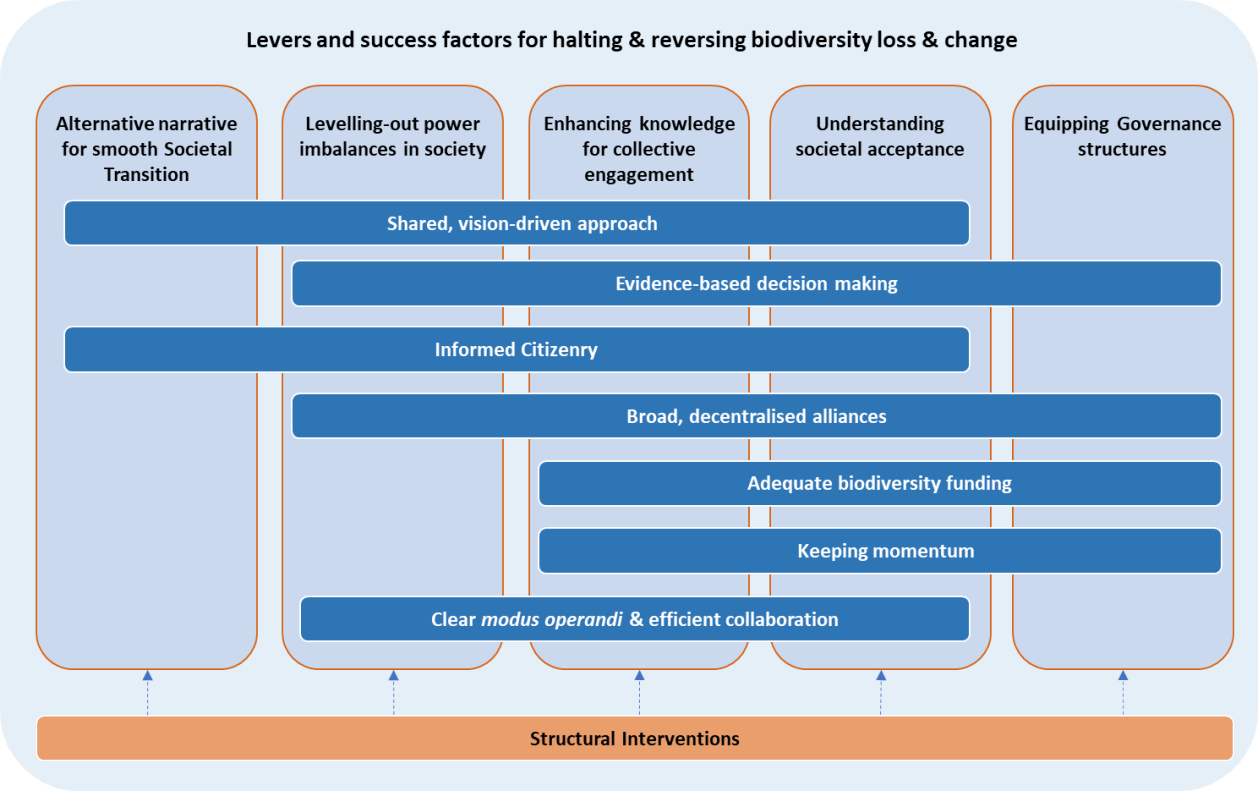
Effectively addressing biodiversity loss and change necessitates behavioural shifts across a triangle of stakeholders and levels: individuals, collectives, and institutions/governance (Figure 1-2, left-hand side, blue box). These behavioural shifts, in turn, have implications on market demands and supply chains, the consideration of which is only touched upon in this report. As such, this chapter delves into the issue of "how" change does or does not happen – exploring the mechanisms behind its occurrence or absence, methods for motivation, inspiration, and sustaining momentum. Key research questions such as *what constitutes success? What fosters dedication and persistence?* guide this investigation.

To complement the theoretical discussions provided in Chapter 3 and provide a first attempt at tackling some of the societal barriers hindering the reversal of biodiversity loss and change, this chapter builds on the outcomes of the brainstorming sessions conducted in 2023 (see Annex 1 for further details). Along with barriers, consulted experts identified a set of five (5) overarching levers (the light blue boxes in Figure 4-1), which are intended as macro-areas of intervention for wider transformative change in society. While acknowledging that further investigation is needed to expand on their rationale and remits, the five overarching levers can be described as follows:

- **Offering an Alternative Narrative** that is compelling and positive, and which can facilitate a smooth societal transition.
- **Levelling-out Power Imbalances** to address and reduce the existing power disparities within our societies.
- **Enhancing Knowledge for collective engagement** to increase EU actors' knowledge and understanding of the mutual relationships between biodiversity and society, ultimately leading to the re-thinking and re-structuring – among others – of EU production and consumption patterns.
- **Understanding Societal Acceptance** for deepening our understanding of the mechanisms through which societal acceptance (and mindset) is shaped, formed and transformed.
- **Equipping Governance Structures** to provide governments and institutions with the proper governance structures to effectively manage increased complexity (e.g., by mainstreaming biodiversity conservation priorities across all EU policies).

To delve deeper into these levers, three case studies were selected to inform our understanding of the ways in which the barriers identified in Chapter 3 – or at least some of them and to a certain degree – can be practically overcome, thus paving the way for enabling to halt and reverse biodiversity loss. The case studies offer insights into actionable factors of success for triggering transformative change mechanisms; these insights have the potential to inform the strategies and future actions of the EU and its Member States. While these case studies shed light on some aspects and potential solutions, they do not intend to provide definitive answers. Rather, they aim to highlight some areas with actionable and possibly scalable suggestions. These studies were critically reviewed, and hypotheses were formulated of what made them successful. Based on this investigation, 7 core factors for success were identified (the blue boxes in in Figure 4-1; see also section 4.2 and sub-sections therein for detailed explanations).

Figure 4-1 Interconnection among levers (light blue boxes) and success factors (dark blue boxes) for halting and reversing biodiversity loss and change. A first attempt in nesting the success factors within the 5 levers is made, showing a cross-cutting linkage across multiple levers, rather than a linear one-to-one link. In addition, structural interventions from institutional governance (orange box at the bottom) are also investigated as instruments able to support and influence both levers and the success factors within them.



The hypothesised success factors have a finer granularity than the levers and are intended to help better understand which factor(s) can contribute to success within each of the 5 overarching intervention areas. A first attempt in nesting the success factors within the 5 levers is made; however, the connections are not a one-to-one linkage, but rather a cross-cutting linkage across multiple levers. In addition, structural interventions at the institutional/economic level are also investigated (see section 4.3), since they support and influence all levers and success factors in our overall schema for transformative change in *human-nature* relationships (i.e., from "human and nature" to "human as nature").

We believe that these success factors can hold a validity that goes beyond the sole case studies (see section 4.4). Nonetheless, as this report is a scientific inquiry, they will need to be tested and further explored in other contexts to be proven of wider, universal validity.

4.1. Case studies: an overview of objectives, process and main outcomes

Three case studies were selected for critical analysis:

1) "Save the bees" public referendum in Bavaria, Germany, which made the Nature Conservation Act of the largest German Federal State, Bavaria, more stringent, demonstrating the potential of individual motivation and collective action to alleviate regional biodiversity pressures (via interventions primarily addressing production aspects).

2) "NGO-steered progress towards the reduction of illegal water use in agricultural supply chains" in the Doñana wetland, Spain, which examines how retail chains are addressing supply chain responsibility with support, demand and guidance from NGOs (thus primarily addressing consumption aspects).
3) "Land Stewardship" initiative, which builds strategic alliances between farmers and an NGO in Menorca, Spain, to achieve beneficial socio-economic and environmental effects.

Information on the criteria used to select these case studies, as well as further details and references about the individual cases can be found in Annex 3.

Due to limited publications on some aspects of these case studies, most information was gathered via interviews with local experts and community representatives who were directly involved in the implementation of the case studies. These were conducted between February and May 2024. A short summary of these case studies is provided below.

Case study 1: The "Save the bees" public referendum which made the Nature Conservation Act more stringent - Bavaria, Germany

Triggered by the publication of the so called "Krefeld study" (Hallmann et al., 2017) – which highlighted a drastic decline in flying insect biomass across North Rhine-Westphalias' nature reserves and increased concerns about insect and species loss as well as habitats destruction – the "Save the bees!" biodiversity petition for a referendum was held in February 2019 in the Federal State of Bavaria, Germany. A successful campaign managed to activate 1.7 million voters in urban as well as rural areas, i.e. 18.3% of those eligible for more stringent insect and nature conservation. The aim of the initiative was to reach new regulations in the Bavarian Nature Conservation Act to save biodiversity. The core demands included: 1) creating a Bavaria-wide network of habitats for animals, 2) preserving hedges, trees and small bodies of water in agriculture, 3) creating and maintaining flowering verges along all streams and ditches, 4) expanding organic farming, 5) converting 10% of all meadows into flowering meadows, 6) managing all state-owned land pesticide-free, and 7) including nature conservation as a topic in the training of farmers and foresters. As a result, the law accompanying the petition for a referendum was finalised in a round table process bringing opponents and supporters together. It was intended to establish the demands of species protection and the associated package of measures in law. On July 17, 2019, the petition for a referendum "Biodiversity and natural beauty in Bavaria" and the accompanying law were finally passed by the Bavarian State Parliament (see Annex 3 for further details).

The effects of the petition for a referendum and the measures implemented since 2019 are gradually having an impact. For example, the creation of new orchards and agri-environmental measures, such as for flowering areas and extensive grassland, as well as the optimisation of support programs for grazing livestock farmers are viewed positively. Also, the use of total herbicides on state-owned land has been further reduced. The target of 10% of natural forests in the state forest was already achieved in November 2022 with the designation of three additional natural forests. The target of having a biotope network on 10% of the open land has almost been achieved.

The initiators of the 2019 campaign are taking the fifth anniversary of the campaign as an opportunity to keep informing the population about this topic, raise awareness of the issue and increase pressure on politicians to deliver on promised targets.
This case study demonstrates the potential of individual motivation and collective action to alleviate regional biodiversity pressures via interventions. It is primarily addressing production aspects.

Case study 2: Progress towards the reduction of illegal water use in agricultural supply chains supported and steered by NGOs - Doñana Wetlands, Spain

In 2023, a controversial plan to increase irrigable land and to amnesty and legalise unauthorised groundwater pumping that would have placed one of Europe's most important and threatened wetlands, the Doñana in the Southwestern part Spain, in even greater jeopardy was averted. This aversion was aided by NGOs and campaigners in several European countries, scientific experts, the international community, and collective action by food retailers leveraging economic power to ensure a more sustainable agriculture with reduced water risks.

The Doñana Wetlands cover an area of almost 130,000 hectares, including a National Park, a UNESCO-listed site as well as four Natura 2000 sites. With marshes and lagoons, the area is of outstanding universal value as it serves as Europe´s most important habitat for migratory bird species and gives home to the Iberian lynx. The area provides important air and water purification, water regulation, and soil fertilisation services. It also acts as a net carbon sink. Many activities and jobs depend on Doñana´s ecosystem services.

Since more than two decades, the Doñana has been drying out – it nowadays receives only about 20% of its natural water input. Rising temperatures and reduced precipitation are the contributing drivers of this trend, although this situation is primarily the result of groundwater pumping for intensive agricultural practices, especially greenhouse-grown soft berries, mainly strawberries. While individuals and companies are responsible for the act of illegal water use, the overall situation reflects a systematic failure of the institutional arrangements in place, including the administrative allocation, control and inspection systems. Retailers have been brought into the spotlight by media and NGO campaigns, exposing them to reputational risk. Fresh fruits are supply chains of high added value, with high levels of control and thus rather transparent. This enables taking action.

Although the plan for amnesty and legalisation of unregulated groundwater pumping has so far been stopped, the issue is not yet permanently resolved (see Annex 3), and Doñana's environmental, social and economic values are still at high risk.

This case study investigates the way in which food retailers could take more responsibility for their supply chains and be supported and steered by NGOs. As such, it highlights some progress made and gives hope that change is possible. The thorough implementation of long-term sustainable water management strategies is a crucial step to protect the delicate ecosystem of the Doñana wetlands and thus it may have the capacity to realise and ensure the economic viability and potential of the region.

Case study 3: The "Land Stewardship" initiative guarantees food supply, secures a social livelihood, and preserves biodiversity – Menorca, Spain

The "Land Stewardship" initiative is a network of agro-natural farms currently bringing together 38 farms, for a total area of approximately 2,910 hectares (≈4.2% of the surface of the island of Menorca). It ensures that Menorca continues to have a living farming sector and a well-managed countryside with the added value of environmental conservation.

Menorca has an area of almost 700 km², approx. 100,000 inhabitants and is one of the Balearic Islands located in the Mediterranean Sea belonging to Spain. Menorca has no pristine, but a predominantly cultural landscape with a mosaic of cultivated fields, spaces of wild vegetation and large intersecting dry-stone walls (12,000 km). In 1993, UNESCO declared the island as a biosphere reserve – especially in recognition of the balance between economic development, environmental protection, and the conservation of local traditions.

About 70% of the island is used for food production. Due to strong economic pressure to keep up with the global price structure, many small farmers have given up their farms. Unmanaged, abandoned farms have an altered, more woody fauna, leading to more homogenous habitats. Meanwhile, farming intensity has increased and the use of large irrigation systems, and pesticides is resulting in negative impacts on biodiversity.

Farms or estates that join the Land Stewardship initiative sign – on a voluntary basis – a strategic alliance, the Sustainable Agricultural Practices Agreement, with the NGO GOB (Ornithology and Nature Defence Group). GOB is a non-profit ecological association, which is active across the entire Balearic Islands. Under such agreement, both parties agree to work together to try to achieve the most from a series of measures which have been identified as potentially beneficial for both the economic viability and the conservation of natural values. The agreements are tailormade to each individual case and according to the type of farm and its practices. GOB's task is to promote the farm among other entities, both public and private, with the aim of providing aid either directly or by marketing strategies which will benefit the farm. Topics such as healthy food, strengthening of the local economy and reducing carbon and ecological footprints are considered. Community benefits are also part of a set of measures aimed at involving all stakeholders (farm owners and managers, society/ consumers, politicians). Each measure sets a time horizon for goal-achievement. The initiative also includes training for farmers (farming techniques, marketing, etc.), allows GOB representatives to engage in school education programs, and organises volunteer days at the farms. Another crucial aspect of success is the network of agro-natural farms allowing farmers to work together, providing them with a platform to support and learn from each other.

The evaluation of the environmental effects resulting from the agreements is ongoing. This case study analyses the motivation factors behind joining and staying within the initiative; it also investigates how the farmers can compete with their products in a local food market that is otherwise monopolised by industrially produced foods.

4.2. Success factors: towards halting and reversing biodiversity loss and change

Addressing barriers to achieve societal benefits, enhanced biodiversity protection, and overall well-being of both people and nature is essential. To this end, this section delves into analysing the key factors that contributed to the success of the three case studies analysed in Annex 3. These "success factors" (see Figure 4-2) allowed tackling some of the barriers identified in section 3.2, thereby contributing to transformative change. In the quest for potential success factors, four key questions guided the investigation:

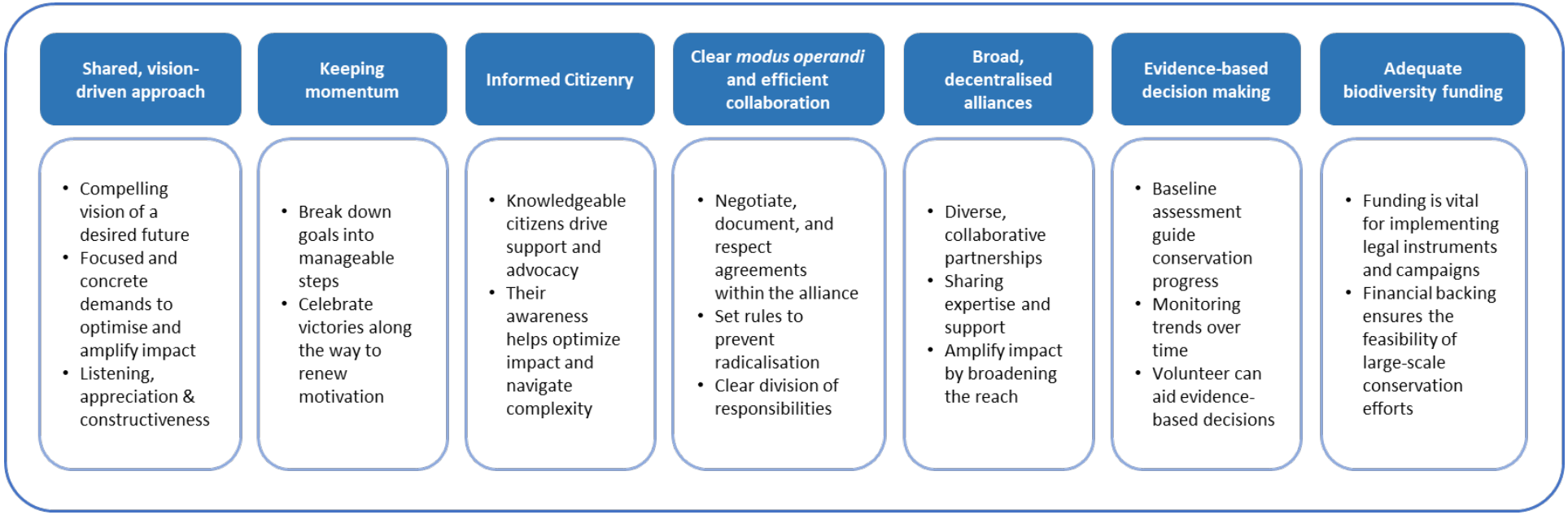
1. *What triggered individuals to act?*
2. *Why and how do people get together in the collective effort to change larger systems and infrastructures?*
3. *What was the role of structural/institutional interventions in triggering change and/or easing collective action?*
4. *How can momentum be kept over time?*

As detailed in the following sub-sections, a key insight derived from the case studies is the necessity for breaking down existing silos, i.e. for more and broader alliances, even in cases in which those alliances may initially appear unusual and unconventional. These alliances could help better combine and leverage the strengths of the diverse stakeholders, organisations, and institutions involved. The following questions can serve as a stimulus to explore the formation of such unconventional alliances and to encourage their pursuit:

- Which pre-competition spaces could be used for negotiation processes towards e.g. compliance with human rights protection and social standards in supply and value chains?
- What forms can cooperation with the public and financial sectors take, including the exploration of new models for public-private partnerships?
- To what extent should companies bear responsibility, particularly for the environment in the proximity of their location, to significantly contribute to the required transitions and digitalisation?
- What is the maximum conceivable level of cooperation that can be envisioned to catalyse and maintain more dynamic progress?

While some of these questions find answers in the discussion below about individual success factors, reflections on the institutional and economic interventions, and the additional governance structures that are needed to create enabling conditions to mobilise individuals and collectives – and flank their engagement – are provided in section 4.3. By emphasising how the foundations for change can be laid out, section 4.3 presents how structural interventions can support, influence and sustain all levers and success factors identified (see Figure 4-1, orange box), as well as scale up, accelerate and validate these efforts on a systemic level.

Figure 4-2 Success factors (hypothesised) enabling transformative change for biodiversity. These factors refer to pre- and enabling conditions and triggering mechanisms that allow tackling societal barriers, thus easing to halt and reverse biodiversity loss and change. We acknowledge that these determinants of success – as explained throughout this chapter – are highly interconnected; grouping them into 7 specific categories was primarily a functional exercise to ease report writing.



4.2.1. Shared, vision-driven approach

A key factor contributing to the success of the three case studies was the motivation generated by a shared vision: a vision aimed at fostering a good life characterised by a low environmental impact, enhanced well-being, and a harmonious relationship with nature. Moreover, it was essential for individuals to embrace this vision personally.

Specific claims or demands – represented, for instance, by catchy slogans such as "Save the bees" or "Custòdia Agrària: Health, Nature and Proximity" – were then derived from this vision; they served to make the vision of the campaigns, initiatives or concrete programmes, helped their design and promotion, and fostered changes in social behaviour and in existing power structures and dynamics. Without embedding demands within a larger vision, their efficacy risked fading away (see also success factor 4.2.2 – "keeping momentum"). Moreover, without a personal commitment and investment in these demands (e.g., when individuals realise that they have something to gain from them and want such demands for themselves), it is unlikely that individuals will be sufficiently motivated to make a real and lasting commitment to their realisation. In addition, it is highly relevant that individual stakeholders know what the upcoming changes will mean for them in the short (and medium) term, as they tend to worry about daily costs and security. Are the upcoming alternatives/changes sufficiently incorporated into the vision, and is it possible to present these predominantly as a gain and not, at least not solely, as a limitation or a threat? Generating or keeping local employment (e.g. restoration work), for instance, is perceived as a positive contribution as seen in the Menorca case study.

The emphasis on species and nature conservation, as evidenced in the bees' case study, the commitment to preserving a wetland of international importance and its biodiversity as in the Doñana case study, or the engagement for a well-managed countryside and a thriving farming sector in the Menorca case study, consolidated ongoing social discussions about climate- and environmental-protection (see section 4.2.3 – "Informed Citizenry"). This momentum was strengthened by a wave of mobilisation for more progressive policies that had already been gaining traction for some time. UK consumers for example continued requesting sustainable products (here, specifically strawberries), in line with UK, EU and global policies which facilitate funding opportunities for change towards sustainability. Moreover, the rising awareness of sustainability issues among European consumers has increased the interest in social and ecological standards, thus influencing established economic structures as the sustainability topic emerges as a competitive parameter. Competition authorities see the increasing need to take into greater account environmental protection concerns (e.g., in antitrust law practice) so that the social challenges associated with biodiversity change and loss, as well as with climate change can be tackled.

The crucial practice of active listening, appreciating differing views and perspectives, understanding the contexts and life circumstances of others (incl. opponents), and constructively engaging with them contributed to this success factor in the Menorca and the bees case study (see connections to 4.2.4. "Clear modus operandi and efficient collaboration"). In the Menorca case study listening to each other was especially practiced during the trust-building discussions and the process towards the signing of the individual Land Stewardship programme agreements. In the Bavarian case study, the establishment of a clear roundtables' process was key. In the Doñana case, a roundtable process is proposed by environmental NGOs to move forward, due to its known detoxification effect, which positively influences negotiation efforts. Nonetheless, it should be acknowledged that achieving a shared understanding and/or vision might be very challenging for highly complex or wicked problems.

In the case study of the Doñana, the lack of a common vision with the local community, or more precisely the identification of a common vision with just a small part of the stakeholders, added and still adds to the problem. This led to situations where farmers, for instance, agreed to have their illegal wells closed, but other farmers blocked the actual closing of the wells.

4.2.2. Keeping momentum

In all three case studies, the involved stakeholders managed to successfully unpack the respective goals into more achievable stages, ensuring they were challenging yet attainable. This approach allowed for the celebration of milestones, fostering a sense of cohesion within the group(s) and providing renewed motivation for the next steps, while also reinforcing the understanding that change may require persistent and prolonged engagement. In the case of the "Save the Bees" referendum, the stages were pre-defined by the steps of the referendum's process. In the Doñana case study, the NGOs reported – via their newsletter and social media channels – about interim successes such as the massive social media echo, the reactions (or the lack of reactions) of the companies, and the number of people who had already signed the petitions. The withdrawal of the "Anti-Doñana law" (see Box A3.3 in Annex 3) was particularly welcomed and celebrated – even though a lot of work remains to be done to address issues like water theft and illegal irrigation in the Doñana wetland and region. In Menorca, the Land Stewardship program began modestly with just 4 farms 20 years ago. However, it was initiated with a well-thought-out concept that has been continuously revised and improved, maintaining its original structure to this day. Since then, the programme has been evolving progressively, without suddenly becoming too large and no longer closely manageable.

Keeping momentum is a critical success factor as it ensures that positive outcomes/successes last over time. Practical experience shows that funding or the necessary policy direction may not always be available or supportive of large infrastructure projects such as, for instance, a dam that could lead to biodiversity destruction. Therefore, the conditions for success in preventing that damage are heightened. But projects harmful to biodiversity tend to not simply vanish. There is always a danger that such projects will resurface once funding becomes available or if they serve political interests (e.g., they might be advantageous to attract votes). As shown in the Doñana case study, despite all the milestones already reached, the disputed law was resubmitted for adoption, highlighting an ongoing challenge and the need for a continuous, critical observation.

4.2.3. Informed Citizenry

As hinted in the previous section, another key factor of success was the presence of an already informed and well-aware citizenry. Information needs to exceed theoretical (*know-what*) and procedural (*know-how*) knowledge; instead, contextual knowledge (*know-why*) or orientational knowledge (*care-why*) is required. This is also a prerequisite for acceptance of change and maintaining motivation for a long time (see the success factor above).

In Bavaria, as in the whole of Germany, the urgency surrounding the bees' conservation gained momentum with the publication of the so called "Krefeld study" in 2017 (Hallmann et al., 2017), highlighting a drastic decline in flying insect biomass across North Rhine-Westphalia's, a German Federal State, nature reserves between 1989 and 2016. This study captured widespread attention by an already-sensitised population, igniting discussions on a global "insect apocalypse". Media coverage – leveraging relatable anecdotes like the "windshield effect"[49] or the potential repercussions of disappearing pollinators, such as barren supermarket shelves – resonated with the public, fostering widespread concern. The "Save the Bees" campaign (see section 4.1, as well as Annex 3) tapped into these worries and anxieties, emphasizing the critical role of pollinators in ecosystem health and human food security. Despite formidable hurdles for referendums in Bavaria (see Annex 3, Box A3.1), mounting apprehension over insect and species loss and habitats destruction triggered support for the cause.

[49] Around 20 years ago, when traveling by train or car, it was common practice for people to frequently clean their windshield due to the accumulation of numerous insects. Even trains would have entirely blackened fronts after extended journeys. The stark contrast to the present, where such occurrences are rare, was used as a clear, simple, and tangible indicator of a significant decline in biodiversity over the past decades, including insects.

Similarly, pre-existing knowledge (i.e., public awareness of tele-coupling mechanisms, drought issues, and their resulting impacts) and concerns among citizens in the UK, the Netherlands and Spain amplified – together with massive scientific evidence – the effectiveness of the effort to avert the controversial law in the Doñana case study. Social perception of the environmental, economic and reputational risks derived from inadequate agricultural practices are reported to have increased, leading to lively debates in the region prior to the averted adoption of the controversial law[50]. However, to have consumers change their purchasing behaviour requires consolidating, explaining and demonstrating alternatives. For this, conviction and commitment are needed, as well as clear communication of the needed demand-side changes that can in turn promote political and management changes towards sustainability. In return, improved governance can strengthen certification standards that address sustainability. The application of good-practice-certifications in agricultural production is a good way to channel social awareness and to facilitate consumer choices in line with their environmental and social concerns.

The Menorca Land Stewardship programme is very actively engaging in school education and organises volunteer days at the farms, show-cooking and information events, etc. Farms can be visited for first-hand experiences about the daily routines of farmers. The programme runs two shops and a market store and can thus directly inform customers and potential customers about the programme, its objectives and benefits. Moreover, since its beginning, GOB Menorca has fostered citizen information and involvement via volunteering sessions.

An informed, involved citizenry is a prerequisite for success, but by no means should it be implied that the equation is this simple: information --> action. Transformative change requires social participation as well as emotional and cultural change. It also requires a well-managed change in collective psychology and social values, and well-communicated, positive relationships of environmental measures with measures to reduce economic and social pressures locally.

The active participation of stakeholders and the public has been key in fostering these achieved successes, which highlights the critical role that informed and engaged communities play in shaping policies that lead to meaningful and lasting improvements.

4.2.4. Clear modus operandi and efficient collaboration

In all three case studies, the team of initiators agreed at an early stage on the framework within which they intend to operate (i.e., a clear "modus operandi"), thus ensuring trust, transparency, and good management of expectations from the start. These early agreements are highly relevant, for instance, to prevent radicalisation, which could result in decreased public support and the weakening or fragmentation of the potential alliance. It is also important to clarify at an early stage how to deal with the potential power and/ or relationship dynamics that could emerge in the alliance because of diverging views (e.g., on the pace at which results shall be achieved) among its members. Negotiating and documenting agreements, like the permissibility of property damage, is essential, as it is respecting them. More precisely, it must be defined transparently 1) what "cooperation", "participation" and "collaboration" between the partners means, 2) what the respective roles in communication are and 3) whether (and eventually how) specific activities and projects are monitored and their quality ensured. Communication channels such as social media and blogs can be used jointly for information and mobilisation if roles are clearly assigned (Sommerwerk et al. 2021). All three case study cases successfully managed to prevent radicalisation, while highlighting the significant need for behavioural change through well-designed, intensifying and escalating actions (especially Bavaria and Doñana cases). All initiatives were thus able to prove that they can peacefully motivate relevant stakeholders for their cause and can therefore be considered as a credible political actor to be considered.

[50] https://www.theguardian.com/world/2023/dec/27/spain-environment-minister-hails-andalucia-wetlands-deal-green-transition

All three case studies had a target-based campaign or plan of action, with a clearly agreed output/ outcome. By centring their aim (or in case of the bees' case study, their mobilisation strategy) around a single, clear demand/claim within the context of biodiversity protection, they managed to maintain focus. This involved identifying key areas of concern, such as agricultural practices impacting biodiversity or the responsibility of retailers and the food trade and concentrating efforts on addressing these issues while excluding tangential factors. By strategically targeting key claims, initiatives, programmes and campaigns can optimise their impact, mobilise support more effectively, and navigate the complexities of the political and public spheres with greater clarity and precision.

In the "Save the Bees" campaign, the primary focus was on addressing agricultural practices deemed detrimental to biodiversity. Key issues highlighted by the campaign's initiators included the intensive nature of agriculture, characterised by frequent mowing of meadows, pesticide use, over-fertilisation, and habitat destruction. Thus, factors such as urban surface sealing, robotic lawnmowers, and light pollution were intentionally excluded from the campaign's scope due to the requirement of a "unity of matter" for successful referendum submission. This focused approach, while concentrating efforts, made the campaign susceptible to criticism for placing undue blame on farmers. However, the initiators of the petition judged the strong intensification of agriculture to be one of the main reasons for the loss of species in rural areas while also viewing it as the most important lever for greater species protection. They further argued that the level of self-sufficiency is still very low, especially in the area of organic vegetables and organic fruit, as a lot of imports from abroad take place to satisfy consumers' needs. Changing this to regional production and consumption could be an opportunity for Bavarian farmers. Additionally, the untapped potential for funding in communal catering, for example in school canteens, was put forward.

Similarly, the "Doñana campaign" of WWF used a very specific call on the food retailer sector to leverage its market power to promote more sustainable farming methods and allow for an increased consumption of "sustainable" products by sensitised citizens. Campact, on the other hand, called rather generally for a boycott of Spanish strawberries, irrespective of the practices on the farms. The Menorca Land Stewardship also pursues a very clear and focused goal and outcome: a thriving farming sector and a well-managed countryside with the added value of environmental conservation.

Clear division and allocation of responsibilities were also crucial in setting the *modus operandi,* with some of the involved actors focusing on content, technical aspects, and social media, while others handling political campaigning. In the "Save the Bees" campaign, for instance, the Federation for Nature Conservation (BN) sent 200,000 letters to its members, a contribution otherwise unaffordable for the campaign; voting offices extended their hours, and municipalities organised evening and weekend openings to facilitate signing. When the previously sceptical prime minister suggested implementing round tables during the registration period (see Annex 3, Box A3.1), the Working Group for Rural Agriculture (AbL)[51], the state association for organic farming in Bavaria (LVÖ)[52], and the Beekeepers' Association provided a non-conservationist, farmer-oriented perspective to counter the opposing statements of the Bavarian farmers' association (BBV). Post-campaign, the support group remained cohesive, and political parties put aside competition to stand united for the cause. This unity was crucial during negotiations at the round tables, preventing regulations from being watered down, and even enabling the push- through of additional measures.

In the Doñana case, responsibilities were also divided: some NGOs focused on political campaigning, while others contributed their expertise on food industry practices, food quality, and consumer protection.

[51] AbL is a registered association, a farming interest group independent of politics and business associations.
[52] LVÖ is a registered association, the leading organisation for the organic agriculture and food industry in Bavaria.

Scientists provided science-based data and facts. Supermarkets and fruit traders joined in with their own action[53].
This solidarity is to be emphasised, as also NGOs are somewhat trapped in their business models and structures - sometimes leading to competitive situations for members and profiling.

4.2.5. Broad, decentralised alliances

Halting the biodiversity crisis is primarily a task for democratically legitimised decision-makers. But this responsibility must also be underpinned by political will. However, the structure and extent of this challenge require changes in the behaviour of a broader spectrum of stakeholders, including consumers and corporations at various levels (local to global).

Alliances refer to collaborative partnerships formed among multiple stakeholders (e.g., organisations, companies, associations, and parties) sharing a common goal or objective. These alliances require an effective *modus operandi* (see section 4.2.4), and can vary in their composition, ranging from narrow to broad, and often occur in the pre-political sphere. They can take diverse forms, from active participation to silent support, and can include official partnerships, networks, or loose alliances based on convenience and complementarity. These alliances often evolve independently of existing structures, necessitating open spaces for development. The commitment to biologically diverse and healthy ecosystems does not actually stop at national borders, nor at party lines – although sometimes that is the case, as could be seen in the weeks prior to the approval of the Nature Restoration Law (NRL). Having roundtable processes allows exchanging ideas across political parties, and cooperating actively with all the stakeholders (e.g., from political, societal, scientific and business groups) who share a concern about biodiversity. In the context of the three case studies, the creation of broad societal alliances facilitated the pooling of resources, expertise, and support necessary for the effective execution of the campaigns, programmes and initiatives. The formed alliances were made up of ultimately weak actors who had to work together against strong governments/interests to succeed. All three cases showed that knowledge/experience, citizen support, access to policy, as well as access to media were key "ingredients" for a successful alliance. In the "Save the Bees" campaign, for instance, the ÖDP's extensive experience in campaigning for referenda facilitated the development of the draft law, which was prepared with specialist lawyers.

Linked to the broad composition of the alliance/movement, a significant factor for success was the decentralised structure of the various campaigners, as seen in the "Save the Bees" campaign. This decentralised structure eased the collection of the votes necessary for the referendum petition within a short two-week period. The petitioning and referendum process resembled an election, involving campaign activities such as information stands, posters, rallies, and support during the registration period. This effort stretched beyond the typical scope of an environmental NGO or association, straining all available resources, including finances[54]. The alliance thus consisted of over 200 organisations, companies, associations, and parties[55], obtaining positive coverage even from tabloid media outlets. Additionally, approximately 70 "action alliances" were formed in individual districts for local implementation, with about 5,000 volunteers supporting the campaign. This enabled outreach into rural and commuter regions beyond the already well-covered, and often more progressive, metropolitan areas.

In Doñana, there is a long history of NGO support and partnerships (this links to the success factor 4.2.2 "keeping momentum"). WWF, for instance, had been working with retailers (e.g. Albert Heijn, Coop and

[53] https://www.theguardian.com/world/2022/mar/22/uk-supermarkets-urge-andalucia-against-huge- strawberry-farm-expansion and https://wwf.panda.org/wwf_news/?5340416/Major-European-supermarkets-and-agro-industries-join-fight-to-save-Spains-Donana-World-Heritage-Site

[54] Estimates suggest the campaign incurred approximately 500,000 EUR in costs (Kranenpohl 2022), covering expenses like poster placement across the Federal State of Bavaria and printing, distributing, and collecting signature lists.

[55] Notable supporters included banks, Catholic bishops, and Protestant church groups.

REWE since 2005) on strawberries before Edeka. The partnership with Edeka and activities with Global G.A.P. have also been running for a long time. The Estacion Biologica de Doñana CSIC (EBD) and the WWF have been cooperating in the area since 1964.

It has been acknowledged that engaging growers early on in actions aimed at excluding illegal water use in agricultural supply chains is crucial, as they are integral to the solution. Freshuelva, the industry association of Huelva's strawberry producers and distributors since 1983, for instance, was asked by WWF already 15 years ago to engage in exchange; such invite was constantly declined, although some farmers participated in actions and pilots. Considering the severity of the unsustainable water management and associated water quantity and quality risks in the region, also coordinated action by alliances of food and drink sector businesses are needed and can be witnessed in the Doñana case study to transition to a more sustainable agriculture. Such coordinated action[56] is essential to obtain a relevant market share, enabling combined influence to advocate for better governance and influence local decisions. Otherwise, growers may simply sell to other buyers. Ideally, this coordinated action also encompasses engagement in local/regional water stewardship projects driven by stakeholders, with appropriate consideration for smallholders.

Additionally, the Menorca case study showed the importance of involving all relevant stakeholders (e.g., farm owners and managers, society/consumers, politicians), and to reach out and effectively cooperate with foundations. Extending this alliance to professionals in the agricultural sector and interested farmers also proved beneficial.

The analysis of the three case studies showed that alliances can comprise long-established teams or be formed based on quick trust or a need for action.

4.2.6. Evidence-based decision-making

To regularly inform decision-making and adapt management strategies, as well as to effectively preserve biodiversity and sustainably maintain ecosystem services, regular monitoring and observations are necessary (BIP, 2010). Biodiversity monitoring refers to the regularly repeated recording of the state of biodiversity and the main anthropogenic drivers of biodiversity loss. This data is then compared with reference, target and limit values to analyse changes and development trends, and to monitor the impact of political strategies and corresponding measures (expanded based on Hellawell, 1991 and Dröschmeister, 1996. See also Galli, 2015). The recording of biodiversity data and the analysis of interactions between humans and the environment are central to understanding the causes, influencing factors and mechanisms that contribute to the loss of biodiversity. In the EU, directly and indirectly, a lot of monitoring systems are in place as a response from the obligation under several EU directives and policies. They also inform the development, implementation and monitoring of conservation and communication strategies and research programs for the protection of biodiversity. Volunteers' involvement can noticeably contribute to the collection and analysis of biodiversity and ecosystem services data, contributing to the development of research questions and applied research (see Sommerwerk et al. 2021 for more details). It is thus crucial to expand data collection efforts and give monitoring a greater social relevance.

[56] https://www.theguardian.com/world/2022/mar/22/uk-supermarkets-urge-andalucia-against-huge-strawberry-farm-expansion and https://wwf.panda.org/wwf_news/?5340416/Major-European-supermarkets-and-agro-industries-join-fight-to-save-Spains-Donana-World-Heritage-Site and https://wwf.panda.org/wwf_news/?5340416/Major-European-supermarkets-and-agro-industries-join-fight-to-save-Spains-Donana-World-Heritage-Site

However, while "evidence" might point to the detrimental state of biodiversity, the way in which such evidence is understood (e.g., a problem of capitalism, human greed, neo-colonialism, imperfect market, imperfect data and the like) varies and consequently also the type of solutions adhered to.
All three case studies highlight the importance of compiling baseline assessments against which to evaluate trends of biodiversity and ecosystem health; this allows tracking progress in biodiversity conservation. For example, in the Doñana case, intensifying the monitoring of the aquifer system and its biodiversity is not yet fully in place, but it has been deemed essential to annually assess the availability of water in the aquifer and to determine a sustainable extraction level, also depending on the annual recharge and its conservation status. Up to date, there is moreover unfortunately a scarce use of the already existing scientific evidence and knowledge for the sustainable management of this unique area. As a result, many of the decisions that are made about its management are not based on existing scientific evidence, and result in further deterioration and unhelpful investments.

Long-term monitoring of some flora and birds is ongoing in the Custòdia Agrària farms. During the last 3 years, several of these farms have also been engaged in the monitoring of the Ecological Footprint of their core productions (e.g., beef, fruits and vegetables); this has allowed assessing whether buying products from those farms may result in a lower footprint for the buyers/consumers compared to conventionally produced, equivalent products.

A dedicated, multi-annum project was initiated as part of the efforts in the bees' case study, to annually monitor progress in the implementation of the stricter nature conservation law and, in turn, progress in biodiversity conservation (see Annex 3).

Programmes, initiatives and campaigns can of course be successful even when there is no official monitoring in place. Often there is very valuable available knowledge of local experts and NGOs (see examples GOB Menorca and WWF Doñana). However, without official data, tangible figures and facts, transparency can be more difficult.

4.2.7. Adequate Biodiversity funding

Nature conservation is an indispensable investment, but it does not come for free. While legal instruments for the protection of species and habitats already exist, their implementation depends on the availability of sufficient financial resources (direct and indirect) and the actual usage/retrieval of funds, political will, and the abolition of harmful subsidies. The same holds true for the programmes, initiatives and campaigns presented in the case studies, as elaborated below. For additional information on economic and financial instruments, harmful subsidies, and putting a fee on nature loss (also in line with Dasgupta, 2021), see the next chapter (4.3).

EU funds like LIFE include the support for awareness raising campaigns and networking. The efforts for such large campaigns as in the save the bees[57] or Doñana case studies go far beyond the normal business of an (environmental) NGO or association, and the standard membership fees are insufficient. GOB, the founder of the Land Stewardship programme in Menorca, has a wide range of supporters. Their network ranges from private foundations to local municipalities, whom they contact for specific funding requests. Without loyal supporters, none of the programmes, initiatives and campaigns such as those presented in the case studies, would be feasible.

[57] The costs are estimated at approximately 500.000 EUR for the "Save the Bees" campaign (Kranenpohl 2022). The Gregor Louisoder Environmental Foundation, a founding member of the support group of the petition, took over the management of various media formats such as cinema spots and social media. Additionally, the Federation for Nature Conservation (BN) covered the costs of sending out letters to each of their 200,000 members explaining the aim of the initiative and calling for support.

As of today, many projects are financed via the rather small sustainability or Corporate Social Responsibility (CSR) budgets of companies, which are insufficient for achieving rapid and widespread progress. In the retailer companies, there is usually a split between the "buying/supply" business department and the (small) "CSR" department. Therefore, it is important to include sustainability criteria in the buying practices of retailers to have a greater leverage on economic drivers and the forces that can influence and/or control them. However, there is also manyfold EU funding available (e.g. via the LIFE programme) which is far more substantial than CSR funds, and which can be used for activities aiming at halting biodiversity loss (directly and indirectly), if retrieved.

4.3. Structural interventions at institutional and economic level

This section presents the structural interventions that can be made at institutional and economic level. Structural interventions are dealt with in this report as a category of its own, as they have the potential to support, influence and sustain all levers and success factors identified (see Figure 4-1, orange box), as explained below.

Structural interventions at an institutional and economic level are carried out by policy instruments, which represent the means through which governments set to affect citizens' and companies' incentives in their decision making. In general, policy instruments can be divided into several categories, and the categorisations vary according to different sources. Typically, laws and regulations are put into a different category than subsidies and taxes, while providing information and education belongs to a third category. Here we use the categorisation used by the IPBES[58], where four categories are identified as 1) Legal and Regulatory Instruments, 2) Rights-based Instruments and Customary Norms, 3) Economic and Financial Instruments, and 4) Social and Cultural Instruments. These categories are elaborated below. The focus here is on policy instruments intended to benefit biodiversity preservation, and the policy instruments harmful for biodiversity are touched upon after the elaboration of the categories.

- *Legal and Regulatory Instruments* refers to implementing laws and regulations. These instruments basically restrict or ban unwanted actions or mandate wanted actions. Examples include the national nature conservation legislation in EU Member States, and the EU Nature Directives (Birds Directive and Habitats Directive) setting the goal(s) that EU countries must achieve in their own legislation. Another example is the Nature Restoration Law that requires EU countries to submit National Restoration Plans to the Commission, as well as to monitor and report on their progress. Yet another example is the Taxonomy Regulation, which sets out the conditions that have to be met if an economic activity wants to qualify as environmentally sustainable.

- *Rights-based Instruments and Customary Norms* refers to strengthening human rights, customary norms, and institutions of local communities. Human Rights Instruments include for example the International Bill of Rights and the core human rights treaties. Customary norms mean customs considered so vital to the social and economic system that they are taken as seriously as they were official laws. Local institutions include for example local governments and rural producer organisations and cooperatives.

- *Economic and Financial Instruments* include fiscal instruments such as subsidies and taxes, the creation of new compliance markets, the creation of voluntary incentive schemes, as well as financial instruments. Economic instruments aim to change the monetary calculations of citizens and firms in their decision-making. Thus, these instruments create incentives to decrease harmful activity and/or increase beneficial activity. An example of a subsidy could be a payment that the government would grant to someone restoring a peatland towards a better natural state. On the other hand, the government can also levy a tax if someone carries out an action which damages

[58] See https://www.ipbes.net/policy-instruments

the natural state of a peatland (e.g. by digging ditches to dry out the land). The creation of a new compliance market means that, for instance, pollutants need permits to be allowed to be released, and that there is a market where these permits are traded. This happens in the European Union for carbon emissions in the form of the Emission Trade System (ETS). The voluntary incentive schemes mean government-led programs offering payments for anyone volunteering to do a certain activity. An example of this is Payments for Ecosystem Services (PES), in which landowners are compensated for managing their land in a way that provides some sort of ecological service called for by the government. Financial instruments are different from economic instruments in that the role of government is often more limited. An example of this is the case of voluntary biodiversity credit markets. Biodiversity credits are issued by biodiversity credit schemes for projects achieving positive biodiversity outcomes (NatureFinance, 2023). These credits can then be traded in markets.

- *Social and Cultural Instruments* include, for example awareness-based voluntary interventions. This means for example environmental education, where individuals are taught how ecosystems function and how they can manage their behaviour and ecosystems to live sustainably. Another example is eco-labelling, which refers to voluntary or mandatory labels aiming to communicate to the consumer the level of sustainability (with some metric) of products. Furthermore, corporate social responsibility (CSR) is a business model, in which companies themselves aim to enhance society and the environment instead of harming them (see also section 4.2.7). One more example of this category of instruments is the enhancement of the collective action of local communities.

Policy instruments for biodiversity preservation aim to change citizen's and companies' behaviour and, thus, decrease the pressures on nature. The impact of the instruments can happen directly (e.g. ban on polluting activities) or indirectly (e.g. environmental education changing peoples' perceptions of acceptable actions). Legal and regulatory instruments can provide quick and sizable improvements, if they are carefully implemented and enforced. However, their implementation in democracies requires sufficient acceptance and political will. Meanwhile, information-related instruments are typically not seen as disruptive and are, thus, more easily accepted. Their impact, however, is often slow and uncertain.

Several policy instruments have also harmful impacts on biodiversity. Particularly the subsidies harmful for biodiversity have gained a lot of attention and have been subject to several studies, internationally and nationally (Matthews and Karousakis, 2022). The most often studied categories of subsidies harmful for biodiversity include direct transfer of funds and foregone government revenues (e.g. tax exemptions). However, another category of these subsidies is the non-internalisation of externalities, which means that the damage costs of the environmental impacts of an action are not (fully) born by the one causing the impacts (Withana et al. 2012). This form of harmful subsidy can be (for example) solved by setting a tax equal to the damage costs, to internalise the externality. Therefore, harmful subsidies are linked to the economic instruments aiming to preserve biodiversity.

4.4. Links between barriers, success factors and structural interventions

This section delves into the investigation of whether, to what extent, and by what means the hypothesised success factors drawn from the case studies (sections 4.2.1 – 4.2.7) are capable of tackling and/or lifting the barriers to halting the loss and change of biodiversity identified in Chapter 3 (sections 3.2.1 – 3.2.8). As such, this section helps shed light on how, and to which extent, these success factors can have usefulness and relevance beyond the mere case studies' context. An initial assessment of the connections between success factors and barriers is visually summarised in Table 4-1.

Table 4-1 Visual representation of the connections (i.e. marked by the ticks) between hypothesised success factors and barriers.

	Knowledge gaps	Misinformation / disinformation	Utilitarian mindset	Short-termism	Governance of Complexity	Social norms	Perception of others	Filtering of Information
Shared, vision-driven approach	√	√	√	√	√			√
Keeping momentum	√				√	√	√	
Informed citizenry	√	√		√		√	√	√
Clear *modus operandi* and efficient collaboration				√	√	√	√	
Broad, decentralised alliances				√	√	√	√	
Evidence-based decision making	√	√		√				√
Adequate biodiversity funding	√	√		√	√			

Of the 7 hypothesised success factors, our analysis suggests that "*shared, vision-driven approach*", "*informed citizenry*", "*evidence-based decision making*" and "*adequate biodiversity funding*" are the most crucial factors for lifting the barriers of "*Knowledge gaps*" and "*Misinformation/Disinformation*". Addressing these factors can help tackle the overarching issue of humans becoming more aware of how biodiversity and ecosystems, or nature in general, enable every aspect of our daily lives and how we are interconnected with nature. In other words, these factors can shed light on the significance of biodiversity and its conservation for human well-being, as well as on how our activities impact it, both locally and globally.

Particularly, monitoring processes provide necessary levels of scientific evidence about pressure-impact relationships and are therefore a powerful tool to reduce misinformation and subjective opinions or to debunk myths. Awareness and acquisition of knowledge can also be stimulated via regular and target group oriented, specific information ("proper messaging"), which ideally leads to dialogue and committed stakeholder engagement ("buy-in") for plans and steps towards transformative change (Benson et al. 2023). Additionally, benefits and incentives of certain policies need to be properly conveyed to garner wide support and to counter green denial and/or backlash, or even "fatigue" about green policies. A "*shared, vision-driven approach*" can be the breeding ground for socially fairer distribution of limited natural resources, thus in a way contributing to levelling-out power imbalances across societal actors. Involvement in specific programmes, initiatives or campaigns can help individuals acquire knowledge of options for acting towards biodiversity conservation. Finally, "*Evidence-based decision making*" and "*Adequate biodiversity funding*", can help lift knowledge gaps and misinformation; yet they also require a longer time frame to be considered (i.e. no short-termism) and necessitates political will for transformative change (this latter point being highlighted as missing several times in the analysed case studies).

Informed and engaged individuals and stakeholders can effectively challenge and compel regressive political agendas to change, paving the way for more sustainable and democratically aligned environmental policies, which is also related to the barrier "*Governance of complexity*". In doing so, these four above listed success factors, but especially the "*shared, vision driven approach*", are also able to tackle the deep-routed barrier "*Utilitarian mindset*", as the intrinsic value of nature is integrated and honoured. It is important to address legitimate economic concerns and anxieties connected to the forthcoming transformation or change that will impact individual lives. The barrier "*short-termism*" could likely be addressed through the success factors of "*shared, vision driven approach*", "*informed citizenry*", "*clear modus operandi – efficient collaboration*" and "*adequate biodiversity funding*" by emphasising long-term economic and environmental gains of transformative change, laying the foundation for a more sustainable, economically thriving future.

The success factor "*broad, decentralised alliances*" also comes into play here: as shown in the Doñana case study, coordinated action and alliances involving businesses from the food and drink sector that have a critical, decisive market share were (and are) needed to effect changes, such as in market criteria. Market criteria are a major driver and starting point for shifting from unsustainable to more sustainable production patterns. They also serve as a driver to abolish systems that, regardless of available scientific evidence, prioritise short-term economic growth and efficiency over long-term resilience. The case studies illustrated how these systems often result in high societal costs and are controlled by those benefiting from them. "*Evidence-based decision making*" is also a factor that, through monitoring, can reveal the real costs of certain actions for society and can help to step away from settings that primarily produce short-term, one-sided benefits.

The absolute necessity of governance structures and policies to be both economically and socially sustainable became very clear from the assessment of the case studies. The barrier "*Governance of complexity*" seems to be best tackled by the success factors "*shared, vision-driven approach*", "*clear modus operandi – efficient collaboration*" and "*keeping momentum*". This is particularly true as the massive social-ecological challenges we are facing are often not yet mirrored in an aligned governance system of policy response, but rather addressed by separate and scattered sectoral solutions, as revealed by the case studies. This current approach of addressing socio-economic issues separately may not be robust enough when encountering shifting political contexts. This might then in turn put the long-term durability of biodiversity protection action at risk, as it carries the risk of falling behind what has already been achieved regarding biodiversity protection. The case studies analysis instead seems to confirm the need for a "whole-of-society approach" to building resilient and inclusive policies for biodiversity conservation (see e.g. Benson et al. 2023[59]). The analysis also emphasises the need for a very well-managed, non-rushed communication with the public, strengthened civil society engagement, inclusive policymaking, and adequate investments, thus pointing to the success factor "*Adequate biodiversity funding*".

The success factors "*Informed citizenry*", "*Clear modus operandi – efficient collaboration*", "*Broad, decentralised alliances*" and "*Keeping momentum*" come into play when dealing with "*the perception of others*" and "*social norms*" barriers – i.e. being integrated into a certain social context and its norms. Such success factors have a significant influence on whether it is possible to cooperate efficiently, resolve disputes, and be willing to take on extra and/or voluntary tasks (e.g. in an initiative, campaign team or an NGO).

"*Shared, vision-driven approach*" and "*Informed citizenry*" seem to be the most effective success factors addressing the barrier "*Filtering Information*". Particularly, the Bavaria and the Doñana case studies showed that there is partly a scarce use of the already existing scientific evidence and knowledge for the sustainable management of the respective regions. As a result, many management decisions are not based on existing scientific evidence, and result in further deterioration and unhelpful - or even harmful - investments. These two mentioned success factors can contribute to increasing positive personal beliefs, more positive first-hand experiences and a strengthening of an open-minded social identity towards biodiversity conservation. Building on this, the success factor "*Evidence-based decision making*" can then have an improved effect in enhancing the uptake of scientific research.

The barrier of *Short-termism* is partly driven by perverse incentives, and the *Economic and Financial Instruments* presented in section 4.3 have, accordingly, the potential to alleviate this barrier by forcing the actors to face the long-term effects of the actions immediately. In other words, long-term harmful effects of an action can be approximated as a one-off price to be paid at the time of the action. This transmits the long-term harm as a short-term expenditure. An example of this approach could be a land-use change fee to be paid when, for example, converting forest land to agricultural land. The amount of the fee could be determined by the extent of biodiversity loss caused. The quantification of biodiversity is, however,

[59] https://www.americanprogress.org/article/the-nexus-between-green-backlash-and-democratic-backsliding-in-europe/

difficult. In policy instruments dealing with climate crisis, the concept of carbon dioxide equivalent is a useful unit of measuring climate harm of actions. Biodiversity harm is difficult (or perhaps impossible) to simplify to a similarly simple and universal unit. This illustrates the barrier *Knowledge gaps* and highlights the need for a further development of a universally accepted system for measuring and monitoring the value of biodiversity and the costs from the loss of biodiversity.

Information-related *Social and Cultural Instruments* (see Section 4.3) can be seen as dealing with the societal barrier *Knowledge gaps* and contributing to the success factor *Informed Citizenry*. Transmitting information is one way how institutional governance can trigger individuals to get together for collective action (see Figure 1-2), also to change larger systems and infrastructure (see Amel et al. 2017). On the other hand, the collective action described in the case studies further increases the awareness of the need for change and, thus, increases acceptance and political will to implement *Legal and Regulatory Instruments* of structural interventions, such as for instance new legislation and regulation. In the Bavarian "Save the bees", and the Doñana Wetlands case studies, the policy instruments also included the 'Legal and Regulatory' type, and both were the 'object'. In the Bavarian case, it was a positive type (referendum pro bees) and in the Doñana Wetlands case as negative type (a law that needed withdrawing). Furthermore, information-related instruments naturally directly contribute to creating pre-conditions for the acceptance of legal and regulatory instruments. The effect of the information- related instruments is hampered by the barrier *Filtering of information*, since novel information incompatible with the receiver's pre-existing worldview gets easily discarded.

Within the structural interventions, the instruments in the category *Rights-based Instruments and Customary Norms* contribute to dealing with the barrier *Governance of Complexity*, since they can promote adaptive and polycentric governance. Polycentric governance of common pool resources comprises multiple levels and decision-making bodies while retaining a certain degree of independence for actors and institutions involved to make choices relevant and pertaining to their domain of operation. In this way, polycentric governance goes beyond hierarchy, autonomy and accountability and incorporates notions of inclusion, experimentation, and learning. See Annex 2 for more information about the polycentric governance of common-pool resources. Furthermore, these instruments help in tackling the barrier *Social norms* by strengthening the customary norms of local communities.

Content-wise, the three case studies highlight the potential of collective action to alleviate regional pressures on biodiversity. However, systemic challenges necessitate broader interventions such as for instance, alternative food production and consumption practices (e.g., reducing animal protein consumption), circular economy, land sharing and land sparing, restoration measures, Nature-Based Solutions, as well as transformative education. While individual and community-level initiatives are essential, systemic changes at the macro level, such as the European Green Deal, are crucial for addressing the underlying drivers of biodiversity loss. Effective implementation of instruments requires comprehensive public engagement and preparatory measures to navigate and pave the way for the expected associated disruptions.

To conclude, the five (5) levers and the seven (7) success factors identified in this report seem to align with the basic design principles for effectively managing Common-Pool Resources (CPRs) proposed by Ostrom (1999, 2010) (see also Annex 2). They also complement the levers and leverage points for societal transformation identified by Chan et al. (2020) (see Table 4-2). While analysing in detail such complementarities go beyond the remit of this report, a key factor in both this report and the study by Chan et al. (2020), for instance, is the capacity to provide stakeholders with an (alternative) vision of humans living a good life as an integral part of nature. Education and knowledge generation, which can pave the ground to changes through the creation of an informed citizenry, capable to accept and positively shape change in a truly participatory manner – as well as inclusion in conservation, which can be achieved through broad, out of the box and decentralised alliances – are also common factors among our and the study by Chan et al. (2020).

Table 4-2: Overview of the levers and success factors identified in this study and their comparison with Ostrom's basic principles for Common-Pool Resources (CPRs)' management and Chan's levers and leverage points for societal transformation.

Basic design principles for the successful management of CPRs	Levers and leverage points for societal transformation towards sustainability	Levers and success factors (hypotheses) to tackle the societal barriers hindering the reversal of biodiversity loss
Source: Ostrom, (1999, 2010)	Source: Chan et al., (2020)	Source: this study
• Properly defined boundaries for the CPR being managed • Clearly defined rules and social norms for the use of CPRs • Existence of a monitoring system to track CPRs' usage (by users) and to punish free-riders, • Existence of a community willing to act as a steward of its own Common Pool Resources.	**Levers:** • Incentives and capacity building • Coordination across sectors and jurisdictions • Pre-emptive action • Adaptive decision-making • Environmental law and implementation **Leverage points:** • Visions of a good life • Total consumption and waste • Latent values of responsibility • Inequalities • Justice and inclusion in conservation, • Externalities from trade and other tele-couplings • Responsible technology, innovation and investment • Education and knowledge generation and sharing	**Levers:** • Offering an Alternative Narrative • Levelling-out Power Imbalances • Enhancing Knowledge • Understanding Societal Acceptance • Equipping Governance Structures **Success factors:** • Shared, vision-driven approach • Informed Citizenry • Clear *modus operandi* and efficient collaboration • Broad, decentralised alliances • Keeping momentum • Evidence-based decision making • Adequate biodiversity funding

All in all, and despite having been derived from the case studies, the seven (7) success factors hypothesised by this report have higher-ranking validity beyond the case studies, and their investigation has allowed for the evidence collected from the literature to be grounded in reality. We thus believe that the success factors presented here could be considered as key elements of a needed, overall biodiversity strategy.

5. Conclusions and Way Forward

In the pursuit of understanding the societal factors enabling the halting and reversal of biodiversity loss and change, this ETC BE report has investigated the societal reasons for repeated historical failures in meeting biodiversity targets, along with associated knowledge gaps. However, many critical questions remain unanswered. This final chapter elaborates on the main conclusions of the report and discusses how they can constitute a springboard for additional research and discussion.

Successfully halting and reversing biodiversity loss and change require directly addressing the current narrative in which we are locked-in by 1) increasing EU actors' knowledge of the mutual relationships between biodiversity and society, 2) equipping governments and institutions with proper governance structures to handle increased complexity (e.g., by mainstreaming biodiversity conservation priorities across all EU policies), and 3) levelling out power imbalances in our societies. Doing this, in turn, depends on our capacity to 4) comprehend how societal acceptance and mindsets are formed, shaped, and transformed, and 5) present an alternative narrative to facilitate a smooth societal transition. These entry points are referred to as levers for transformative change in society (i.e., shifting the *human-nature* relationships from "human and nature" to "human as nature"), which can favour the halting and reversal of biodiversity loss and change (see Figure 5-1 and Chapter 4). Further research is needed to validate, enrich, and elaborate these five identified levers and eventually expand on them.

While acknowledging that humans operate within given socio-economic contexts and paradigms, and that several entry points for halting and reversing biodiversity loss and change exist (see Figure 5-1, blue area, right-hand side), the focus of this report has predominantly been on the cultural, psychological and process barriers to change biodiversity-harmful behaviours at individual and societal levels (and less on top-down systemic interventions and policy actions), in an attempt to help shed light on the way in which our societal mindset can be shaped. Therefore, additional research is needed in more closely connecting structural interventions (at institutional and economic level) to the elements focused upon in this report. This is further emphasised by the fact that policy instruments are likely needed to change the incentives of (the majority of) actors to really act differently. Furthermore, an additional inquiry could delve into assessing whether even ambitious policy instruments would be sufficient if carried out without a profound change in the dominant economic system that aims to maximise shareholder value.

In this report we have discussed how *human-nature* relationships have evolved over time (see Chapter 3.1), leading to the "human and nature" perspective as the predominant life frame along with measurable and identified challenges in the state of global biodiversity (see Chapter 2.3). Eight (8) barriers hindering transformative change have been provisionally identified through a combination of expert workshops and a literature review (see Chapter 3). These barriers are not unique to biodiversity but are applicable to many complex societal challenges (e.g., climate change), which have often been incorrectly addressed as individual, independent problems. They suggest the possibility of addressing multiple crises concurrently, emphasising the importance of leveraging potential synergies while being transparent about trade-offs to achieve some level of success in transformative change. Nevertheless, more work is needed to identify the most important and influential barriers. Furthermore, some of the barriers might be driving others. Therefore, a more detailed understanding of the dynamics of the framework is worth seeking for. Moreover, it is essential to assess which barriers are still missing from the overview we provided, and what might be their practical implications at societal level with respect to biodiversity.

Building on the illustrative examples of three case studies, seven (7) success factors have been hypothesised, which seem to have fostered effective conservation efforts at regional level (see chapter 4.2). Although extracted from just three case studies, these factors align well with the basic design principles for effectively managing Common-Pool Resources (CPRs) proposed by Ostrom (1999, 2010), complement the leverage points for societal transformation identified by Chan et al. (2020), and nicely tie into the five (5) levers identified by the EEA and ETC experts. As such, the meaning and validity of the hypothesised success factors can be considered to span beyond the sole case studies' context. Yet, they

would need further testing to be fully leveraged to halt, reverse, and restore the ongoing loss and change of biodiversity. Further inquiries are also encouraged to assess the scalability of the hypothesised success factors, and success factors that our analysis might have missed.

By analysing the case studies, it has also been possible to preliminarily assess the multiple connections between the identified barriers and our success factors' hypotheses, specifically looking at how these factors can manage to tackle the barriers. Likewise, the analysis showed connections and interdependencies among the success factors, and we believe that further research is needed to delve deeper into their reciprocal influence as well as their resulting force to lift the barriers. We also identified linkages of policy instruments to barriers and success factors. Policy instruments as structural interventions can support success factors and levers in addressing the barriers. The potential of the structural interventions for scaling-up, accelerating and validating the hypothesised success factors needs to be further explored. In addition, more research is needed to investigate policy coherence, since policy conflicts with other societal goals make it hard to address some of the barriers.

Although providing definitive answers towards solving the biodiversity crisis is certainly beyond the scope of this report, we believe that the success factors hypothesised by our inquiry would be crucial for the success of any biodiversity strategy, present or future (i.e., enabling factors and conditions for success), at EU level or beyond. Likely missing or not pursued with sufficient rigor in the past, these factors will have to be increasingly cared about as they may have the potential to break down the current siloed approach through which biodiversity protection and restoration activities are dealt with, if a faster, more comprehensive and area-wide, socially just systemic transformation is to be achieved. Changes in our relations to nature will also need to be reflected in our legislation, economic system, and social context.

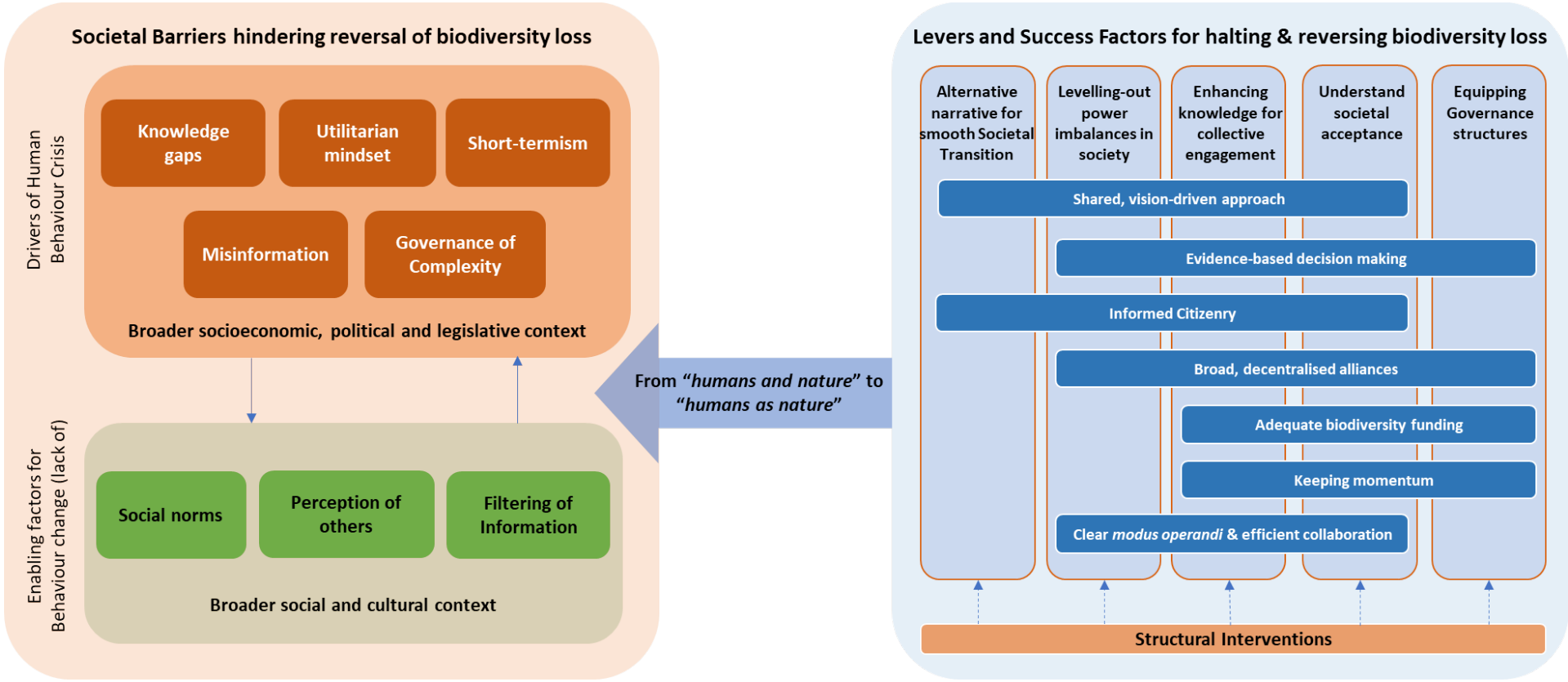
Defining a single widely accepted and coherent master plan to solve the biodiversity crisis might be unrealistic, and biodiversity policy will likely always remain a patchwork of approaches. Moreover, the recipe for addressing biodiversity loss seems to be more complicated than that to address the climate crisis, and will likely require a multi-layered, multifaceted and fuzzy intervention logic to develop coherent actions and policies. The case studies investigated have highlighted the potential of collective action to alleviate regional pressures on biodiversity. However, systemic challenges necessitate broader interventions, such as for instance the use of diverse policy instruments to influence, trigger and motivate citizenry. These instruments can operate directly (e.g., by banning polluting activities) or indirectly (e.g., by changing people's perceptions of acceptable actions via environmental education). Legal and regulatory instruments can provide quick and sizable improvements, although their implementation in democracies requires sufficient acceptance and political will. Meanwhile, information-related instruments can be more easily accepted, although their impact is often slow and uncertain. One way to look at the patchwork of policies is that the regulatory instruments (such as national nature conservation legislation in EU Member States, the EU Nature Directives, and the Nature Restoration Law) can be used to provide the minimum level of biodiversity conservation and restoration, as well as to secure the most valuable sites for biodiversity. Economic instruments (such as biodiversity loss fees or ecological compensation) and information-related instruments (such as guidance for landowners) can then be used to further incentivise action beneficial to biodiversity (and disincentivise action harmful for biodiversity).

For a biodiversity strategy to be successful, it shall have the capability to activate governments and regional actors, as well as motivate and mobilise people, and even trigger their curiosity. What is known as the "tragedy of the commons" (Hardin, 1968), can be turned into a "comedy of the commons" (McCay and Acheson, 1987) through mechanisms that empower individuals to act in the interests of the collective good (i.e., Polycentric governance) rather than with narrow self-interest (NRC, 2002; Ostrom, 1999) (see also Annex 2). A necessary (but not sufficient) condition for this is the presence of an informed and well-aware citizenry (sensitised), which offers fertile ground for the strategy to take root (activate). Whether support from the population to initiatives is facilitated by the fact that only a small group of the people had to fear immediate negative effects is a critical aspect to consider when examining the willingness to, for instance, vote in referenda. Additionally, our results point to the need to equip any biodiversity strategy (either at

EU or national level) with a dedicated communication strategy to assist effective implementation, and support and at best ensure civil society engagement, participation and acceptance.

This report is a scientific pursuit: it aims not to provide conclusive answers but to identify the societal factors that hinder the reversal of biodiversity loss and change, and it calls for further research in exploring the promising hypotheses for transformative change to restore and protect ecosystems and biodiversity and thus coming back to a “human as nature” life frame. Despite its narrow focus and limited scope, we believe the findings of this report and the critical questions it raises can serve as a catalyst for fostering ongoing debates on systemic, transformative change. Ultimately, we hope that this report will prove useful in supporting awareness campaigns and in educational contexts, thereby indirectly reaching a wider audience within civil society.

Figure 5-1 Overview of the interplay and connection between the eight (8) societal barriers (left-hand side) and the levers for halting and reversing biodiversity loss and change (right-hand side). Levers are grouped into five (5) overarching entry points of transformative change (light blue boxes), within which seven (7) success factors (dark blue boxes) are hypothesised. In addition, structural interventions from the institutional governance (orange box at the bottom) are also investigated as instruments able to support and influence both levers and the success factors within them. Societal barriers are drawn from Figure 3-2 and were derived from brainstorming sessions among EEA and ETC BE experts and refined through a narrative review conducted in Chapter 3. Levers were identified in the same brainstorming sessions conducted in 2023 (see Annex 1) for further details); they represent the view of the experts' group and are thus likely incomplete and non-comprehensive. Success factors were identified and derived through the critical review and analysis of the case studies and are further elaborated in the subsections of section 4.2. Overall, levers, success factors and structural interventions pave the ground for the required shift in the life frame of human-nature relationship from "humans and nature" to "humans as nature" (central blue arrow)" to be able to halt and reverse the loss and change of biodiversity. All these elements constitute preliminary findings of this report with the aim of fostering ongoing debates on systemic, transformative change; yet, the need of further investigation into them is acknowledged and called for.



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Annex 1 – ETC BE 2023 brainstorming sessions

Within the context of Task 1.1.5.2 "*Progress Assessment towards BD strategy 2030*" of the 2023 Action Plan for the European Topic Centre Biodiversity and Ecosystems (ETC BE), two online brainstorming sessions were organised in the first semester of 2023, which were then followed by an in-person workshop at the EEA premises (June 21, 2023) and two rounds of written consultation (via surveys and e-mails) in the second semester.

These sessions helped defining the rationale and the outline for this report; moreover, outcomes from those sessions offer expert-based indications on the perceived key societal barriers to reversing the change and loss of biodiversity, and related levers (when their identification was possible). To this end, three guiding questions were identified at the end of the first brainstorming session, which were then used to gather experts' opinions and feedback in the subsequent sessions[60]: 1) *What holds us back (at EU and global levels) from being successful in safeguarding biodiversity*?, 2) *Why are barriers to success not being removed*? and 3) *What would it take to reverse biodiversity loss and restore biodiversity*?

Full details on the barriers and levers identified by the experts are provided below, alongside with the list of the involved experts.

Expert's identified barriers: full list and description

The following table lists down experts' original answers to the question – *"with regard to the 2050 vision of the BDS2030, please identify what holds us back – at EU and global levels – from being successful in safeguarding biodiversity"* – and their grouping and synthesis.

Table A1.1 Barriers identification and description by experts in ETC BE 2023 brainstorming sessions

Barriers Description by experts	Barriers Topic
One of the key barriers has to do with our mindset in the way we relate humans to nature. That comes along an excessive, almost monopolistic, focus on utilitarian approaches to nature.	**Utilitarian mindset**
lack of multiple and diverse perspectives in decision-making.	
The main obstacle is the resistance to change our way of living (high living standards have changed our way of using natural resources). Our current [remedial] measures try to do little things here and there but are far too small to make an impact.	
Unwise framing and driving principles for managing agrifood systems in Europe. Pursuing 'productivity', 'efficiency', and 'growth' at all costs lead to paradoxical outcomes in the food system. NOTE: 1 thumb up	
Too many incentives that encourage unsustainable practices.	
Importance of biodiversity is seen very low on the political priority list. NOTE: 1 thumb up	
We are addicted (or inextricably dependent) on an excessive resource demand.	
This goal [BD protection] is in competition with many other goals (e.g., employment, energy security, food security) but the trade-off is not explicitly recognised. We do as if we could just "manage better" and the weaker goals like biodiversity preservation are losing out.	**Lack of knowledge**
Main mechanisms of biodiversity loss are ignored in policy debate. ('harmful subsidies' gives the impression that it is just about a few bad actors, rather than the overall material metabolisms being incompatible with the size of ecosystems that support humanity).	
Impacts through tele-coupling - makes it hard to link action with impact.	
lack of narratives that inspire meaningful biodiversity preservation.	

[60] A multi-step process was used to collect answers to these questions during the second (held online on May 15, 2023) and third (held in a hybrid form on June 21, 2023) brainstorming sessions. At the beginning without much framing to allow for a free flow, and then in a more structured way to channel experts' thinking.

Younger generations being in less contact with nature and therefore appreciating its importance less.	
My gut sense is: "resource security" needs to be a more central policy topic as it starts to bring biodiversity (and other envir. themes) into the real, of the "really important" economic questions.	
Too many decision makers (as well as the general public) are still thinking of biodiversity as a 'nice to have' rather than 'must have' - and they fail to see the real threat of biodiversity loss.	
High opportunity costs (at least perceived). NOTE: this is interpreted as BD conservation being perceived as having a high cost.	
Uncertain outcomes of restoration (not willing to take risks).	
Challenges in monitoring and measuring impacts on biodiversity.	
Biodiversity values are largely not yet incorporated in decision-making. NOTE: 1 thumb up	
There is no agreed metric to show whether we are making progress or not.	
The links between 'upstream actions' to biodiversity loss must be explained in a way that the general public understands, including using understandable metrics!	
[Tendency to] Focusing only on a part of the larger picture, for example on one actor or one sector, which means missing out on the larger picture. Any effect will remain local and small.	
Biodiversity and climate change are still seen as separate.	
The effect of harmful subsidies must be made very clear, even when they are put in place to boost either social or economic benefits.	
Lack of education.	
Biodiversity values are largely not yet incorporated in decision-making.	
Policies are driven by urban interests which are focused on "securing their demand" and do not give as much emphasis to "securing long-term availability" or maintaining the natural capital.	**Short-termism**
Increasing risk of biomass being seen as the solution to shortages in material supply, climate solutions, etc.	
Importance of biodiversity is seen very low on the political priority list. NOTE: 1 thumb up	
Short term projects unsustainable in the long term (conservation stopping with the financing, no appropriation from the local communities, etc.).	
Challenges in governing biodiversity across sectors, temporal and spatial scales (i.e., specific problem structure of biodiversity loss compared with climate change).	
A lot of narratives that confuse and detract - fantastical thinking about "biodiversity credits".	**Misinformation /Disinformation**
Impression that innovation can solve everything. NOTE: 1 thumb up	
How to deal with situations where there are no win-win options?	**Complexity**
[Tendency to] Focusing only on a part of the larger picture, for example on one actor or one sector, which means missing out on the larger picture. Any effect will remain local and small.	
Looking local when impacts are global. NOTE: 1 thumb up	
Uncertainty on the operation of complex systems where actions based on good intentions can result in negative outcomes.	
Different values of nature across social groups and cultures	
Supply chains are complex, competencies are scattered in several institutions, skills to support the deployment of more systemic changes are missing, lock ins from the production side in high- impact practices and technologies, lack of incentives, lack of perception of the severity of the biodiversity loss crises.	
A very skewed and limited set of powerful actors in the food sector.	**Unbalanced power forces**

Expert's identified levers: full list and description

The following table lists down experts' original answers to the question – "*please indicate the top 3/5 actions/decisions that, in your view, would be needed to stop the loss of biodiversity and restore BD*" – and their grouping and synthesis.

Table A1.2 Levers identification and description by experts in ETC BE 2023 brainstorming sessions

Levers Description by experts	Levers Topic
Better understand how the economy (and which activities) alters biodiversity and then adapt.	**Knowledge & data about anthropogenic impacts on biodiversity**
ABLE TO MEASURE PROGRESS? There is a basic condition: To have meaningful discussion, and observability, we need to decide what we mean by safeguarding biodiversity – how would we measure this? Otherwise, we have endless debates whether we are making progress or not.	
Consider climate change in biodiversity actions.	
In any meaningful biodiversity policy, we would need to recognise the 5 mechanisms that destroy biodiversity. And the respective weight of them is shifting. Like climate change is not such a big driver on biodiversity loss today but will become increasingly dominant. So, climate and biodiversity cannot be separated.	
One confusion is the marginal versus the absolute view. For instance, deforestation is merely a symptom of the absolute competition for nature's regeneration (if absolute demand becomes too large, it will manifest somewhere). So, protecting one forest here may come at cost of deforestation somewhere else.	
Problem of grandfathering: old agriculture that destroyed biodiversity 100 years ago is seen as less harmful than fresher loss. This may be a bias in favour of Europe that may produce resentments.	
Developing a risk-based approach to address the systemic mispricing of biodiversity risk in the financial sector.	
Time scales of impacts vary. For instance, invasive species grow over time in impact, not instantaneously, while deforestation is immediate. These different time scales may produce perception biases where we need to intervene.	
Provide guidance and capacity building on sustainable agroforestry and sustainable agricultural practices, including reducing the use of pesticides and fertilisers, investing in land regeneration, and developing state-of-the art techniques for improved water management, etc.	
There needs to be clear guidance for how companies, public authorities, and consumers can reduce their impact on biodiversity both voluntary steps, information, as well as green procurement rules or economic incentives. NOTE: *upon discussion, experts tended to be aligned on the fact that* there must be a way for all people in society to understand their role in biodiversity loss (knowledge brokerage).	
Standardisation of biodiversity data to ensure comparability and consistency across different datasets. This is key as financial decisions makers need ways to address the issues.	
Target the causes which are "upstream", i.e. those societal actions with a significant impact on biodiversity loss.	**Mainstream BD conservation across EU policies**
Give a higher value to avoided losses than to compensation activities.	
Hotspot protection is important, but only as a piece of strategy. It is like hoping that having zoos will protect biodiversity.	
Enhance coordination across policy domains and governance levels to improve coherence.	
Biodiversity needs to be featured more prominently in policies addressing production and consumption and vice versa. This could mean having a direct reference to biodiversity and efforts to reduce biodiversity loss in the next circular economy strategy. Similarly, the biodiversity strategy needs to make a direct reference to circular economy.	
Apply the precaution principle to all projects with a possible risk on biodiversity. NOTE: *upon discussion experts agreed that it is* better not to destroy in the first hand rather than destroying and trying to compensate and reconstruct.	
Reversal cannot take place without a visible change in how our societies use land and sea. All kinds of land and sea use cause habitat fragmentation and, as side products, also often pollution and disturbance (noise/visual). The most impacting forms of land use are agriculture and forestry. At sea the most impacting human activities are bottom trawling and coastal land use (incl. tourism). What to do to reverse the trend? Save large proportions of land and shore as protected areas.	**Increase protection of land and shore areas**
Ensure conservation of key biodiversity areas. Conservation is not in itself a solution but at the same time we need to protect some key areas because many biodiversity hotspots are not yet protected.	
Our protected areas should be made effective, rather than often being simple paper-parks.	

Limits on urban expansion (as land transformation and unsustainable resource consumption are liked to urbanisation).	
Set up contractual schemes for land stewardship preservation/restoration, which could be supported by Payment for Ecosystem Services schemes[61]	
Rethink resource use and material flows. (Links to reducing waste and biodiversity-friendly sourcing).	**Rethink production & consumption models (fair, shrunk & circular)**
Behind all 5 drivers is one bigger issue - size of human demand. There is some room for improving quality of use, but ultimately it is a QUANTITY question. and this QUANTITY question can be in competition with economic goals (enough food, energy etc.). So, addressing the QUANTITY question (of amount demanded) is central, but poorly addressed in EU policies.	
Targeting individual drivers or pressures without considering our overall production and consumption systems will have limited effect.	
Humans are in competition with other life for what ecosystems can regenerate. Hence there is direct competition for regeneration with wild biodiversity against domesticated biodiversity. Without reducing human demand significantly, biodiversity will not have space (now wild mammals on land are merely 2% of all the land-based mammalian biomass). Here is a recent paper on the global biomass of mammals - https://www.pnas.org/doi/10.1073/pnas.2204892120	
Finding an alternative to continuous growth / productivity /efficiency.	
The question of resource use competition needs to be far more central in the discussion. NOTE *during discussion, experts commented on the fact that* there are many goals in society and biodiversity preservation is just one. Trade-offs are always forgotten.	
To address biodiversity loss, we need to look beyond pressures and drivers to our production and consumption systems, without addressing them we cannot reverse biodiversity loss and restore biodiversity[62]. As such, among the main levers is to implement and scale up circular economy approaches.	
Three key areas in which the circular economy can be of help: 1) reduce primary resource demand (via increasing efficiency, extending products lifespans, and recycling materials), 2) prevent waste production, 3) biodiversity-friendly sourcing (e.g., via promoting regenerative practices that can reduce the negative impact of resources' extraction).	
Ensuring a just transition for affected stakeholders.	
Recent research indicates that the food, construction, energy and textile sectors account for approximately 90% of the pressure on biodiversity worldwide[63].	
Phasing out harmful subsidies. Financial institutions should not continue to fund projects that destroy nature.	
Pricing commodities according to environmental impact and redirecting financial flows so that harmful subsidies are replaced with incentives for sustainable activities	
Financial experts and biodiversity experts should work more closely	
Strengthen biodiversity in sustainable finance (taxonomy and corporate sustainable reporting).	
On the demand-side, reducing the pressures and impacts of food implies dietary changes moving away from animal protein, reducing food overconsumption and reducing food waste (by households).	**Transform EU food systems**
On the production side, actions need to be explored to protect ecosystems, to improve land management, decarbonise the supply chain and reduce food losses (along the production chain).	
Incentivising the transition to agroecology and other sustainable agricultural models.	
Improving food production methods to build resilience of natural systems and reduce environmental impacts, for example through sustainable intensification, agroecology, organic farming and halting overexploitation of fish stocks.	
Regenerative agricultural practices seem to be a promising way to restore soils, sequestrate carbon and enhance biodiversity[64].	
Reducing use, risk and dependency on pesticides and antimicrobials, and enhancing integrated pest Management.	
Reducing fertiliser use and nutrient pollution through integrated nutrient management.	
Reducing food losses and waste across the food supply chain, consumption sectors and households.	

[61] IPBES 2019. Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Inter-governmental Science-Policy Platform on Biodiversity and Ecosystem Services. S. Díaz, J. Settele, E. S. Brondízio E.S., H. T. Ngo, et al. (eds.). IPBES Secretariat, Bonn, Germany. 56 pages.

[62] The International Resource Panel estimates that 90% of global biodiversity loss can be attributed to the extraction of natural resources (mainly agriculture) and that we are heading towards a doubling of material extraction by 2060 (IRP, 2019).

[63] See EEA briefing "The benefits to biodiversity of a strong circular economy" published on June 12th, 2023.

[64] Dixson-Decléve, Gaffney, Ghosh, Randers, Rockström, Stoknes: Earth4All, New Society Publishers, 2022.

Creating a food environment that makes it easier to choose healthy and sustainable diets to benefit well-being and reduce health-related costs for society.	
Redirect finance and trade of food commodities, and mainstream sustainable food choices in a way that are accessible and affordable.	
Setting out a clear vision of a sustainable food system and further developing the policy framework with legally binding targets. NOTE: *Related to this, an expert suggested the* "development of national action plans (e.g., national dietary guidelines considering planetary boundaries, as well as improved human health) to reduce the consumption of the most impactful food commodities" *while another expert pointed out that* "reforming agriculture would require structural changes rather than relying on agro-environmental measures built on voluntary measures (compensated by EU subsidies).	
Embedding food production in a broader development perspective and promoting participatory social innovation.	
Mainstreaming more sustainable food options, making them more socially accepted.	
Regulation and incentivising of the use of nudging-type mechanisms and innovations to promote more sustainable choices (e.g., food choice architecture, such as positioning in stores, changing option availability, and quantity available, or by investing in the recipes, display and marketing).	
Transitioning to less animal farming, with reduced dependency on critical feed materials and improved animal welfare.	
Decrease the amount of meat production (and eating).	
Shifting food choices and diets towards plant-based dietary patterns and reduced meat and dairy Consumption.	
Supporting a global transition and ensuring that European food production, consumption and trade do not compromise food security or the environment of those outside the EU.	

List of Experts involved in the brainstorming sessions and online consultations

The following table contains the full list of EEA and ETC BE experts that have contributed to Task 1.1.5.2 during the course of 2023.

Table A1.3 List of experts involved in the brainstorming sessions and online consultations

ETC BE	EEA
Alessandro Galli (GFN)	Janica Borg
Mathis Wackernagel (GFN)	Jan-Erik Petersen
Maria Serena Mancini (GFN)	Gorm Dige
David Lin (GFN)	Dario Piselli
Henrique M. Pereira / Miguel Fernandez (MLU)	Tobias Nielsen
Pedro Beja / Joana Vicente / Angela Lomba (BIOPOLIS)	Beatriz Vidal
Josef Settele (UFZ)	Beate Hollweg
Samuli Korpinen / Sampo Pihlainen (SYKE)	Lorenzo Benini
Piero Visconti (IIASA) – Reviewer	Nicolas Roberts

Annex 2 – Basic design principles for Common-Pool Resources (CPRs) management

The lack of incentives to act for the common good can be studied by the concept of "tragedy of the commons". Under such "tragedy", the very same resources that are essential for human survival and wellbeing are selfishly compromised or destroyed (Garcia-Gonzalez et al., 2024). The global biodiversity and the ecosystems it inhabits – i.e., nature – are life-essential Common-Pool Resources (CPRs) that span across multiple jurisdictions and are regulated by different policies.
According to Dinerstein et al. (2020), the level of planning and foresight that is needed to properly scale nature conservation requires the emergence of a worldview that embraces the notion of "stewardship at a planetary scale". As such, creating the enabling conditions to successfully halt, reverse and recover the change and loss of biodiversity is one of the crucial challenges of the Anthropocene, and it requires reconciling the diverging views of the two main approaches for the governance of the Commons: the classic view of Hardin – calling for division and private property rights as the only way to avoid the "Tragedy of the Commons" (Hardin, 1968) – and that of Ostrom – suggesting coordinated actions for community-based management of common-pool resources (Ostrom, 1999).

The difficulties of collective behaviour have been studied in the resource economics literature, especially after the publication of the article *The Tragedy of the Commons* (Hardin 1968). Hardin's focus was on the human population growth, and the reasons why it was hard to limit. Hardin explains the main idea with an example of a pasture, which is open to all. Every herder is expected to maximise their number of cattle on this common pasture. More specifically, each herder decides (time and time again), is it profitable for them to increase the herd on the pasture with one more animal. The positive component from doing this is +1, since the herder obtains all the benefits this animal provides. The negative component comes in the form of degradation of the pasture as the result of overgrazing and can be in total thought to equal -1, but this is distributed among all herders, so the decision-making herder only experiences a fraction of it. Therefore, each herder concludes that it is profitable to add another animal to the pasture, again and again. However, the pasture has its carrying capacity and cannot feed an infinite amount of cattle. Therefore, the rational maximisation of own benefit did in this example does not lead to the maximised good for the society, opposed to the thought of the "invisible hand" (Smith 1776). This is, thus, one of the occasions which economists study and consider as *market failures*. These market failures are in economics typically solved with governmental intervention.

This type of situation has been studied by means of game theory. The classical game *Prisoner's dilemma* lays out the dynamics of the case. In its canonical formulation two criminals of the same gang are captured and prosecuted. They are offered a lightened sentence if they inform on their fellow criminal. The best outcome for them both would be if they both would remain silent. If they both inform, both face a long sentence. If one informs and the other remains silent, the informer gets a very light sentence and the other gets a very long sentence. Faced with this set of payoffs, both criminals will inform, leading to an outcome that is worse for both than would have been the case if both would have remained silent (Dietz et al. 2002). Is the tragedy of the commons avoidable? This has been studied extensively by, for example professor Elinor Ostrom. Ostrom has in her research outlined a general framework for analysing the sustainability of socio-ecological systems (Ostrom, 2009). Her main focus is on the conditions for sustainable use of natural resources, such as fisheries, forests and water resources. The concept of tragedy of the commons calls for the government to intervene in the resource use, since this concept implies that the resource users would never self-organise to maintain their resources in a setting of commons. However, there are documented cases where the resource users have achieved sustainability in collective action. Ostrom's research has systematised the success criteria behind these cases. It is important to note that the common-pool resources in question can be interpreted widely; the resource can for example be the global atmosphere where greenhouse gases are released, or global biodiversity as a whole.

In broad speaking terms, the probability of resource users' self-organisation is high, if the expected benefits from it surpass the costs involved (Ostrom 2009). Self-organisation takes time and effort and possibly a loss of short-term gains. There is also the inherent fear that some users will not follow the rules and, thus rule-followers are worse-off. However, if the users can trust others to follow the rules, a Tragedy of the Commons can be avoided. This situation is no longer described by the Prisoner's dilemma, but rather with another game, Assurance Game (Sen, 1967). In this game the best outcome for all is achievable without external intervention, it emerges from self-organisation. Such a best outcome, however, depends on prior expectations regarding the other's intended action.

Research on the use of common-pool resources has shown that possibilities to avoid the tragedy of the commons can be dependent on several variables in the subsystems outlined by Ostrom (2009). It is important to note the complexity and case-specificity of the issue, to understand how simple one- size-fits-all solutions often fail.

First, the characteristics of the resource system play a major role. Particularly the size and productivity of the system, as well as the predictability of its dynamics are variables that are found to be relevant for the willingness and capability for resource users to self-organise. For very large territories (of for example forests), the users are unlikely to self-organise because it gets costly to define the boundaries and to monitor the resource use. Furthermore, users need to observe some scarcity in the resource to motivate for the self-organisation. The resource system also needs to be predictable enough for the users to be able to estimate how their use norms would affect the resource development. Furthermore, self-organisation is less likely when the resource units are mobile, like migratory fish, because the costs of observing the system get costly.

In addition to the characteristics of the resource system, severable variables relating to resource users also play an important role (Ostrom 2009). If the number of resource users gets too high, self- organisation becomes costly. Furthermore, if some users of the resource are respected as local leaders, self-organisation becomes more likely. Importantly, norms and social capital among the users lower transaction costs in reaching agreements and succeed in self-organisation. Moreover, if the users have full autonomy at the collective-choice level to craft the rules, self-organisation is ever more likely. The users' common knowledge level of the resource system functioning is also an important variable in whether the self-organisation succeeds. The resource also needs to be important enough for the users to be motivated for the effort to self-organise.

To sum-up, the successful management of a common-pool resource (CPR) depends, according to Ostrom (1999) on some basic design principles: the presence of properly defined boundaries, rules and social norms for its use, a monitoring system to track its usage (by different users) and to punish free-riders, as well as the existence of a community willing to act as a steward of its own Common Pool Resources.

Annex 3 – Case studies

A3.1. Criteria used for the selection of Case Studies

Several questions guided our selection process for case studies to ensure relevance and suitability to this report, aligning with both its research objectives and the phenomenon under investigation (Kuzel, 1999). These questions include:

1. Does the case study illustrate how change can be triggered, both at the individual level in modifying personal behaviour or actions, and subsequently, how such individual actions contribute to collective efforts to alter existing larger system dynamics? Here also sheer motivation of individuals is meant. Although individuals may not have purposefully set out/planned to directly affect certain collectives or institutions, exactly these trends may end up happening as an indirect result of their "sheer motivation''.
2. How were success factors (i.e., levers) implemented to overcome existing barriers?
3. Does the case study cover interventions and settings capable of influencing a diverse range of stakeholders and behaviours, recognising the need for changes beyond individual motivation – and especially considering the collective and institutional levels?
4. Is there sufficient information available within a short timeframe to address all facets of the stakeholders triangle – individual, collective, and structural/institutional levels – as well as their potential interactions and synergies, drawing from diverse sources[65] such as grey literature, local newspapers, expert knowledge, and interviews (Kuzel, 1999)?
5. Can the case study identify win-win solutions with significant positive impacts on biodiversity conservation – despite the complex challenges that come with transformative change –, and help us evaluate whether impact-oriented goals have been achieved, ideally using evidence- based and measurable metrics?
6. Does the case study reveal assumable, scalable success factors that can be logically generalised to other contexts, facilitating rollout, prioritisation, and recommendations applicable across various EU regions (and beyond) and circumstances, while also considering the socio-economic drivers the case study will be up against, and the potential aggregate effects at the system level?
7. Did the positive outcome/success last?
8. Is the case study novel, offering insights not previously explored extensively?

We evaluated numerous potential cases against these criteria, omitting those that did not meet one or more criteria. Ultimately, we selected three case studies: 1) the "Save the bees" referendum in Bavaria, Germany; 2) the "Protection of critical water resources" in the Doñana wetland, Spain; and the "Land Stewardship initiative" in Menorca, Spain. Case study no.1 demonstrates the potential of collective action to alleviate regional biodiversity pressures (via interventions primarily addressing production aspects); no.2 examines how retail chains address supply chain responsibility with support and guidance from NGOs (thus primarily addressing consumption aspects); no.3 explores the conservation (as well as socio-economic) outcomes of an alliance between local farmers and a NGO. Due to limited publications on these three case studies, interviews were conducted between February and May 2024 with local experts and community representatives who were directly involved in the implementation of the case studies.

[65] Many of the necessary information for an in-depth analysis of case studies is not published in scientific papers but needs to be gathered from alternative sources, which are often in the native language of the case study.

A3.2. Disentangling the Case Studies

In this section, we present the three selected case studies individually. Each case study begins with a) an overview of its overarching objective, followed by b) a description of the process and the sequential steps leading to c) current outcomes and status quo. Emphasis is placed on identifying and addressing the barriers that hindered societal progress, enhanced biodiversity conservation, and ultimately promoted the well-being of both people and nature. While the process descriptions remain concise, additional details are provided in accompanying text boxes. For a deeper understanding of the success factors acting as catalysts, such as enablers, and the strategies employed to overcome barriers, referred to as the "how" and system-level validation, please refer to chapters 3 and 4, respectively.

A3.2.1 Case study 1: the "Save the Bees" public referendum in Bavaria

This first case study deals with the petition for a public referendum in favour of a stricter nature conservation in the Federal State of Bavaria, Germany. It is known under the motto "Save the Bees". The Federal State of Bavaria is the largest German Federal state, with an area of seven million hectares, of which approximately three million hectares are used for agriculture.

The overarching objective

The petition for the referendum "Biodiversity & Natural Beauty in Bavaria," known under the motto "Save the Bees," emerged in Bavaria, Germany, in early 2019, addressing the critical issue of insect loss and its impact on species protection. It aimed to enshrine the protection of flora and fauna biodiversity, the preservation and enhancement of existing habitats, and the mitigation of species decline in agricultural landscapes through amendments to the Bavarian Nature Conservation Act. According to Article 74 of the Bavarian State Constitution, the petition for a referendum required a detailed draft bill. Key provisions of the draft law included:

- Increasing the proportion of agricultural land managed according to organic farming principles to at least 20% by 2025 and 30% by 2030 (previously at 10% in 2019[66]).
- Prohibition of ploughing permanent grassland.
- Prioritising the preservation and protection of forest biodiversity in state forests.
- 10% of the annual grassland mowing may take place only after June 15[67].
- Establishing a biotope network covering 13% of open land area by 2027.
- Banning pesticides in nature reserves and other protected areas.
- Safeguarding various natural structural elements of fields, including avenues (with trees), orchards (over 2500 m²), field trees, hedges, borders, rows of trees, stone piles, natural stone walls, accumulations of dead wood, field margins, depressions, and small bodies of water.
- Prohibiting sky spotlights and similar insect-harming lighting systems in outdoor areas.
- Mandating the protection of waterfront strips with a width of 5m to foster the creation of "flowering meadows" and promote insect diversity.
- Enhancing nature conservation education in schools and vocational training.
- Requiring the state government to provide annual reports on the effectiveness of the measures.

[66] As part of the then-existing coalition agreement between the Christian Social Union in Bavaria (CSU) – a Christian democratic and conservative political party – and the Free Voters (FW) – a centre-right political party – an agreement was found aiming for a "medium-term" doubling without a specified date.

[67] The requirement that 10% of grassland may only be mown after 15 June from year 2020 onward does not apply to individual farms. The target is only to be seen nationwide. Support programmes and budget funds have been put in place for voluntary, cooperative implementation on individual farms.

The process

Three main steps can be identified in the design and implementation of the campaign for the "Save the Bees" referendum petition. They are summarised here below, while further details and a timeline of the steps are reported in Box A3.1.

1. Petition Application: The Bavarian regional association of the Ecological Democratic Party (ÖDP) drafted the bill for the referendum's petition, officially opening the campaign on May 18, 2018. With support from 50 partners, including state associations of the Social Democratic Party (SPD) and the Green Political Party of Germany (The Greens), the petition for the "Save the Bees" referendum began gathering signatures starting from that date. The initiators aimed for 25,000 signatures, the first necessary step toward a referendum in Bavaria; to this end, signature lists were made available through the campaign office, as well as in many health food stores. Initially, major environmental associations like the Federation for Nature Conservation (BN) and the State Association for Bird Protection (LBV) – with 200,000 and 100,000 members, respectively – did not support the referendum[68], citing limitations in state legislature authority over agricultural policy as a reason for not backing-up the petition. Despite this, on October 5, 2018, the ÖDP submitted the petition application to the Ministry of the Interior, having surpassed the signature requirement with a total of 94,700 signatures gathered.

2. Support Group Formation: Following approval of the petition application on November 13, 2018, by the Bavarian State Ministry of the Interior and Integration, district offices and municipalities received instructions (see the "Registration Period" section for further details) for the referendum procedures on November 19, 2018. Subsequently, on December 2, 2018, a meeting among the ÖDP, The Greens, and the LBV led to the establishment of a support group tasked with organising and funding the referendum campaign.

3. Registration Period: During the registration period from January 31 to February 13, 2019, individuals eligible to vote – at least 10% of the approximately 950,000 people entitled to vote[69] – were required to register with the local administration within 14 days to support the referendum. Concerns arose over cold winter temperatures deterring registrations, compounded by heavy snowfall in southern Bavaria, which disrupted transportation and campaign activities. Nevertheless, campaigning efforts spanned across Bavaria, attracting the attention of national and international media (e.g., from India, Japan and Australia). In Munich, Bavaria 's capital, 1.35% of eligible voters signed on the first day, reaching the quorum by the 8th day of the 13-day registration period. The success of the petition surprised political leaders (e.g., the Christian Social Union in Bavaria – CSU), as the Prime Minister and the Minister of Agriculture were still expressing doubts and showing opposition right before the start of the registration period.

[68] Both organisations joined the campaign later, as members or supporters of the support group.
[69] Anyone who would have been entitled to vote on the day of registration if a Bavarian state election had taken place on that day was eligible to vote.

BOX A3.1 – Regulation of the people´s legislative process in the state of Bavaria

According to Article 71 of the Bavarian Constitution, bills may be proposed either by the State Government, by the State Parliament, or through petitions for referendums. Request for approval of a referendum petition must be made to the Bavarian Ministry of the Interior, sent by 25,000 eligible voters (approximately 0.26% of the electorate), and must be accompanied by a draft bill with a justification of the subject of the referendum petition. The petition must pertain to a "closed subject area" to ensure unity of the matter. Signatures can be collected without time constraints, and municipalities must confirm signatories' voting eligibility within the past two years. The Ministry of the Interior assesses petition admissibility; if rejected, the Bavarian Constitutional Court reviews it. Upon approval, at least 10% of eligible voters must register within a 14-day period using registration lists available in official offices. The registration period is announced by the Ministry of the Interior, beginning eight to twelve weeks after announcement. The state election committee determines the registration outcome, and if over 10% register, the petition for a referendum becomes valid. The Bavarian government must respond to a valid petition within four weeks, submitting it to the state parliament for consideration within three months. The state parliament can 1) accept the petition unchanged, triggering its enactment, 2) reject it leading to a referendum within three months (NOTE: in this case, the state parliament can present its own draft law as an alternative for people to vote), or 3) dispute the legal validity of the petition, allowing signatories to appeal to the Bavarian Constitutional Court.

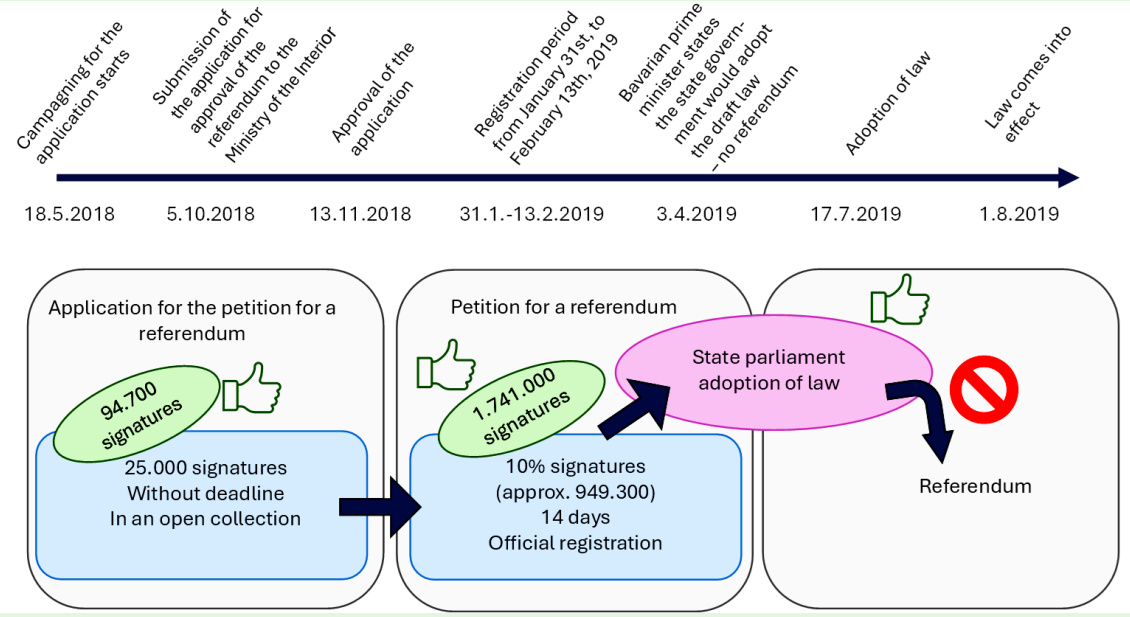

Figure A3.1: Structure of the three-stage people´s legislative process in the state of Bavaria and timeline of the "Save the bees" initiative.

The outcomes

Three main outcomes were achieved, at different points in time. They are summarised here below, while further details on a necessary, ancillary "Reconciliation law" are reported in Box A3.2.

1. Short-term – Implementation of a stricter Nature Conservation law: Out of 9.493 million eligible citizens, 1.741 million validly registered to vote (constituting a 18.3% participation rate), marking "Save the Bees" as Bavaria's most successful referendum to date. The Bavarian Prime Minister convened a "round table" on February 20, 2019, aiming to reconcile agricultural and conservation interests. Three round table meetings involving politicians, farmer representatives (e.g., BBV), and referendum initiators[70] – which were mediated by a former state parliament president – took place, along with four specialist groups addressing landscape, forests, water, and urban spaces (and intended to discuss farmers' criticisms and concerns and develop regulations for future implementation). By April 26, 2019, consultation results were made public[71]. While consultations were still ongoing, on April 3, 2019, the Prime Minister announced the government's adoption of the draft bill – as prepared for the application for the petition for a referendum, accompanied by a reconciliation law (see Box A3.2) based on round table discussions. With 167 votes in favour, 25 against and 5 abstentions, the Bavarian state parliament passed the law on July 17, 2019, which came into effect on August 1, 2019, alongside the reconciliation law. This latter includes financial compensation for farmers and aims for a climate-neutral administration in Bavaria by 2030.

2. Mid-term – Implications and monitoring of the Nature Conservation law: Full implementation of the law's measures is targeted for 2030, monitored annually[72] by the Bavarian State Ministry for Food, Agriculture, Forestry, and Tourism. A monitoring project has been launched, and a set of 32 indicators developed, with the goal to evaluate progresses in the implementation of the Nature Conservation law (and the accompanying reconciliation law) over ten years[73]. A first assessment, conducted in 2020, has showed that these laws are gradually having an impact, although with mixed results (Lenz et al., 2023): while funding for flowering plant promotion in agricultural landscapes has increased, interest in flowering areas has declined. Positive outcomes include increased insect detection (40% more insects in water edges of fields) and withdrawal from use of 60,000 hectares of state forest, which are now set-aside for biodiversity promotion. Challenges remain in the expansion of organic farming (13% of the agricultural area under organic farming in 2023 against a 30% target) and in the inclusion of organic food in the requirements for the procurement practices of canteens. The quality control of areas of the biotope network needs to be tightened – this is especially important, as this serves as a basis to improve measures and to increase and demonstrate the positive effects on biodiversity. The initiators of the referendum plan to renew awareness on the issues of the petition in mid-2024, through multiple actions and events.

[70] Among the initiators, representatives of the ÖDP, The Greens, LBV and BN took part. The state government was represented by the Prime Minister, the Minister of Agriculture, the Ministers for the Environment and Economy, and the state parliament by the Agriculture and Environment Committees. In addition to the Bavarian Farmers' Association (BBV), smaller agricultural associations were invited. Associations from nature conservation, forestry, hunting, fishing and beekeeping as well as representatives from municipalities, the German Alpine Association and the Catholic Church also participated.

[71] See https://www.umweltstiftung.com/fileadmin/sn_config/mediapool_umweltstiftung/volksbegehren/rundertisch_bericht_glueck_190426_final.pdf

[72] See https://www.stmelf.bayern.de/foerderung/agrarpolitik/agrarpolitik/index.html

[73] See https://www.anl.bayern.de/publikationen/anliegen/doc/an44115lenz_et_al_2022_gesetzesnovelle_zum_volksbegehren.pdf

3. Campaign's replication and Federal-level Initiatives: The success of the "Save the Bees" initiative inspired similar campaigns across German Federal States from 2019 to 2020, under the push of environmental protection associations. In response, the German federal government established an "Insect Protection Action Program" in 2019 and passed a law protecting insects in 2021. Additionally, amendments to the Plant Protection Application Ordinance proposed by the Federal Ministry of Agriculture were approved in 2021 by the Federal Government and the Federal Council, to safeguard insect habitats, reflecting growing nationwide concern for biodiversity conservation.

BOX A3.2 – Reconciliation Law: "Accept, Improve, Reconcile

The Reconciliation Law introduces several enhancements to alleviate farmers' challenges while incorporating technical refinements to the draft bill for the referendum petition, aiming to advance nature and species protection goals:

1. Grassland Mowing Time: The law clarifies that grassland mowing targets apply statewide rather than individually to farmers/companies, ensuring no loss of funding for the latter.
2. Restriction on Rolling Grasslands: Governments may determine a later rolling time post-March 15 in cases of local weather conditions, offering limited-time flexibility to prevent undue hardship and ensure effective species protection.
3. Open Landscape Biotopes Network: Expansion of the biotope network is pursued with spatial flexibility, encouraging voluntary participation from farmers through additional funding incentives (i.e., in accordance with the principle of "voluntariness before regulatory law"), and without land expropriation.
4. Orchards as Biotopes: Measures are introduced to preserve orchards as biotopes, offering monetary compensation for their classification to offset financial burdens.

Additionally, the Reconciliation law establishes numerous new and enhanced support measures for agriculture and job creation, with an annual allocation of €75 million. Additional incentives prioritise voluntary participation, including:

5. Expansion of support for organic farming
6. Targeted aid for young farmers
7. Financial compensation for waterfront strips
8. Expansion of the Bavarian Cultural Landscape Program for flower strips/green belts.

NOTES:

- The Bavarian Cultural Landscape Program (KULAP) encompasses voluntary environmental initiatives for farmers, rewarding those who exceed legal environmental standards with financial support from the EU, federal government, and Bavarian state.

The Reconciliation law text can be accessed from the Bavarian State Parliament website: https://www1.bayern.landtag.de/www/ElanTextAblage_WP18/Drucksachen/Basisdrucksachen/0000001500/0000001556.pdf

A3.2.2 Case study 2: Progress towards the reduction of illegal water use in agricultural supply chains supported and steered by NGOs - Doñana Wetlands

This case study presents the averting of a controversial plan to increase the extension of irrigable land by legalising illegal wells that would have placed one of Europe's most important and threatened wetlands, the Doñana in Spain, in even greater jeopardy. From the 1990s onwards, the region has developed into "Europe´s berry factory", with a high share of intensive farms. The management of the region is unsustainable, not based on the available scientific knowledge; many conservation and restoration projects which are included in government plans are not implemented, and an overall, joint political strategy is lacking. Large parts of the wetland have over time turned into dry bushland. Scientific evidence shows[74] that the area is on the verge of an ecological collapse - severely hitting the most water-dependent ecosystems.

After initial strong reactions from environmental NGOs, a group of leading UK and German supermarkets had criticised the draft law and were called upon by NGO campaigns, WWF Spain at first, to take responsibility for their supply and value chains in compliance with environmental as well as human rights protection and social standards. Not only does the water over-consumption pose a problem, but also the plastic pollution, including the pollution of coastal areas. Moreover, are the workers´ living and working conditions to be improved? Their low wages are an important price factor. The presentation of the overall situation and the interrelationships of e.g. farming techniques, market structure, consumption patterns and water scarcity helped raising awareness on the issue also outside of Spain.

The Doñana Wetlands are located in Andalucía, the Southwestern part of Spain and cover an area of almost 130,000 hectares, including a National Park. The Doñana National Park was established in 1969 and includes a UNESCO-listed national park and a Ramsar site[75]. The wetlands, with marshes and lagoons, provide habitats for migratory bird species as well as one of the world's most endangered cat species, the Iberian lynx. Due to climate change, events like droughts, changing rainfall patterns, higher temperatures are going to be longer in duration and more frequent, decreasing water availability. Additionally, and more importantly, water demand in the Doñana region has continuously increased in the protected area, and in the immediate surroundings and the estuary of the Gualdalquivir River. Extreme water overuse is driven by the production of berries and other types of farming activities as well as by the presence of golf courses and holiday homes of the urban population. Moreover, many of the water extractions supporting these activities are illegal[76]: they stem from illegal boreholes tapping into groundwater reserves that, otherwise, would be available to support/maintain and regenerate the Doñana wetlands. As such, this case study investigates the way in which food retailers could take responsibility for their supply and value chains and be supported and steered by NGOs.

The overarching objective

The objective of the conservation activities in Doñana is to address the significant decline in water supplies to the national park[77], which has drastically worsened over the past 30 years. This decline is due to a mix of climate breakdown, mining pollution, tourism and marsh drainage, as well as farming activities. The latter have played a key role, as the protected areas of Doñana are surrounded by many fruit and berry farms, which consume a vast amount of water. In addition to legal irrigation, around a thousand new illegal deep wells have been dug since the 1990s and gone on till recent years. NGO campaigns have aimed at

[74] http://awsassets.panda.org/downloads/wwf_dalberg_saving_donana_lr_spreads.pdf; https://wwfint.awsassets.panda.org/downloads/wwf_science-to-save-don-ana.pdf and references to scientific literature therein

[75] https://whc.unesco.org/en/list/685/; https://rsis.ramsar.org/ris/234

[76] It is estimated that 1.900 ha are irrigated via illegal wells.

[77] According to studies by the Biological Station in the national park, almost 60 percent of all lagoons in Doñana have dried up in the last ten years.

mitigating these impacts by addressing illegal water abstractions, promoting responsible and socially fair agriculture, with the final aim of ensuring the preservation of natural resources in the Doñana region.

The issue at stake is complex as agriculture is the driving force of the economy of the Andalusian province of Huelva, in which strawberries' production plays a major role (see Box A3.3). Despite a sentence to Spain by the Court of Justice of the European Union for neglecting legal obligations concerning water management and biodiversity conservation in the Doñana region, the threatened inscription on UNESCO's List of World Heritage in Danger and the removal of the park from IUCN's green list for failing to meet the necessary standards, the regional government of Andalucía proposed a law to expand the irrigable land areas around the Doñana wetlands, potentially granting amnesty to strawberry farmers who have been illegally extracting water[78]. On paper, the proposed law aimed to balance economic development with environmental protection, asserting that the aquifer will remain untouched and claiming Doñana's irrigated crops to represent an example of sustainable development. These claims have been disputed with scientific evidence[79]. Consequently, the negotiation focused on increasing fruit farm areas while preserving the fragile water and ecosystem.

Authorities' attempts to break the trend of increasing abstractions for irrigation have been ongoing for almost three decades. The first Plan for Sustainable Development in Doñana was approved by the European Commission and lasted from 1993 to 2000. It provided approx. 372 million Euros to the socio-economic area influenced by the protected areas. While successful in reducing the opposition to conservation and fostering environmental awareness among the local population, this plan also allowed further economic growth via the development of tourism infrastructures and greenhouse-based agriculture. As such, it contributed to maintain and fuel development expectations for the area (see Palomo et al. 2011[80] and references therein), thus failing to address the gap between conservation and development visions.

[78] Such an amnesty can be seen as a campaign gift to the influential agricultural sector in view of the regional and local elections in Andalusia on May 28, 2023, and the parliamentary elections at the end of 2023 in Spain.
[79] See for instance Doñana Biological Station EBD-CSIC, 2023
[80] https://www.jstor.org/stable/pdf/26268839.pdf?refreqid=fastly-default%3Aea44bab4e08f05c21da032cfd926a265&ab_segments=&origin=&initiator=&acceptTC=1

BOX A3.3 – The legislation system around Doñana ecological issues

According to the Interfresa association, the strawberry fruit sector provided 100,000 jobs in 2021 and almost 8% of the gross income of Andalusia. Of the 360,000 tons of strawberries produced in Spain in 2021, almost 90% came from Andalusia. Around a third, 113,000 tons, went to Germany, the world's largest buyer, and 20% are exported to the UK. Between January and June 2022, Huelva's exports of soft fruit were worth 801.3 million EUR. It is estimated that up to 1,900 hectares of land are illegally irrigated. Strawberries are harvested almost exclusively by seasonal workers, with between 80,000 and 100,000 people hired each season. Repeatedly, there are reports of poor working conditions or inhumane accommodation for migrant workers[1]. Spain has been sentenced by the judgment of 24 June 2021 of the Court of Justice of the European Union (C- 599/19 Doñana) for failing to fulfil its legal obligations under the Water Framework Directive (2000/60/EC) and the Habitats Directive (92/43/EEC), by not taking into account the illegal water abstractions for cultivation nor the water abstraction for urban supply in the estimation of total groundwater abstractions in the Doñana region, as well as by failing to provide any measure to prevent the alteration caused by groundwater abstractions to priority habitats (Doñana Biological Station EBD-CSIC, 2023). Following a monitoring mission to the site by experts from UNESCO, the International Union for Conservation of Nature and the Ramsar Convention on Wetlands, in 2021 the World Heritage Committee requested Spain to implement all recommendations of the mission[2], such as: ensuring that planned projects including water transfers, dam extensions, and licensed groundwater abstraction have no negative impact on the Outstanding Universal Value of the area; and also to encourage, incentivise and provide financial support if needed for the adoption of sustainable agriculture practices by farmers of the Doñana area. Despite this, Andalucía's regional government wanted to increase the area of irrigable land around the Doñana wetlands by about 800 hectares, thereby introducing a de facto amnesty for the strawberry farmers who have sunk illegal wells there.

It is important to note that both a Doñana Land-Use Plan[3] and the so-called "Strawberry Plan"[4] are in place. These plans aim to reduce water abstractions for irrigation, especially to control the amount of water that could be used on farmland around the protected area. However, these plans have not been fully implemented, thus failing to achieve their expected scopes. Consequently, irrigation has continued to increase.

The new draft law "Improving the planning of irrigated areas of the Condado de Huelva in the municipalities of Almonte, Bonares, Lucena del Puerto, Moguer and Rociana del Condado (Huelva)" was presented in the Andalusian Parliament in March 2023, ahead of the regional and local elections on May 28, 2023, and the parliamentary elections at the end of 2023 – possibly to attract local votes to the parties promoting the law. The text of the proposed new law stated that 1) the aquifer would not be touched, 2) Doñana's irrigated crops were an example of sustainable development and 3) Doñana was more protected than ever, as the preservation of natural resources is being guaranteed. These assessments have been refuted with scientifically sound figures, data and facts[5]. Thus, the strawberry issue was about to continue being a major topic of confrontation. Subject of the negotiations:

- Increasing the area for fruit farms that lead to an increased area of water extraction.
- Still fostering economic development in the region and protection of the already fragile water and ecosystem.

Box Footnotes:

[1] "DIE ZEIT April 17, 2024: "Strawberries from Spain: Why 1.50 euros for strawberries is an outrageous price" An analysis by Julia Macher and Ruth Fend"; About half of the workers stem from Spain. The other half come from other EU countries, but also from Morocco or Latin America.

[2] https://whc.unesco.org/en/soc/4220

[3] https://www.juntadeandalucia.es/export/drupaljda/04_001_decreto_aprobacion_def_341_2003.pdf

[4] https://www.juntadeandalucia.es/organismos/fomentoarticulaciondelterritorioyvivienda/areas/ordenacion/actuaciones-supramunicipales/paginas/plan-corona-forestal-donana.html

[5] Doñana Biological Station EBD-CSIC, 2023

The process

The process against the Andalusian government's proposal for additional agricultural use of the Doñana wetlands' ecosystem services – i.e., the "Improving the planning of irrigated areas of the Condado de Huelva in the municipalities of Almonte, Bonares, Lucena del Puerto, Moguer and Rociana del Condado (Huelva)" law – and finally its cancellation involved a series of steps and a combination of factors:

- Scientific opposition: Local scientists played a crucial role by issuing reports outlining the critical state of the local ecosystems. These reports provided evidence of the potential detrimental effects of increased water extraction on the Doñana wetlands (e.g., WWF, 2016[81]; Doñana Biological Station EBD-CSIC, 2023; de Felipe et al., 2023, Gil-Gil and Schmidt, 2024[82]).

- Public pressure: NGOs such as the WWF (active in the region since the '1950s) and Campact (a German association/NGO) and the general public actively voiced their concerns through protests, campaigns, and media attention. This public outcry amplified the issue and brought pressure upon food retailers and governments (e.g. in the UK, NL, CH and DE).

- EU and UNESCO intervention: The European Commission, having already condemned Spain for inadequate water management in Doñana, issued a strong warning of potential sanctions if the plan proceeded. The UNESCO World Heritage Committee reserved further steps as it sent a monitoring mission to Doñana and, ultimately, foreshadowed the possibility of inscribing the site on the List of World Heritage in Danger. These significant interventions added another layer of pressure on the Andalusian government.

- Negotiations and agreement: Negotiations occurred behind the scenes for almost two years until finally, in October 2023, a 1.4-billion-euro deal was made between the central Spanish government (Madrid) and the regional, autonomous Andalucian government (Junta de Andalucía) to help protect the Doñana wetlands from drought. They have pledged to invest 1.4 billion euros in the south-west of the Doñana region, thus targeting 14 municipalities in the provinces of Huelva, Seville and Cádiz. The planned financial incentives should encourage and compensate affected farmers with 100,000 euros (10,000 euros per year for a decade) if they stop cultivating their land and reforest it or grow crops that do not need irrigating. The foreseen national government's share is 70%, the Juntas's 20% and the remaining 10% are up to the Huelva provincial government. Up to this date, this deal has not been implemented.

Spotlight on the campaign in Germany

Campact[83], a German association that organises online campaigns, mobilised German consumers to sign a petition on their online portal. Campact swiftly mobilised 270,000 people to protest against the law that would have legalised irrigation of strawberry production in the vicinity of the fragile wetland ecosystem. Recognising the economic significance of agriculture, particularly strawberry production, in the structurally fragile Andalusian province of Huelva, the campaign strategically targeted local authorities by leveraging the economic value of strawberry exports to Germany. By spotlighting the potential repercussions on the region's economy and leveraging the reputational concerns of major supermarket chains presenting themselves as sustainable, the campaign effectively exerted pressure on companies' decision-makers. This was evident primarily on Edeka supermarkets and its campaign's effectiveness, as the expected image loss/image damage was greatest precisely because of their already intensive commitment in the field of

[81] https://awsassets.panda.org/downloads/wwf_dalberg_saving_donana_lr_spreads.pdf
[82] https://wwfes.awsassets.panda.org/downloads/science-to-save-donanaok.pdf
[83] Campact is a citizens' movement, which had about 2.5 million members and 80,000 sponsors at the time of the case study. The organisation builds up political pressure with the help of appeals.

sustainability[84]. This assessment proved to be true during the campaign. Campact reached out to several of its newsletter subscribers (about 180,000 out of approximately 2.5 million) describing the case and calling for donations for the campaign. Additionally, they engaged with the general public through provocative posters titled "We love drought – a national park in Spain is drying out for our strawberries" – an allusion to Edeka's advertising slogan "We love food" as also mimicking their corporate design – displayed in front of Edeka branches in several German major cities. This drew attention to the "No water theft for strawberries" campaign and sparked significant social media attraction. Although consulting with other organisations (e.g., WeMoveEurope and the WWF), Campact opted for an independent campaign tailored to German consumers, leveraging economic incentives for maximum impact.

The outcome

The agreement that was reached between the central Spanish government (Madrid) and the regional, autonomous Andalucian government (Junta de Andalucía) included measures to further protect the area, diversify the local economy away from its reliance on soft fruit, and develop a regulatory scheme to guarantee the environmental credentials of the fruit grown in the Andalusian province of Huelva. This action responds to the legitimate interests and expectations of the region's population with incentives for diversification of economic activities, including investment in education, industry and value-added services that are sustainable in the expected environmental scenarios.

It remains to be seen whether and how the promised funds will actually be made available, how well the distribution mechanism will work. However, the social perception of the environmental, economic and reputational risks derived from inadequate agricultural practices is rapidly increasing in the region.
While some say that the campaigns had little effect on the political decision in Spain, the case study displays the important role of the public opinion to drive transformative change, including biodiversity protection and climate change mitigation. In fact, the deal was the result of internal and external pressure on the one hand, but also a change in public opinion, and the multi-pronged engagement with people on the ground in the region to explain the need for urgent action. This also pinpoints to the need to intertwine environmental action into social and economic policy if better biodiversity protection is to be achieved.

Moreover, it was suggested to urgently initiate a multilateral working commission named "*Doñana 2030*", aimed at discussing the following arguments in a round-table discussion set-up (Biological Station Doñana, 2023):

- Rapid and coordinated progress in improving the governance and conservation of Doñana and its region,
- depoliticising technical management decisions and allowing the critical situation of the aquifer to be addressed,
- other key issues such as (i) water pollution, (ii) the loss of value of Doñana as a key site for breeding, migration and wintering of birds on a continental scale, or (iii) the intense overgrazing occurring due to overestimated carrying capacities for the current biomass production under today's rainfall.

[84] Edeka was the first German retailer to become a member of the Alliance for Water Stewardship, an international network of organisations promoting water management, which has introduced a certification standard for water management. Edeka and its suppliers were the first in the world to apply the standard in agricultural production. Since 2009, Edeka has been working with the Worldwide Fund for Nature (WWF) to promote greater environmental protection and sustainable action. The aim of the cooperation between Edeka and WWF is to reduce Edeka's ecological footprint and to sensitise their customers to more sustainable shopping.

It's important to note that this doesn't mean the issue is permanently resolved. The 1.4. billion Euro deal is not yet implemented and there has been at least one attempt to get the critical law passed – under a different title but with the same aim. Long-term sustainable water management strategies are crucial to ensure the economic viability of the region while protecting the delicate ecosystem of the Doñana wetlands.

A3.2.3 Case study 3: The "Land Stewardship" initiative guarantees food supply, secures a social livelihood, and preserves biodiversity – Menorca, Spain

The "Land Stewardship" initiative established a network of agro-natural farms on the island of Menorca, Spain, which mobilises private and voluntary stakeholders into nature conservation tasks. It promotes agricultural management practices and systems that enable a balanced coexistence of economic viability and local economic development on the one hand, and biodiversity protection and the conservation of local traditions and landscapes, on the other. At the core of this initiative is to reconcile human activities with environmental values. The concept of land stewardship was introduced to Spain in the '2000s, inspired by initiatives taking place in North America and Northern Europe. Already in 2004, the NGO GOB (Ornithology and Nature Defence Group) Menorca took up this new concept and created a local land stewardship programme titled Custòdia Agrària. GOB is a non-profit ecological association, which has been active across the entire Balearic Islands since 1973. In 1977 a GOB special group focusing on Menorca was established and it nowadays numbers a very vivid community of about 1,400 members. Taking action was and still is a pressing necessity as about 70% of the island is used for food production, but as the agricultural sector is facing changing market conditions, it results in uncertain income. Due to strong economic pressure to keep up with the global price structure, many small farmers have given up their farms. Unmanaged, abandoned farms have an altered, more woody fauna, leading to more homogenous habitats. Land speculation is also an issue. Moreover, the island was and still is facing environmental problems caused by the increasing intensification of many farms which, in the quest for economic survival, have decreased soil fertility, using large quantities of pesticides, irrigating large fields with aquifer water to produce animal food, and spread chemical fertiliser on the land, with nitrates leaching into the aquifer[85].

Menorca has an area of almost 700 km², approx. 100,000 inhabitants and is one of the Balearic Islands located in the Mediterranean Sea belonging to Spain. Menorca has no pristine, but a predominantly cultural landscape, as humans have slowly transformed the island´s terrain into a mosaic of cultivated fields, spaces of wild vegetation, heritage sites, and countryside areas with large intersecting dry-stone walls (12,000 km). In 1993, UNESCO declared the island as a biosphere reserve – especially in recognition of the balance between economic development, environmental protection, and the conservation of local traditions, heritage and knowledge.

The overall objective

GOB Menorca's main objective is to achieve an economic model compatible with environmental values. The Land Stewardship programme's objective is to stimulate the island's economy via local production models that preserve the cultural landscape. As food production and consumption are crucial elements in this equation, the preservation of the cultural landscape is achieved via the establishment (and subsequent implementation) of voluntary agreements among private farmers, landowners and GOB; these agreements allow for the creation of a financially and environmentally sustainable agricultural model. Under such agreements, the agricultural practices must align with three fundamental values: health, nature and proximity. The programme brings together economic viability – fundamental for the survival of the agricultural sector – with the preservation of environmental values – fundamental both for Menorcan society and the future of the agricultural sector.

[85] https://menorcapreservation.org/grants/gob-custodia-agraria-2021/

The farmers are encouraged to diversify production on the farms, to experiment with soil regenerative practices, to facilitate livestock management strategies and to apply environmental methods for pest control. More specifically, farmers managing agricultural holdings that have adhered to the Custòdia Agrària avoid pesticide use. Fruit and vegetable production is seasonal, and products are harvested when ripe and ready to ensure high nutritional value. Cattle graze at their own pace, while autochthonous breeds and local varieties are prioritised as they are adapted to the local climate. The farms use less water by prioritising rainwater harvesting practices; additionally, permanent water sources are created for wildlife to access when there is a lack of rainfall. Wildlife corridors are created on the farms to benefit local fauna, with vegetation growing alongside paths and dry walls. This encourages the presence of birds that act as a form of biological pest control. The farms' products have a reduced carbon and ecological footprint, as their production requires less natural capital and they are distributed to consumers via very short supply chains (i.e., only a few kilometres are travelled from farm to plate).

Overall, the Land Stewardship programme develops through 6 strategic lines (each then further broken down and detailed in actions to be performed):

(i) Agricultural resilience: Soil fertility, Water resources
(ii) Commercial resilience: Communication and promotion, Diversification of products
(iii) Environmental resilience: Biodiversity, Landscape
(iv) Training and consulting services
(v) Measuring impact: Monitoring the Ecological Footprint of products
(vi) Scaling up of interest: Land stewardship agreements, Social alliances, Creating an exportable project, Influencing policy and decision-making.

The process

Farms or estates that join the Land Stewardship programme sign – on a voluntary basis – a strategic alliance, the Sustainable Agricultural Practices Agreement, with GOB. All parties involved must find consensus in order to sign the agreement and reach the programme's objective. In doing so, they agree to work together towards achieving the most from both an economic viability and a conservation of natural values viewpoint (see above in the objectives section). The agreements are tailormade to each individual case and according to the type of farm and its practices. The agreement is initially signed for two years with the option for prolongation.

GOB task is to promote the farm and their products among other entities, both public and private, with the aim of providing aid either directly or by marketing strategies which will benefit the farm. Product promotion encompasses, among others, regular actions and events promoting the farm's products to enhance visibility and increase sales in the local market. Home delivery and buying directly from farmers ("cutting out the middlemen") is encouraged. The Custòdia Agrària logo/ label is not a certificate, yet it is a well-known and recognised brand that characterises the products and distinguishes them from the rest of the products usually available on the Menorcan market. The programme runs two shops and a market store.

Besides topics such as healthy food, strengthening of the local economy and reducing carbon and ecological footprints, community benefits are also part of the set of agreed measures[86], as the aim is to involve all relevant stakeholders (farm owners and managers, society/consumers, politicians). Each measure sets a time horizon for goal-achievement. The programme also includes training (farming techniques, marketing, etc.) and consultations between farmers and professionals in the agricultural sector. Also interested farmers are invited.

[86] Measures included in the agreement are: Type of crop, Crop management, Livestock management (only for farms with livestock), Management of natural elements and (voluntary) Complementary activities.

The programme moreover engages in school education and organises volunteer days. Activities are offered in schools and high schools all over the island and allow farm visits and first-hand experiences about the daily routines of the farmers. Moreover, since its beginning, GOB Menorca has fostered citizen involvement via volunteering sessions.

The agreement between the farmers and GOB is flexible in the sense that it allows other agents to be added later, such as public institutions or companies, who wish to support the agricultural land under the stewardship agreement. Implementing the list of measures includes a settling-in phase and follows a realistic timeline developed by both parties.

There is also direct investment in farms, including habitat and species inventories (botanical and ornithological). This is made possible thanks to funding from foundations, private and public donors and public grants. Financial support is translated into very specific, tailor-made projects that share the aim of changing the production model on the farm and inspire other places to do the same. The range of investments on farms that join the programme have 5 main areas of focus and action:

(1) Habitat conservation: when a farm enters the programme of Custòdia Agrària, usually a quite in-depth natural value inventory is carried out together with the Socio-Environmental Observatory of Menorca (OBSAM) to identify the habitats, species, etc. that can be found on the farm. This allows to make informed decisions about the forthcoming actions, give management recommendations and to assess the taken actions.
(2) Improving soil fertility: soil analysis, consultation services, rotational grazing systems are carried out.
(3) Biodiversity conservation: actions include bio-indicator monitoring and creation of water sources for wildlife.
(4) Improving water resources: actions include rain-harvest channel installation, traditional water tank (*aljub*) restoration using solar energy.
(5) Restoring landscapes: actions include waste removal, traditional wild olive tree gate installation.

The outcome

In 2004, the first 4 land stewardship agreements were signed with farms on the island of Menorca. Nowadays, 38 agreements are active, equalling 4% of the total surface of the island. Once having joined the programme, the farmers are able to compete with their products in the local food market that is otherwise monopolised by industrially produced foods.

Long-term monitoring indicates[87] a rise in the floristic inventories on farms having joined the programme. GOB also runs an annual bioindicator monitoring on 20 farms with volunteers[88] (following a simplified version of a butterfly monitoring scheme for butterflies and two other methodologies which GOB has designed and is regularly advancing to monitor plants and coprophagous insects in cow dung). There are also nesting boxes[89] installed on 4 farms where GOB revises annually what animals have nested (mainly bats). Moreover, there are nesting boxes installed for common kestrels and owls[90]. It is however challenging to quantify the impact even more. While much data is collected, the clear focus of GOB is on the implementation and promotion of agricultural practices that have previously been proven to have a positive impact on biodiversity and agriculture. Additionally, the farmers are interviewed regularly to see what impact they notice (an example is the installing of nesting boxes for birds of prey).

[87] https://www.researchgate.net/publication/366807228_Els_inventaris_floristics_de_les_finques_en_custodia_agraria_de_Menorca_una_informacio_pel_coneixement_i_la_gestio_de_la_flora_vascular_i_dels_habitats_Floristic_surveys_in_stewardship_farms_of_Menorc
[88] https://www.youtube.com/watch?v=DUxDd34xW8c
[89] https://www.instagram.com/reel/C1rlvvStJvF/
[90] https://www.linkedin.com/showcase/83700911/admin/feed/posts/

Moreover, analysing the Ecological Footprint indicates that buying products from the Custòdia Agrària farms is a sustainable choice when compared to national average footprints of comparable products. Producing a kg of beef and making it available to consumers in Menorca takes the farms of the Custòdia Agrària program about 26% less footprint than if the beef were produced conventionally in Spain; such a saving reaches up to 44% when the environmental benefits from land stewardship and conservation are factored-in [91]. Meanwhile, producing fruit and vegetables using Custòdia Agrària methods places a footprint on the environment that is about half of that of conventional Spanish products[92].

Farmers having joined the programme can claim recognition and social acknowledgement as key players in environmental conservation and land stewardship. Another crucial aspect of success is the network of agro-natural farms allowing farmers to work together, form alliances, giving a platform for support and learning from each other. So far, the products of the programme have not yet made their way into restaurants or agro-tourism in a significant way. Nonetheless, attempts for agreements between canteens and the farmers are envisaged.

Influencing policy is one of the strategic lines of the Custòdia Agrària programme. GOB Menorca is part of many "consuls" (committees) or working groups that help decide on policy actions for the island, together with other group representatives relevant to land and agriculture. Additionally, GOB:

- pushes for support - e.g. after an extreme climatic event [93] that destroyed many farmers infrastructures and crops
- suggests new lines of support to incorporate in the CARB (https://www.agrocultura.org/el-contracte-agrari-de-la-reserva-de-la-biosfera/), this is the support line from the Island Committee to farmers (Contracte Agrari de Reserva Biosfera).
- is mentioned as Custòdia and have influenced the Llei Agrària de Balears, the Balearic Agricultural Law[94].
- will be starting a "hub" through a European project using a "living lab" methodology, within a European Horizon project within the Soil Mission
- is an active member of several local, regional, national and international networks[95] in order to transform the reality of agriculture and support small producers that work in a respectful way with land and biodiversity.

Thus, GOB Menorca and its network of farmers together have quite a large critical mass and are at least heard when promoting the inclusion of the nature conservation perspective in institutional and governmental policy and decision-making. Especially, as they join forces and collaborate with other entities and platforms to achieve desired policy outcomes.

[91] See https://www.iucn.org/sites/default/files/2023-04/amnc_foodnected-factsheet_beef-menorca_v3_compressed.pdf
[92] See https://www.iucn.org/sites/default/files/2023-04/amnc_foodnected-factsheet_fruitandveg-menorca_v3_compressed.pdf
[93] https://www.menorca.info/menorca/local/2024/03/02/2117011/consell-resuelve-ahora-ayudas-por- temporal-2022.html - This happened in 2022 where there was a strong storm and hail.
[94] https://www.boe.es/buscar/pdf/2019/BOE-A-2019-3911-consolidado.pdf
[95] https://www.gobmenorca.com/recursos/

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