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A PROactive approach for Communities
to enAble Societal Transformation

D7.8 – Policy Guidelines Final Version

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BACKGROUND: ABOUT PRO-COAST PROJECT

The PRO-COAST project was launched in November 2023 to address the issue of biodiversity loss in European coastal ecosystems. Around 40% of Europeans live within 100km of the coast, relying directly on ecosystem services that are threatened by both quantitative and qualitative losses. Groups already facing socioeconomic vulnerabilities are likely to be disproportionately affected. PRO-COAST aims to empower local communities to support the restoration and maintenance of biodiversity and ecosystem services across Europe, integrating local knowledge into practice and policymaking. The project is coordinating the efforts of 20 partners across 14 countries working on 10 case studies. These case studies cover multiple conservation approaches across nine very varied coastal ecosystems, testing different governance models and social incentives to engage local actors in adopting technologies and actions for biodiversity conservation.

An important element of PRO-COAST is its holistic, interdisciplinary approach, based on a conceptual framework that treats social-ecological systems as interconnected. By mapping relationships between ecosystem components and uncovering feedback dynamics, the project seeks to identify leverage points for transformative change. PRO-COAST promotes integrated bottom-up decision-making, recognizing that environmental issues cannot be separated from social, economic, and political factors. Through extensive citizen engagement guided by state-of-the-art conservation science, the project aims to build community capacity for biodiversity management, providing scalable solutions that balance conservation needs with local socioeconomic priorities. Now in the final quarter of its three-year study, PRO-COAST has developed adaptive, participatory approaches to governance that are intended to avoid biodiversity losses and ensure sustainable, equitable access to coastal resources.

EXECUTIVE SUMMARY

This document presents policy-relevant recommendations from PRO-COAST, coordinated by the European Sustainable Use Group (ESUG). It argues that socio-ecological transformation depends on stronger links between community action, scientific evidence, decision-support tools, and responsive governance across local, national, and European levels.

The recommendations target policymakers, research funders, and public bodies responsible for environmental governance. They cover four areas: working with local communities; communication, knowledge exchange, and clustering between EU-funded projects; DG R&I research organisation; and wider action by the European Commission and national governments. The document stresses that progress requires public legitimacy, responsive institutions, long-term knowledge retention, and practical community tools, as well as technical solutions.

KEY MESSAGES

Top-down policy frameworks remain essential for priorities, resources, and regulation, but durable environmental transformation also requires meaningful bottom-up participation. Communities should help identify problems, set priorities, co-create responses, and monitor progress, with local experience feeding into higher-level policy and funding decisions.

PRO-COAST shows that community-based sustainability work cannot simply transfer organisational change models into local socio-ecological contexts. Effective change depends on trust, relationships, institutions, local knowledge, stakeholder vulnerabilities, and the distribution of costs and benefits. Policy

frameworks should allow time and flexibility to understand contexts, build relationships, and adapt methods.

SUPPORTING COMMUNITY-LED TRANSFORMATION

Policymakers should support community transformation through multi-level governance that enables, rather than directs, local action. Higher-level bodies should provide resources, evidence, regulatory clarity, and routes for community concerns to influence policy, with mechanisms for accountability, feedback, and learning.

Communities may contain more support for environmental progress than is publicly visible. Early assessment of attitudes can reveal shared concerns, reduce misperceptions and build confidence for collective action.

Policymakers should promote co-creation rather than imposed change, involving affected stakeholders wherever feasible while maintaining scientific integrity, inclusiveness, and regulatory standards. Co-creation should address trade-offs, including who bears costs and receives benefits, and consider mitigation, alternative implementation, or compensation where impacts are uneven.

Projects should monitor and communicate both environmental and social change, including attitudes, barriers, trust, and participation. Reporting aggregate findings back to communities can strengthen transparency, legitimacy, and adaptive learning.

Community action also needs accessible, engaging tools that help people understand local conditions, contribute knowledge, record progress, and support adaptive management. Their value depends on usability, trust, language accessibility, and meaningful participation.

IMPROVING COMMUNICATION AND KNOWLEDGE RETENTION IN EU PROJECTS

EU-funded projects risk losing knowledge, tools, and contacts after completion, reducing public value. CORDIS and related platforms should make outputs, deliverables, tools, methods, contacts, and case-study experience easier to find and use. Thematic sections or satellite platforms could help users navigate projects and identify expertise more efficiently.

Projects should clearly describe the tools, frameworks, and methods used in case studies, including their purpose, scope, and applications. Contact routes should be maintained where possible so adopters can obtain advice after projects end. The PRO-COAST Community Sustainability Platform and Conservation Human-Use Index illustrate how outputs can remain accessible.

Publication budgets should remain available after project completion, especially for open-access papers based on project data. This would prevent valuable findings being lost when analysis and peer review extend beyond the funding period. Preregistration or prospective analysis plans should be supported by strong research design from the outset.

Project clustering should rely on useful incentives, not excessive administration. Support for multi-project conferences, targeted networking, and continuation actions may be more effective than mandatory clustering. Direct dialogue between project leaders can promote collaboration, reduce duplication, and align outputs with policy needs.

DESIGNING RESEARCH FRAMEWORKS FOR PRACTICAL IMPACT

DG R&I and other funders should give ambitious interdisciplinary case-study projects enough time. Socio-ecological transformation requires early investment in shared understanding, relationships, local context, and methodological alignment. Projects of four years or more may be needed where case studies are expected to deliver detectable change.

Two-stage bidding should be used more widely for long-duration projects to reduce wasted effort and improve planning. However, call requirements should not change substantially after first-stage bids, as this can undermine fairness and consortium strategy.

Research frameworks should protect innovation beyond call wording, especially as AI makes it easier to mirror proposal language without improving project quality. Funders could reserve part of each call budget for highly innovative, interdisciplinary projects that address priorities such as biodiversity in ways not fully specified by the call.

Funding models should better recognise volunteer-based SMEs and civic-sector organisations in demonstrator projects. Europe could lead in multilingual environmental decision-support, civic science, and community engagement technologies if funding reflects the contribution of organisations that do not fit conventional commercial SME models.

PRIORITIES FOR EUROPEAN COMMISSION AND NATIONAL GOVERNMENTS

European and national governments should link biodiversity and ecosystem-service monitoring more directly to decision support for local managers. Monitoring must be paired with guidance that helps users interpret data, compare options, and adapt decisions. Remote sensing, digital platforms, and micro-incentives could broaden access.

Governments should promote multilingual environmental support systems. Effective action needs vertical links between local practice and higher-level governance, and horizontal links between communities and practitioners. Multilingual design is essential for genuinely pan-European adaptive management.

The voluntary sector should be recognised as a source of environmental science capacity, civic trust, and frugal innovation. As AI raises questions about credibility, open-source tools, and information quality, policymakers should support civic-sector environmental networking nationally, and internationally.

POLICY IMPLICATIONS

Environmental transformation should be treated as a socio-technical and governance challenge, not only a matter of evidence or regulation. Policies and research programmes should allow time for trust, participation, and learning; preserve durable, findable research outputs; support innovation, and post-project publication; and invest in accessible, multilingual decision-support systems for local managers and communities.

Overall, we call for a more connected approach to European environmental governance: linking local action with European coordination, integrating social, and environmental science, retaining project knowledge beyond funding cycles, and recognising the civic sector as a partner in practical environmental solutions.

LINKS WITH OTHER PROJECT ACTIVITIES

This deliverable (D7.8) is closely connected to all other PRO-COAST work packages, acting as a bridge between the project's scientific, operational, and engagement components. Insights from search and analysis in WP2 (Theoretical Framework), from development of the CHUI in WP3 (Biodiversity Management), and from joint work of WP4 (Framework Operationalisation) and WP6 (Stakeholder Engagement) to develop the Deep Change strategy for behavioural and organisational transformation are crucial for this report, while T7.4 on Cooperation and Clustering with Other Projects has provided further material. Finally, information from WP5 (Case Studies), especially on software development for Arne Parish in the UK, provoked research (also involving WP2) which revealed the stark difference in progress during the last 15 years of different types of online tools for communities. Continuing lack of environmental decision support tools for communities is a global issue, which the EU's ability to integrate environmental research and technology across languages could turn to a global advantage.



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1.INTRODUCTION

1.1. Scope of the document

The PRO-COAST coordinator, the European Sustainable Use Group (ESUG), has partnered in four previous Science Framework research projects, starting in Framework 5. In all cases ESU(S)G has had responsibility for the policy guidelines, and in the previous project also published the project findings as a book with fulsome endorsement by European Commission [TESS book]. The PRO-COAST guidelines are based on the project results, as well as such previous experience that has received further support before or during PRO-COAST [Sustainability papers: CHUI, CUSP]. They draw also on experience by ESU(S)G from implementation work with United Nations (Environment Programme and Intergovernmental Platforms), Council of Europe, and non-governmental organisations.

This is a time of appreciable political concern about the competitiveness of the European Union. Such competitiveness tends to depend on research. At a time when Artificial Intelligence (AI) can greatly facilitate bidding and has scope for use in assessing bids, much care is needed for funding allocation in future science frameworks, to assist EU competitiveness. Based on long experience of conducting successful projects, but also of spending disproportionate creative effort on unproductive bids and of struggling to survive between bids, we now address aspects of policy for bid management as well as wider environmental considerations.

1.2. Structure of the deliverable

We conclude this report by considering three types of guidelines:

1. Those arising directly from research in our Science Framework projects;
2. Constraints arising during bidding and the administration of such projects;
3. Opportunities lost through EU structural considerations revealed in 1 and 2.

However, before making Policy Guidelines from PRO-COAST, we examine the fate of policy guidance given in the last three projects, because that process too has implications for our recommendations here. Some of the guidelines, and the efforts made by ESUG to take relevant research forward have had interesting consequences, and we keep in mind the dictum of a Jesuit priest in Dorset, UK, to the effect that “one can achieve much in life if one is prepared not to take the credit for it”.

We also benefit from the clustering activities encouraged by our Project Officer, and from the late start of our project, by reviewing Policy Guidelines from other projects. A concluding conference of nine similar HORIZON projects during 3-5 June 2026 in Brussels, on Transitional Change for Biodiversity (TC4B) was a particular help. We draw on the many recommendations of the Intergovernmental Science-Policy Panel on Biodiversity and Ecosystem Services (IPBES). We also follow IPBES by providing a concise Summary for Policymakers and in rating guidance as based on evidence that is “Well Established” when there are multiple sources of evidence in favour and “Established but Incomplete” when there is positive but limited evidence.



1.3. List of abbreviations

The following abbreviations are used in this Deliverable:

AAPG	Addis Ababa Principles and Guidelines for Sustainable Use of Biodiversity
AEMBAC	Agri-Environmental Measures for Biodiversity Assessment and Conservation (project title)
AI	Artificial Intelligence
BAMBOO	Boosting new Approaches for flexibility Management By Optimizing process Off-gas and waste use (project title)
B-cubed	Biodiversity Building Blocks for Policy (project title)
BioAgora	Bio Knowledge Agora: Developing the SSBD for European Research and Biodiversity Policymaking (project title)
BIOcean5D	MARINE BIODIVERSITY ASSESSMENT AND PREDICTION ACROSS SPATIAL, TEMPORAL AND HUMAN SCALES (project title)
BIONEXT	The Biodiversity Nexus: Transformative Change for Sustainability (project title)
BIOTraCes	BIOdiversity and Transformative Change for plural and nature positive societies (project title)
BioValue	Fork-to-farm agent-based simulation tool augmenting BIOdiversity in the agri-food VALUE chain (project title)
CBD	Convention on Biological Diversity
CHUI	Conservation Human-Use Index
CirCHive	Developing & piloting biodiversity footprinting & natural capital accounting via a 'beehive' of sectoral hubs, for sustainable transition to a circular bioeconomy
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CLEVER	CLEVER: Creating leverage to enhance biodiversity outcomes of global biomass trade (project title)
CORDIS	Community Research and Development Information Service
CoCos	Country Coordinators
CUSP	Community Sustainability Platform
DAISY	DigitAI, technological and Social innovation mixes enabling transformation for biodiversity and equity
DG R&I	Directorate-General for Research and Innovation
ECSA	European Citizen Science Association
eDNA	Environmental DNA
EDS	Environmental Decision Support
EIA	Environmental Impact Assessments
EKLIPSE	Establishing a European Knowledge and Learning Mechanism to Improve the Policy-Science-Society Interface on Biodiversity and Ecosystem Services (project title)
eLTER	Integrated European Long-Term Ecosystem, critical zone and socio-ecological Research (project title)
EmpowerUS	Socio-economic Empowerment of coastal communities as users of the sea to ensure sustainable coastal development
ESUG	European Sustainable Use Group
ESUSG	European Sustainable Use Specialist Group of IUCN
EU	European Union
FP	Science Framework Programmes of the European Union (e.g. FP5-7)
FSC	Forest Stewardship Council
GEMCONBIO	Governance and Ecosystem Management for Conservation of Biodiversity (project title)

IAF	International Association for Falconry and Conservation of Birds of Prey
IAM	Integrated Assessment Methodology
iGIS	Intelligent Geographic Information System
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IUCN	International Union for Conservation of Nature
KPIs	Key Performance Indicators
LLMs	Large Language Models
MARCOBOLO	MARine COastal BiODiversity Long-term Observations (project title)
MORPH	Multilingual Online Restoration Project Hosting
MOSAIC	Mastering job-Oriented Skills in Arts & crafts thanks to Inclusive Centres of vocational excellence (project title)
NGO	Non-Governmental Organization
OPPLA	OPen PLATform for knowledge on natural capital, ecosystem services and nature-based solutions
OURCOAST	European portal for Integrated Coastal Zone Management
PEBLDS	Pan-European Biological and Landscape Diversity Strategy
PEER	Partnership for European Environmental Research
Planet4B	understanding Plural values, intersectionality, Leverage points, Attitudes, Norms, behaviour and social LEarning in Transformation for Biodiversity decision making (project title)
PLUS Change	Planning Land Use Strategies: Meeting Biodiversity, Climate and Social Objectives in a Changing World (project title)
PNAS	Proceedings of the National Academy of Sciences
PRO-CLIMATE	Proactive community adaptation to climate change through social transformation and behavioural change (project title)
REDS	Reciprocal Environmental Decision Support
SAFFIRE	Sustainable Action for Fauna and Flora in the Regions of Europe (project title)
SESF	Socio-Ecological Systems Framework
SELINA	Science for Evidence-based and sustainabLe decslions about NATural capital (project title)
SMEs	Small and Medium-sized Enterprises
SUSG	Sustainable Use Specialist Group (of IUCN)
SYCL	System for Community Liaison
SYKE	Suomen YmpäristöKEskus (Finnish Environment Institute)
TC4B	Transitional Change for Biodiversity
TC4BE	Transformative Change for Biodiversity and Equity (project title)
TESS	Transactional Environmental Decision Support (project title)
TESSA	Transactional Environmental Single Support Area
TransPath	Transformative pathways for synergising just biodiversity and climate actions (project title)
UKCEH	UK Centre for Ecology and Hydrology
UK	United Kingdom
UKRI	UK Research and Innovation
UN	United Nations
UNEP-CMS	United Nations Environment Programme – Conservation of Migratory Species
US	United States
WaterLANDS	Water-based solutions for carbon storage, people and wilderness (project title)

2. LESSONS FROM PREVIOUS PROJECTS

2.1. Four projects, one theme

European Sustainable Use Group (ESUG) has a long history of planning and coordinating research projects for the European Union. ESUG was established in 1997 as the European Sustainable Use Specialist Group (ESUSG) within the global Sustainable Use Specialist Group of IUCN. Global SUSG was a volunteer network of multi-disciplinary experts within the Species Survival Commission, one of 6 (now 7) commissions of volunteer experts within an organisation which since 1948 has grown to affiliate 90 states and more than 1,300 NGOs, with more than 20,000 members of Commissions.

The formation of SUSG, and hence ESUSG, was associated with the push by IUCN to implement the second pillar of Convention on Biological Diversity (CBD), on sustainable use of biodiversity. IUCN had been drafting for Council of Europe since 1978 and produced the first draft of what had become the Convention on Biological Diversity. IUCN's Sustainable Use Initiative, which created SUSG and its regional groups in 1997, was very strongly involved in drafting both for CBD's Ecosystem Approach (Malawi Principles) of 1998, which promoted adaptive management by local communities as part of ecosystems, and the Addis Ababa Principles and Guidelines on Sustainable Use of Biodiversity (2004).

These guidance documents from CBD, with which ESUSG was closely involved, became the basis for the three projects that preceded PRO-COAST:

- Agri-Environmental Measures for Biodiversity Assessment and Conservation (AEMBAC) 2001-04
- Governance and Ecosystem Management for Conservation of Biodiversity (GEMCONBIO) 2006-08
- Transactional Environmental Decision Support (TESS) 2008-12.

2.2. FP5 AEMBAC (2002-4)

The Committee of ESU(S)G has been designing and coordinating projects funded by the European Union since 2001. AEMBAC was a three-year EU 5th Framework project, co-financed by the Nando Peretti Foundation and coordinated by ESUSG as a part of IUCN, that concluded in February 2004. AEMBAC produced a set of "Practical Guidelines" which can be best understood as a series of eight steps, of which the first four are for Identifying agriculture's environmental impacts and related pressures, while the last five are for creating agri-environmental measures (Annex 1). The eighth step, following seven which were essentially work for ecological and agricultural experts, is to "Involve stakeholders and produce accounting and reporting systems". This reflects IUCN's thinking, as represented in its Commission on Environmental, Economics, and Social Policy and the UN's policy in the CBD's Ecosystem Approach (1998) and the Addis Ababa Guidelines on Sustainable Use of Biodiversity (2004).

In 2001, at the start of AEMBAC, ESUSG was also invited by the Council of Europe's Bern Convention to prepare a review paper on innovations in agriculture for an interministerial conference in 2002 to develop a 'Pan-European Biological and Landscape Diversity Strategy'. This paper for PEBLDS produced another

set of recommendations which were aimed at governments, relevant institutions, and organisations (Annex 2). One concluding paragraph is especially notable for defining ESUG strategy during the following three projects. It reads as follows:

“Much of the research to optimise conservation through sustainable use will need to be done in large, multi-disciplinary institutes, creating complex models that link food webs with land-use economics. In other words, the knowledge will be centralised. However, the new technology that enables construction of complex models in computers can also be used to disseminate that knowledge so that planning decisions can again be made primarily at local level. The models can be made a basis for expert planning systems to be used at local level, through the Internet. Moreover, local experiences can be fed back in the same way to help improve the models, and local planning monitored centrally to ensure the necessary connectivity for fragment-dwelling species. The adaptive management that is crucial for conservation (Holling, 1978) will be possible at all levels.”

ESUG bid, at that time, to the 6th Framework for a project called Sustainable Action for Fauna and Flora in the Regions of Europe (SAFFIRE) to develop this central-with-local knowledge exchange. However, the work was (correctly) considered too ambitious for one project. ESUG therefore joined with Tero company in Greece to bid for an intended sequence of (i) awareness raising, (ii) design and (iii) build and test. The final process – build and test - has finally occurred in PRO-COAST, as described in the following sections which lead to the Policy Guidelines for PRO-COAST.

2.3.FP6 GEMCONBIO (2006-8)

Using some of the planning in SAFFIRE, ESUG's member in Tero designed the project on Governance and Ecosystem Management for CONservation of BIOdiversity (GEMCONBIO). GEMCONBIO noted that in Europe, possibly more than anywhere else, human societies have altered the landscapes and species that occupy them to such an extent that most of our biodiversity-rich areas are reliant on some form of human management. Even with 18% of the European Union protected under Natura 2000, biodiversity was still declining. Following the production of the Millenium Ecosystem Assessment (2005), GEMCONBIO proposed that only through the equitable and sustainable management of natural resources in all areas would it be possible to maintain levels of biodiversity, by focussing on the ecosystem level and the services that ecosystems provide. Only through the realistic valuation (in all senses of the term) of ecosystems would we be able to achieve some form of sustainable development.

The overall objective of GEMCONBIO was: “to explore the interactions between governance modes and sustainable development objectives in view of identifying what governance processes and institutions can best contribute to the conservation of biodiversity” (GEM-CON-BIO project, 2006, Annex 1). Leaders of GEMCONBIO work-packages, who were mostly social scientists, arranged the analysis of 29 case studies at different spatial levels and time frames. The case studies analysed one or more specific uses of natural resources and biodiversity as follows:

- a) 17 in EU and US at ecosystem/local level;
- b) 3 pan-European studies of agriculture, fisheries and use of terrestrial wild species resources
- c) 9 in local and regional ecosystems in 'Non-Western' countries

An analytic framework based partly on the work of Ostrom (Ostrom 2007, 2009; McGinnis and Ostrom 2014) was used to develop 70 research questions/variables in clusters structured around natural, social, economic, and institutional resources, together with external drivers and major threats affecting case studies. Analyses of individual components that were essentially qualitative produced a large set of policy

recommendations (Annex 3) but ESUSG ecologists responsible for most European case studies favoured a more quantitative approach which aggregated many variables, for example into regulatory intensity (number of laws), strength of adaptive management (whether monitoring occurred and, if so, whether management changed as a result) and knowledge leadership (whether single or multiple knowledge sources were consulted and how often).

An analysis of all the factors that had evidence of effects from previous studies showed that adaptive management and knowledge leadership were most positively associated with biodiversity, resource sustainability and ecosystem services, with regulatory intensity weakly positive for biodiversity and negative for ecosystem services. Ownership (state, community, free access, private) and management types were much less important than these factors (PNAS paper).

2.4.FP7 TESS (2008-11)

ESUSG's third project investigated planning of land-use, noting that overall change in landscapes mainly reflected the myriad changes decided by local managers of land and species within an envelope of top-down legislation. Although a European Commission call for work on environmental decision-making was framed for top-down Environmental Impact Assessments (EIAs), the ESUSG design for a Transactional Environmental Support System (TESS) drew heavily on the PEBLDS paper, and the findings in GEMCONBIO regarding the importance of knowledge leadership and adaptive management, to contend that:

- ▶ central actors can collate complex knowledge and incentives to guide local decisions;
- ▶ they need local information to monitor and to adapt their knowledge and incentives;
- ▶ local actors must also gather local information to make and monitor their decisions;
- ▶ the local information can be exchanged for decision support that benefits livelihoods.

The designers of TESS, ESUSG and Tero company in Greece, appreciated that transfer of knowledge to assist local decisions could only occur at scale through the internet, with decision support software in multiple languages complementing the small number of experts available to assist local adaptive management. One TESS partner, the UK Centre for Ecology and Hydrology (UKCEH), had found many such software tools developed by its staff, who had started using Bayesian techniques to handle issues of uncertainty. Another partner, the Tallinn University of Technology in Estonia, created a global database for such software (Piirimäe & Aruvee 2014), while Anatrack organised a Case Study in Arne Parish.

TESS also surveyed work on decision making, not only by governments at national level to the most local levels, but also decision making by individual managers of land and species and by the organisations (for hunting, fishing and birdwatching, as well as for harvesting fungi and plant materials) which federated these stakeholders at national levels. This required a team of Country Coordinators, organised through the ESUG, to translate questions and code open-ended responses. The initial findings indicated a strong need for decision support tools at local level that could use fine-detail mapping. Ten case studies demonstrated that local people could use software that was well designed and in local languages to do such mapping (Papathanasiou & Kenward 2014). The case studies also confirmed a GEMCONBIO estimation that private spending on ecosystem-based activities exceeded €60 billion/year (i.e. greater than all agricultural subsidies, let alone a small fraction set aside as public payments for ecosystem services). In TESS, ESUG developed an approach with 80% response rate for sampling local communities at random

across Europe and used this to show that an index of attitudes to biodiversity related strongly to the initiation of EIAs (Kenward et al. 2013).

TESS concluded that a multilingual 'intelligent' Geographic Information System (iGIS) could deliver decision support to all levels (but especially local), that private spending could probably support this and that uptake by the 120,000 local communities across Europe might be possible. Policy Recommendations and Guidelines were provided (Annex 4), both to improve the use of biodiversity data for statutory assessments by governments, and to collate and use mapping of land and species by local people in case studies, which they could do very effectively. However, in terms of providing model-based decision support for local people, the project found a huge information gap.

Of 386 tools recorded by 2011 in the TESS project, 205 were accessible enough for their origin and use of language to be reviewed. These included 76 (37%) from Europe and 119 (58%) from North America. Only 19 (9%) of the 205 were in languages other than English, with 9 in one non-English language, 8 in English and one other language and 2 in English with two other languages. Moreover, among 198 of the 386 tools (51%) which could be downloaded and assessed for ease of use, only 14 (4%) were deemed usable by non-experts and only 10 were designed for decision making at the local use. Of the 10, one was in French as well as English and two were only in Hungarian. Thus, a tiny minority of tools were available for use by local managers and even fewer in languages other than English. Even in English, the only substantial decision support available was for agricultural and forestry production, with little on managing for wild biodiversity.

Therefore, a system was designed, in TESS, to provide widespread decision support, in multiple languages, for local people. As a first step towards this, a website was launched in 24 languages, with a multilingual mapping tool and links to the most useful map-based decision support. An initial proposal to reach all local communities across Europe was again considered too ambitious, with insight from within Directorate-General for Research and Innovation that such pan-European work was not considered desirable.

ESUG therefore discontinued bidding for further EU projects and focussed on building a series of multilingual platforms for research and education, in the hope that policies might change. These are summarised in section 2.5, below. It took ten years to find the funding, through invitation by Tero to coordinate the social-science-based bid PRO-COAST, to obtain funds for a multilingual platform that encourages sustainability by communities across Europe. In the meantime, North American software technology giants, based more on consumerism than sustainability, have become ubiquitous for social media, search functions and news at local level worldwide. Support for environmental management and sustainability is not one of their priorities.

2.5. Establishing Online Networks

2.5.1. Sakernet

The original TESS site was built by ESUG in 2011 as a Multilingual Online Restoration Project Hosting (MORPH) platform to translate 30 European languages, of which 24 were used on the website <https://www.naturalliance.eu>. The aim was to encourage the engagement of many of those involved in different activities depending on land and wild species, ranging from farming and recreational fishing to walking and watching wildlife - all contributing to conservation. Information on best practice management



was provided as well as a tool for mapping habitats through a multilingual mapper that was available to download). In its first five years the site achieved about 50,000 visits (most frequently in English and with Russian as the second most used language).

The level of interest motivated an upgrade to naturalliance.eu in 2015, along with the launch of a site for conservation of the Saker Falcon (*Falco cherrug*) in five central Asian languages (Arabic, English, Farsi, Russian, and Urdu), in cooperation between the Convention for the Conservation of Migratory Species (UNEP-CMS), Birdlife International and the International Association for Falconry and Conservation of Birds of Prey (IAF). For this <https://www.sakernet.org>, the MORPHmaster staging site was upgraded to handle texts reading right-to-left. Sakernet was intended to host a system for falconers and trappers of the Saker Falcon to work with international authorities to monitor marked wild and trained falcons. That system is yet to be built but the funding for Sakernet from UNEP-CMS and IAF was a lifeline for ESUG, whose members serve, as in IUCN Commissions, as volunteers.

2.5.2. Perdixnet

At that point it was realised that the top-down approach of a single multilingual hub could best serve also to transact knowledge if national and local satellites could be more creatively edited, and richly linked, than was possible for MORPHmaster. A System for Community Liaison (SYCL) had already been developed, for initial trials with local authorities and clubs in the UK, as <https://sycl.net>. Initially, for Sakernet, one SYCL satellite site was linked to the MORPHmaster hub to coordinate the science-based partners in English.

It was then realised that top-down-with-bottom-up communications would be most effective if SYCL satellites could operate in every language on the MORPHmaster, with instructions in that local language so that no knowledge of English would be needed to run a satellite. The MORPHmaster hub was upgraded to link to a separate satellite for each country and language (e.g. even to the point of separating Deutschland-Deutsch from Schweiz-Deutsch) to make networking possible at global-with-local (glocal) levels. This led to the creation in 2017 of <https://www.perdixnet.org> as a network capable of hosting 33 languages and 43 satellite language-areas. Subsequently five Perdixnet satellites were created, with the German and UK satellites becoming independently active.

2.5.3. Naturalliance.org

In the meantime, the European Sustainable Use Group had become independent of IUCN as the global SUSG had been replaced in 2011 by an inter-commission group for Sustainable Use and Livelihoods (SULi), across the Commissions on Species Survival and on Environmental, Economic and Social Policy. ESUG changed its name to reflect this. When another group for Sustainable Use and Management of Ecosystems (SUME) was founded in 2014 within Commission on Ecosystem Management, ESUG became a support group for both new entities within IUCN. ESUG joined IUCN as an NGO member for Belgium in 2025. Its members continue voluntary work, at weekends or in retirement, to support IUCN's quadrennial Programmes.

In 2018, ESUG agreed with IUCN to host a highly multilingual <https://www.naturalliance.org> with global capability (hence hosting all likely non-Latin scripts, including those reading right-to-left). With 88 language areas available, the international presence of IUCN and IAF enabled the establishment of 38 linked satellites by providing translatable content for each, initially as a single home page. IAF, which had commissioned Perdixnet, then also required Sakernet to be converted to a network with links for satellites



in 10 local languages (a single link on the first version was to a site in English for scientists). The advent of Covid motivated an upgrade of sites to three translated pages, two of which gave information on avoiding infection by the virus. Whereas 39 naturalliance.org satellites started in three years, there was relatively slow development of satellites for both Perdixnet and Sakernet (Table 1), for which there was no provision of content by the team that had built the hub.

*Table 1: The development by ESUG, before and for PRO-COAST, of multilingual online networks for conserving species and ecosystems. A high proportion of satellites in local languages on **naturalliance.org** and **pro-coast.eu** (cells with red outline) reflects translation of standardised satellite content.*

	Year	Languages		Satellite links	
	Launched	Available	Used	Available	Used
Naturalliance.eu	2011	30	24	0	0
Sakernet.org version 1	2015	5	5	0	(1)
Perdixnet.org	2017	33	18	43	5
Naturalliance.org	2019	54	44	88	39
Sakernet.org version 2	2019	10	10	15	2
Pro-coast.eu version 1	2024	20	15	30	21

Thanks to volunteer administration and expert translators who volunteered time for IUCN, the cost of establishing the naturalliance.org network with its first 32 satellites was €4,680. After all the current 39 satellites were established, the 52 translators and satellite builders were surveyed to assess ease of translation on the hub and of building sites in the separate system for satellites. Responses were obtained from 46 (89%). Among 29 of them who had been asked to set up satellites, (79%) found it “easy” or “very easy”. Only 4 respondents found it “difficult” (3) or “very difficult” (1). Several respondents suggested that groups managing satellites should have forums for discussions and on which those with difficulties could be helped. The use of forums was initiated for PRO-COAST but hindered by disengagement of one partner.

The groups of volunteer experts in IUCN Commissions are not well funded. Typically, they bid every 1-2 years for about US\$2,500 of funding to leverage the holding of events or send representatives to external meetings. IUCN’s sustainable use groups and NGO members also have an uncomfortable position in the conservation politics of this broad-church organisation. On the spectrum from strict protection and animal rights (which is accommodated in IUCN) to unconstrained hunting and commercial use (which is not), sustainable-use interests are considered inadequately committed by both extremes, while also a threat both to the “protect and reserve” business model and the kudos obtainable from successful conservation through sustainable use. It took ESUG six years to re-enter IUCN as an NGO member.



With a need for full funding to do any full-time research, winning contracts from UN or EU is the most frequent way for ESUG to conduct substantial projects which are truly in the civic sector, influenced neither by corporate economics nor by national state politics. The challenges of both surviving and bidding for such projects were initially aided by development of the internet. However, with AI now able to fit text very precisely to terms of detailed calls, we feel that innovative approaches in our bids, which gave a success rate 15 years ago of about one in three bids, will fail to gain attention among the far larger numbers of bids which can be created to conform precisely to call requirements but which are less likely to have novel approaches.

2.6. Council of Europe: Bern Convention Charters

Early international conventions for environmental conservation were essentially for top-down protection (e.g. Paris 1902, CITES 1973). However, the Bern Convention (1979) and Bonn Convention for Conservation of Migratory Species (1979) both recognised roles of culture and sustainable use as motivations and tools for conservation, after which the Convention on Biological Diversity (1993) had three pillars: the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of benefits arising from genetic resources. Conservation was widely taken to mean protection of species, despite IUCN's reminders that it also includes restoration, for which sustainable use is a powerful motivation and tool. Work by IUCN in three quadrennial programmes from 1996 to 2008 helped to emphasise the importance of local actions and responsibilities for sustainable use of biodiversity.

In 2007, the Norwegian government worked with the European Sustainable Use Specialist Group of IUCN Species Survival Commission (ESUSG) on a European Charter on Hunting and Biodiversity for the Bern Convention. The Bern Convention is the Convention on the Conservation of European Wildlife and Natural Habitats which was inaugurated at Bern by the Council of Europe and has annual meetings of its Standing Committee in Strasbourg. The convention, which encompasses 50 states and has observers who represent NGOs and representatives of other Multilateral Environmental Agreements, was the basis for the EU's Birds Directive (1979) and Habitats Directive (1992); the EU's Natura 2000 network is based on the Bern Convention's Emerald network.

The Charter on Hunting and Biodiversity is based on two important agreements of the Convention on Biological Diversity (1998, 2004). These CBD documents are the 'Ecosystem Approach' (or Malawi Principles) and the Addis Ababa Principles and Guidelines for Sustainable Use of Biodiversity (AAPG). The Ecosystem Approach and AAPG are intended not to be prescriptive but advisory, and to give equal consideration to social, economic, and ecological issues. A total of 26 principles were condensed to 12 simple recommendations in the Hunting Charter (Annex 5), and for two other charters (Recreational Fishing and Biodiversity and Fungi-Gathering and Biodiversity) that followed.

In the full text (<https://rm.coe.int/168074649f>), under each principle, is advice that conservation will be enhanced if a set of guidelines are followed. A charter is a document that agrees responsibility of government towards citizens, effectively conferring rights as well as responsibilities for citizens. Thus, the Bern Charter for Hunting and Biodiversity not only has guidelines for hunters, but also for regulators so that they too can help hunters to benefit conservation of biodiversity. Moreover, although the guidelines developed by IUCN's ESUSG originally were designed to cover hunting, the 12 Principles above do not mention hunting specifically. They therefore embrace (with suitable guidelines) all aspects of conservation through use of wild resources. The Ecosystem Approach and Addis Ababa Principles and Guidelines for Sustainable Use were relatively easy to combine because both originated in the Sustainable Use Initiative

of IUCN. In 2008, IUCN passed Resolution 4.26 that appreciated adoption of the Charter, requested members to promote it and invited governments and NGOs more widely to develop similar trust-building tools. ESUSG then developed two further Charters that the Bern Convention adopted, on Recreational Fishing and Biodiversity (<https://rm.coe.int/090000168074699d>) in 2010 and on Fungi-Gathering and Biodiversity (<https://rm.coe.int/0900001680746764>) in 2013.



3.LESSONS FROM CONTEMPORARY PROJECTS

3.1. Rationale

The principle of clustering with other projects is very important. However, clustering needs to involve long-term projects and other research organisations, as well as past and current projects in EU Science Frameworks. A great inefficiency of the current Science Framework system of short projects is that results are overlooked by the science community when organisations lack the resources for publication of results after projects. Long-term projects and other organisations are likely to adopt the most important findings from Horizon projects that align with their interests, although that may mean that material most relevant for innovation continues to be overlooked. ESUG is privileged that, through coordination of PRO-COAST, it has had the opportunity to review developments and draw awareness to publications of which the significance has only recently become apparent.

3.2. Clustering activities by PRO-COAST

Searching CORDIS revealed 72 projects with some resemblance to PRO-COAST in that online assessment showed them to have case studies, community engagement, integral social science, or a coastal situation. Of this total, 59 (82%) projects aligned with PRO-COAST to the extent that they had case studies but only 22 (31% of the 72) also included (at least to some extent) both community engagement and social science. Of these, just 4 were also coastal.

From the list of 72 projects identified, 44 projects were contacted by email, 1 was approached through an online event, and ongoing communication is being maintained with 2 through shared partners. The remaining projects were either no longer active (4 projects) or did not list a direct contact person, providing only an online form instead. Of the 44 projects contacted by email, 14 responded (all positively), representing a response rate of 32%. Twelve projects, including 9 of 11 respondents with similarity scores of 2 or above, and 3 others with lower similarity scores, were enthusiastic enough to retain contact and were therefore featured on the PRO-COAST website. These, with their similarity scores on a scale of 1-5, are B-Cubed (1.5 similarity score), BioAgora (1), BioValue (2.5), BIOcean5d (1), CLEVER (2), EmpowerUS (4), MARCOBOLO (2), MOSAIC (2), PLUS Change (2.5), PRO-CLIMATE (3), SELINA (2), and WaterLANDS (3).

As a further effort at outreach to other projects, PRO-COAST organised a series of three webinars at monthly intervals for January, February and March 2026. These covered the main exploitable products of PRO-COAST, including the Deep Change Model, the Conservation Human-Use Index and the Community Sustainability Platform CUSP, its most innovative tool. Although advance publicity, focussed on Horizon projects and longer-term research organisations, produced a list of about 80 registrants, the number attending the webinars declined from about 50 to about 40, of which a majority were members of PRO-COAST partners. There were never more than a dozen attendees from outside PRO-COAST.

It is worth noting that, along with the 12 Horizon projects with which PRO-COAST has kept in contact (but which will soon, like PRO-COAST, be coming to the end of their funding), PRO-COAST has links with 6 other European organisations for longer-term research. These are Alternet, e-LTER, and PEER (through affiliation to UKCEH of one Coordinator in ESUG), ECSA (through Tero), OPPLA and OURCOAST. Other organisations with which we link are listed in D7.4 and D7.5. These contain the stakeholder organisations at European level who have consistently supported ESUG's networking and other outreach efforts when their resources have permitted.

As a result of much work using CORDIS for searches of projects funded in EU Science Framework and Horizon calls, and of several other PRO-COAST searches during work on the CUSP, we developed a number of recommendations which may be useful to DG R&I. These recommendations are considered in more detail, along with the recommendations we have developed for policymakers more widely, in Section 5.

3.3. Guidelines from other initiatives

3.3.1. IPBES report on Transformative Change

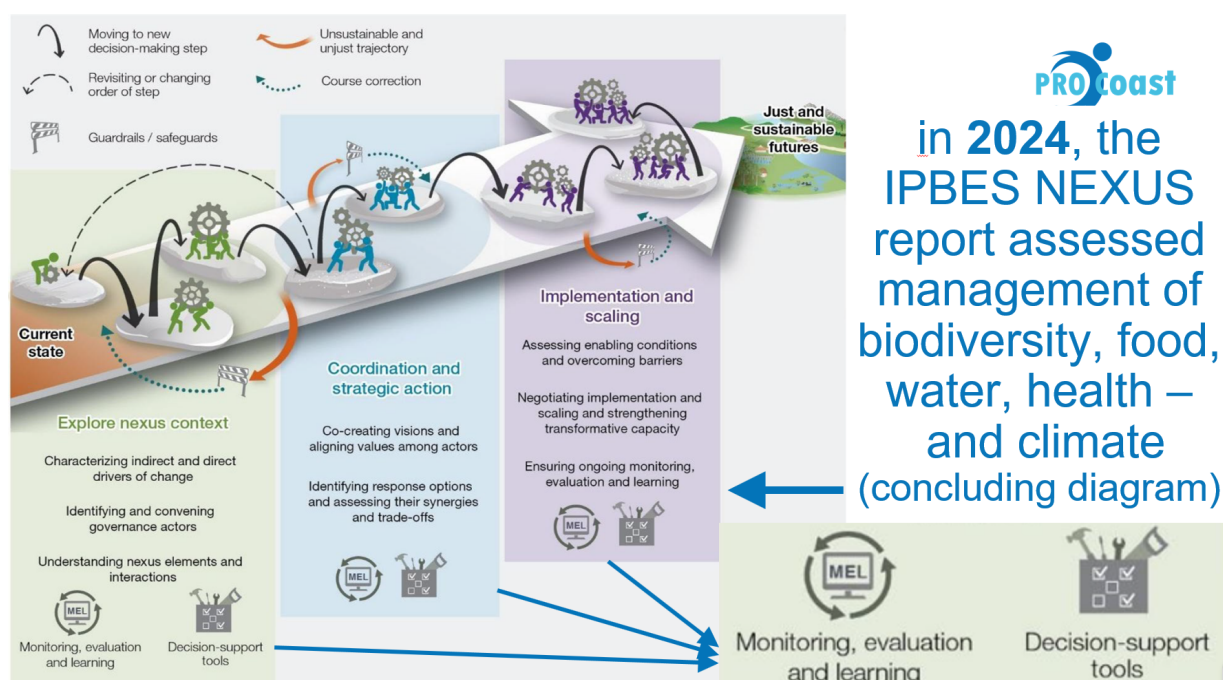
Following the PEBLDS paper, ESUG became strongly engaged with an initiative led from within DG R&I as an early GoogleGroup which became an organiser of meetings and other initiatives, the European Platform on Biodiversity Research Strategy, an open forum of scientists, policymakers, and National Biodiversity Platforms. Established in 1999, EPBRS functioned as a think tank to identify knowledge gaps, promote collaboration, and ensure that biodiversity research priorities effectively served environmental policies. The forum traditionally met twice a year under the rotating EU Presidencies to discuss strategic research needs and was a forerunner of groups such as EKLIPSE and IPBES, created in 2010, before its main organiser retired in 2013. A particular achievement of ESUG occurred during that period, at the 2009 conference in Athens at which Minister Stavros Dimas admitted failure to stop biodiversity loss by 2010, which was to ensure that Restoration became a prominent part of incoming EU strategy.

As ESUG was no longer a group in IUCN after 2011, the ESUG Chair at that time engaged with IPBES at invitation of UK government through a stakeholder organisation, Anatrack Ltd, a biodiversity-based business creating environmental software (and responsible for the UK Case study in PRO-COAST). This led to an invitation in 2016 to assist with scoping for the IPBES Assessment on Sustainable use of Biodiversity (2020) and work to review this, along with comparable Reports: on the Futures Framework (2021), Alien Species (2022), Transformative Change (2024) and the Assessment on Interlinkages between Biodiversity, Food, Water, and Health, the 'Nexus Report' (2024).

At the start of the process, the Anatrack/ESUG team had particular help from government of the Netherlands, through an IUCN Councillor, to ensure that the Assessment considered not merely how use of wild species could be kept sustainable short-term but also how that process could contribute to conservation of the species' ecosystems and hence also sustainable long-term. In the conference to accept the report, Parties also agreed a change, recommended by the team, that acknowledged achievement of sustainability by a group of responsible stakeholders. While reviewing later reports, a group of experts was built within ESUG and related NGOs to assess draft comments before submission to IPBES.

In the case of the Reports in 2024 on the Nexus and on Transformative Change, comments from the Anatrack/ESUG team were provided also to the EU team for IPBES. It was especially gratifying that many comments made during these and previous reports, on the importance of Adaptive Management at local level and about use of Decision Support Tools to assist that management, resulted in these aspects featuring strongly in the final diagram of the Nexus report's Summary for Policymakers.

Figure 1: The final figure in the Summary for Policymakers of the Nexus Report, as explained by ESUG to PRO-COAST partners and in dissemination events.



Whereas the PRO-COAST team had contacts, through affiliation with UKCEH, to one chair of the Nexus Report, there had been less contact with the team for the IPBES thematic assessment on The Underlying Causes of Biodiversity Loss and the Determinants of Transformative Change and Options for Achieving the 2050 Vision for Biodiversity, which ran in parallel and had started well before PRO-COAST. However, the Report on Transformative Change was reviewed by the ESUG team and, through the good offices of the European Commission Project officer for PRO-COAST, passed to the EU team for IPBES comments. Unfortunately, pressure of work from PRO-COAST in October 2023 prevented participation from PRO-COAST at the IPBES Plenary in Namibia where the Transformative Change and the Nexus Report were approved. The Key Messages and Background statements from the IPBES Report on Transformative Change are in Annex 6. Support from them for Policy Recommendations is noted as {IPBES-TC-XX} where relevant.

3.3.2. Related Horizon Projects

Lesson to draw from this is that clustering seemed to occur most fruitfully with projects in which direct contact already existed with members of partner organisations, with 5 of 11 containing partners with which one member of coordination has annual contact compared with less than a third (16) of the other 53

projects that did not respond. In the presence of large numbers of projects, for which inclusion of social scientists is making survey increasingly frequent as a tool, there is a fatigue for clustering activities. After three decades of promoting international cooperation through science programmes, during which communication has changed from letter to internet and language differences have become greatly reduced through automated translation of increasing sophistication, the EU may be considered to have overcome internal science barriers.

Efforts to encourage clustering by particular projects as official requirements, unless very carefully designed by DG R&I to include projects that Project Officers know should work together (both for synergies and to avoid problems better recognised in a particular project), risk detracting from the research able to be conducted within projects. Arranging incentives for clustering, through multi-project conferences (see Section 3.4 below) and cooperation actions that provide continuation funding, are likely to be most fruitful.

3.4. The TC4B conference

Three members of ESUG attended the conference in Brussels on Transformative Change for Biodiversity, including the chair and former chair and a former committee member who remains CEO of Tero, the administrative partner in PRO-COAST Coordination. The conference included the following projects: BAMBOO (on trade in biodiversity), BIOTraCes (on governance to enhance innovations), BIONEXT (on the biodiversity nexus), TransPath (on transformational pathways), DAISY (on digital technology and social innovation especially for agrifood), CircHive (Mainstreaming biodiversity footprinting on sectoral hubs), Planet4B (on pluralistic values and intersectionality) and TC4BE (on Transformative Change for Biodiversity & Equity). It was also strongly influenced by BioAgora, which is developing an enduring Science-policy interface for biodiversity based on the contention that Europe has much biodiversity knowledge which is often mismatched to policy. ESUG has close contacts with BioAgora, through SYKE as PEER member of the Consortium (one PRO-COAST coordinator being a Fellow of UKCEH) and has attended all its online and physical meetings during PRO-COAST.

The ESUG participants considered the most interesting sessions of the conference to be the panel in the opening session on “Why Transformative Change Now?” presentations, and the concluding Breakout session in Track C on “Futures for Transformative Change for Biodiversity Research”. The opening panel included two members familiar to us through clustering activities, including with IPBES, but the most memorable presentation was from DG Environment, in which it was pointed out that too much attention was being paid to the classy and conspicuous cheetah, which tended to tire after a fast sprint, and too little to the small steps of the ants, which led to substantial constructions. This describes elegantly how the slow but steady work of ESUG to gather and disseminate multilingual information to all levels has been overlooked by a system focussed on funding 2-5-year projects.

The concluding breakout session on “Futures for Transformative Change for Biodiversity Research” involved BioAgora in moderation and three of the presentations. During that session we were shown results of a survey by Leiden University on ‘Prefigurative’, ‘Reinforcive’ and ‘Countervailing Power’ to which PRO-COAST had contributed. Finally, a whiteboard was used to collect Post-Its with examples of projects operating on ‘governance’, ‘awareness-raising’, ‘social-ecological science’, and ‘technology’ topics at scales from international to local. Whereas PRO-COAST could post in each topic at local level, only one other project posted at this level, placing the word ‘artists’ under ‘awareness-raising’. The focus of PRO-COAST on supporting bottom-up activities seemed to be unusual in this cluster and may explain why, despite previous messages to six of the nine projects at the conference, only BioAgora had

responded to our messaging. Another issue with current clustering is that it tries to set up links after the fact. During the grant preparation process, project budgets are fully allocated and often stretched to cover all the work that a project envisions. Having additional funding and personnel time to cover clustering activities can be difficult. There should be additional funding available for clustering activities - reserved from the main funding - for successful projects.

In terms of material from the cluster on Transformative Change for Biodiversity to inform PRO-COAST policy recommendations, no Policy Briefing or set of succinct Policy Recommendations was found for BAMBOO (<https://bambooproject.eu/resources/>), while DAISY (<https://mydaisy.eu/>) and TC4BE (which has no website yet) have started too recently for this. TransPath has given many analyses of policy development pathways, including three workshops (most recently at the TC4B conference in June 2026). These are given in several reports at <https://transpath.eu/library>. However, no overall set of guidelines or recommendations had been produced by the time this deliverable was written.

BIOTraCes has produced two Policy Briefs at <https://www.biotraces.eu/resources/#policy>. The substantive parts of both are in Annex 8. The first focussed on lessons learned from how SDGs are implemented and experienced in local and diverse contexts, with policy recommendations resulting from that. The SDGs are not seen as helpful to the promotion of transitional change at local level, due to being inadequately radical, enforceable and adaptable to complex social realities including need for local empowerment. The second Policy Brief gave, and discussed, simple recommendations to reduce the problems which were recognised earlier. These recommendations are:

1. Cherish local biodiversity innovations;
2. Make room for marginalised voices;
3. Foster cross-scale learning and amplification;
4. Encourage civic engagement and contestation of biodiversity policy priorities;
5. Mainstream biodiversity together with social justice across broader policy agendas;
6. Imagine nature-positive and just futures.

BIONEXT leans heavily on the IPBES Transformative Change Report (IPBES 2024) and a later publication (Valve *et al.* 2025) to produce a succinct and effective Policy Brief <https://www.bionext-project.eu/policy-brief-2>, which is given more or less completely in Annex 8. As the main focus is to promote bottom-up action, this material was of considerable interest for PRO-COAST, not least through its own consideration of the IPBES report.

CircHIVE focusses on biodiversity footprinting and natural capital accounting as processes for enhancing biodiversity. The project has produced 3 Policy Briefs, on Soil Monitoring, Biodiversity Credits, and Forestry Resilience and Disturbance. A series of five reports follow an overview of existing standards and standardization activities in the fields of biodiversity footprinting and natural capital accounting. These Policy Brief and Reports, for which links are given in Annex 8, are primarily for use by corporations working with biodiversity conservation NGOs and government planners.

Planet4B, a sister project of BIOTraCes, has (at <https://planet4b.eu/project-documents/>) some policy proposals on a number of issues, especially on Fashion, Private Finance, Resilient Trade, and Farm Seed Diversity, but also in consideration of Pathways for Change, Engendering action, Knowledge Products, Change Stories, Scaling in the EU and Beyond, Leverage points, etc. There is educational material than will need linkage on the CUSP being run by PRO-COAST.



4. LESSONS FROM PRO-COAST

4.1. Project structure and role of Coordination

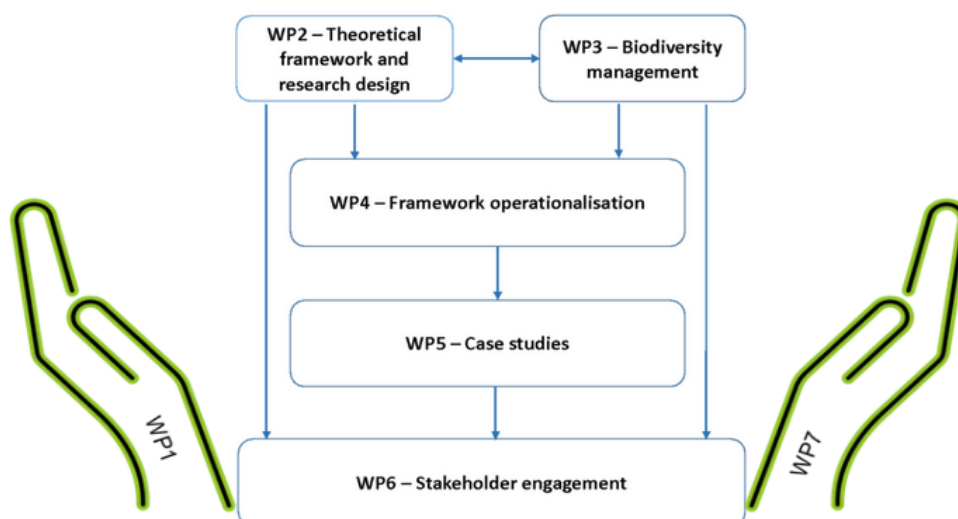
PRO-COAST was designed to support socio-environmental work in ten coastal case studies in a way that could both be guided by social scientists and where the approaches of the social scientists could be studied to assess the success of that guidance. This process was foreseen in the layout of PRO-COAST Work-Packages (Figure 2).

Within the Work Packages the bid had included 25 Deliverables across all WPs, 15 Impact Targets across WPs3-6 and 11 other Key Performance Indicators (KPIs) for Dissemination activities in WP7. This seemed a reasonable commitment for Coordination in a strongly multidisciplinary project with 20 partners in 14 countries, especially because an extensive WP7 included also responsibilities for ESUG to “Draw on the network of Country Coordinators (CoCos) that has been maintained by European Sustainable Use Group” to build a “communities sustainability platform [CUSP] ... modelled in the framework of existing ESUG initiatives SYCL (System for Community Liaison) and Naturalliance...”; which will provide “‘must-have’ tools for biodiversity conservation”. The end of the project requires “Massive scale-out” on “the project network of multilingual websites and social networking presence.” Although the project funding ends in 2026, ESUG has responsibility for the CUSP until 2033.

Coordination of PRO-COAST has been challenging. To the supervision responsibilities of coordination of 25 Deliverables and 26 KPIs that were included in the original proposal more were added during negotiation. There were an additional 25 KPIs across all WPs and five more Deliverables because of splitting existing deliverables in WP2 and WP7, both work packages being led by Coordination. This included additional clustering responsibilities in WP7. The opportunity to learn by clustering with other projects in the Horizon Cluster on Transformative Change for Biodiversity seemed sensible because the delayed decision on PRO-COAST funding meant that the project was starting a year after most of them. At this point in time, we consider that all KPIs should be achieved by the end of the project. It would have been preferable for more time to be spent testing the CUSP before massive scale out but this had not been possible due to the heavy coordination responsibilities as we have outlined here. Actual scale out of the multilingual CUSP, featuring the innovative tools and research findings of PRO-COAST, is not a direct KPI (although it affects Dissemination KPIs) but adversely affects exploitation prospects because there is no funding for this incubation process. There is a recommendation for DG R&I to consider this further in Section 5.



Figure 2: The Work-Packages of PRO-COAST, emphasising the importance throughout the project of Management (WP1) and Dissemination (WP7).



4.2. The Case Studies

Case studies in previous projects managed by the PRO-COAST ESUG partners had included extensive socio-ecological work with local volunteers. PRO-COAST, however, introduced an additional level of complexity. For the first time, case study activities were accompanied and assessed systematically by social scientists, while case study partners were simultaneously expected to host local activities, contribute to project communication and dissemination, and provide evidence and data for the development of the Community Sustainability Platform (CUSP).

The potential burden associated with these multiple responsibilities was recognised at the PRO-COAST kick-off meeting. In particular, repeated requests for data and information from different social-science work packages risked placing excessive demands on case study partners and local stakeholders. It was therefore agreed that WP6, working closely with WP5, would assume a central liaison role between the case studies and the social-science activities.

A further challenge resulted from the one-year delay in the start of PRO-COAST. Six of the 20 partners in PRO-COAST, including four of the seven WP leaders, subsequently became involved in another Horizon Europe project, PRO-CLIMATE, which focuses on proactive community adaptation to climate change through social transformation and behavioural change. PRO-COAST and PRO-CLIMATE therefore share six partners, including organisations involved in WP2, WP5 and WP6 of PRO-COAST, as well as two case studies. While this created additional coordination demands, it also generated opportunities for methodological exchange and future dissemination synergies, particularly in relation to community engagement and behavioural change.

The delayed start also affected the development of individual case studies. For several of the nine partners, case studies were based on socio-ecological matters already current in the study communities. In one case, developments during the delay meant that the originally planned case study was no longer suitable for the purposes of PRO-COAST. The partner subsequently identified two new and highly relevant case study opportunities, requiring a formal Project Amendment.

To address these coordination challenges, Tero and ESUG (both with heavy coordination responsibilities as well as leading WP1 and WP7), responded to the difficulties in two ways. Firstly, Tero and ESUG

introduced monthly two-hour online meetings involving all project partners. These meetings combined dedicated sessions for case study leaders and WP leaders with joint discussions of cross-cutting issues. The format provided case study teams with an opportunity to raise practical challenges while allowing social scientists and WP leaders to coordinate research requirements, data collection and stakeholder engagement. This was particularly important in reducing duplication and ensuring that requests for interviews, behavioural data and other case study information were coordinated rather than made independently by different parts of the consortium.

The second step was for ESUG to strengthen the capacity of its team in social sciences by addition a Docent (assistant professor) in environmental psychology with a background also in ecology and software development. Finally, Coventry University, as leader of WP6, established regular bilateral online meetings with individual case studies in parallel. Together, these mechanisms created a more integrated interface between case study implementation and the project's social-science activities. The coincidence in time with PRO-CLIMATE also offers potential for longer-term dissemination and exploitation. In particular, shared interests in climate adaptation, social transformation, and behavioural change may support knowledge exchange and dissemination across European communities during the 2027–2033 period, when ESUG will continue to support CUSP.

From a social-science perspective, this coordination was particularly important because the behavioural-change research required repeated engagement with different stakeholder groups across countries and case studies. Rather than treating individual data-collection activities as isolated research tasks, the project increasingly sought to coordinate interviews, surveys, and case-study evidence within a common framework. This allowed the social-science work to capture not only behavioural outcomes, but also the motivations, perceptions, barriers and contextual conditions underlying behavioural change.

4.3. The literature reviews

During the first six months of Pro-Coast, six literature reviews were conducted in D2.1 to set the scene for the social and ecological science to be conducted. These reviews covered:

1. Impacts of biodiversity loss on coastal ecosystems and ecosystem services.
2. Direct and indirect drivers of biodiversity loss in coastal ecosystems.
3. Governance of Coastal Biodiversity.
4. Communities impacted by biodiversity loss and their role in biodiversity restoration.
5. Influence of demographic, cognitive, affective, attitudinal, and societal factors on coastal biodiversity.
6. Ways that transformative change has been utilised to halt coastal biodiversity loss.

These literature reviews contributed to the development of hypotheses to be tested during the research, but also substantially to the Socio-Ecological System Framework design during the same time period in D4.1. The results thus informed the work in Sections 4.4–4.7 below. They also substantially informed work on two of the early mid-term reports, in months 15 and 16 of the project. The first of these was D2.2, on Project Research Technology, which started a process of reviewing software tools that was initially intended to help build the Community Sustainability Platform (see Section 4.11) but also provided interesting findings for the relationship between Citizen Science (Section 4.9) and tools for environmental decision support (Section 4.10).

The second mid-term report, D3.2 on Coastal ecosystem management data, produced a very extensive analysis of governance for coastal management at all levels, from international to local, with a synthesis

of key messages and insights to provide clear directions for sustainable coastal management practices. Although PRO-COAST is focussing its policy recommendations and guidelines mainly on findings from the project at the level of local communities, and relevant to the working of DG R&I plus the EU more broadly, the key messages and insights from D3.2 have become part of this report as Annex 7.

4.4. Theory of Change: a Deep Change process

At an early stage of PRO-COAST, case study leaders were encouraged to appoint Change Agents - individuals who were trusted and respected within their communities and who could support and facilitate local processes of change. The original intention was that Change Agents could largely fulfil this role on a voluntary basis.

However, experience during project implementation demonstrated that the role required a more substantial commitment than initially anticipated. In addition to facilitating local engagement and change processes, Change Agents were expected to engage with social-science concepts, contribute to data collection and reflection, and report on developments within their case studies. In most cases, these combined requirements proved too demanding for a purely voluntary role. Consequently, Change Agents increasingly became employees of the respective case study partner organisations. The project also experienced appreciable turnover in this role, with half of the original Change Agents being replaced during implementation (Table 2).

Table 2: Numbers of Case Studies in which change agents were voluntary or employed by project partners, and in which change agents were replaced during the project.

Motivation of Change Agent	Volunteer	Part-employed	Fully employed
	1	8	1
Turnover of Change Agent	None	One change	>1 change
	5	4	1

These experiences provided an important learning opportunity for PRO-COAST. They demonstrated that community-based transformation requires not only locally trusted individuals but also sufficient organisational capacity, continuity, methodological support, and clearly defined responsibilities. The Change Agent role therefore evolved from an initially informal community function towards a more structured interface between local stakeholders, case study organisations, and the project's social-science activities. A further development emerged during the Change Agent Workshop at the 2025 PRO-COAST meeting in Tallinn, approximately 18 months into project implementation. Through cooperation between the leaders of WP4 (Framework Design and Use) and WP6 (Stakeholder Engagement), the project began to develop what subsequently became the **Deep Change Model**, as further described in D6.2.

From the beginning of PRO-COAST, Change Agents had been encouraged to draw on Kotter's (1996) eight-step approach to organizational change, published in Harvard Business School. Experience within the case studies, however, revealed limitations when applying a model originally developed primarily for

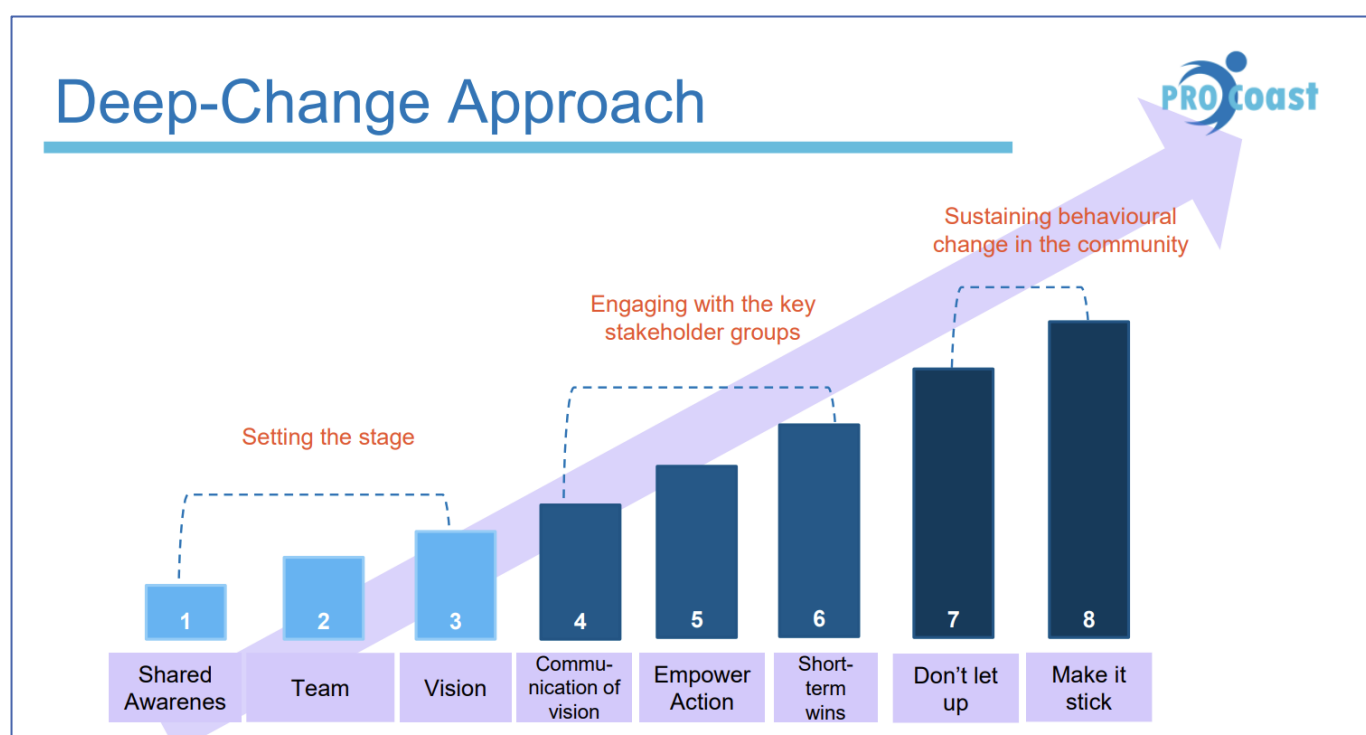
organizational change to complex community-based socio-ecological transformations. In particular, the initial step of creating a sense of urgency could prove counterproductive in communities where stakeholders were already aware of environmental challenges and were actively attempting to address them. In such contexts, emphasizing urgency risked overlooking existing knowledge, engagement and local ownership.

WP4 therefore introduced Theory U (Scharmer 2007, 2016) as a complementary perspective, emphasizing listening, reflection, co-creation and the development of change through engagement with stakeholders. Discussions between WP4 and WP6 suggested that neither approach alone fully captured the requirements of the PRO-COAST case studies. Community-based transformation requires both the momentum and orientation towards action emphasized in Kotter's approach and the participatory, reflective and co-creative elements associated with Theory U.

The resulting **Deep Change Model** integrates elements of both perspectives while adapting them to community-based socio-ecological change. Importantly, the first step was reframed from “Create Urgency” to “Create Awareness.” This shift reflects a central lesson from the case studies: sustainable community change is as likely to emerge from developing a shared understanding of the issue, recognizing existing local knowledge and activities, and creating ownership of the change process, as from externally imposed pressure.

Deep Change therefore places particular emphasis on stakeholder relationships, citizen science, small actions that build momentum, communication, participation and reflection. Rather than conceptualizing stakeholders primarily as recipients of change, the process recognizes them as participants in its development and implementation. Subsequent Change Agent Workshops used the emerging Deep Change framework to reflect on and assess progress across the PRO-COAST case studies (Figure 3).

Figure 3: The Deep Change Model developed through the integration and adaptation of Kotter's change approach and Theory U.



The development of Deep Change also illustrates the adaptive nature of collaboration within PRO-COAST. When the WP6 leader moved from Coventry University to a position at a German university, Brexit-related funding arrangements prevented the transfer of the associated UKRI funding to Germany, while concurrent staffing changes at Coventry left the WP6 team unable to attend the Tallinn meeting. WP4 therefore supported the delivery of the Change Agent Workshop. This unexpected collaboration contributed directly to the integration of the different change perspectives and the subsequent formulation of the Deep Change Model.

The resulting changes within WP6 required additional coordination and a formal amendment involving Coventry University, the European Commission and UKRI. Appropriate arrangements were ultimately established to maintain WP6 capacity and enable the completion of its remaining PRO-COAST activities.

4.5. Integrated Assessment Methodology (IAM)

Assessment of socio-environmental change requires an integrated methodology. In WP2 and WP4, an initial review of the literature, in D2.1 and D4.1, used the work of the late Nobel laureate Elinor Ostrom and others (Ostrom 2007, 2009; McGinnis and Ostrom 2014) on Social Ecological Systems to develop an analysis Framework (an SESF). This informed further work in two directions. It was deemed important, on the one hand, to have an effective set of ecological and social baseline data in each case study from which to measure changes, and then to repeat the measurement of those baseline measures within the short timescale of the case study projects. This informed the development of the Integrated Assessment Methodology (IAM), developed within PRO-COAST. On the other hand, there was a perceived need for an index which could be used by any local community or higher level of government to assess the general status and use of biodiversity and ecosystem services over the case study area, as well as over wider areas and longer timescales. This led to development of the Conservation Human-Use Index (CHUI, see Section 4.5).

Each case study committed to measure a set of 8-15 social and ecological components for the IAM. It was recognised at an early stage that although the IAM measurements could be used to indicate how much change had occurred, within the funding period or beyond, a sample of only 9-10 case studies was inadequate for robust quantitative analysis of many factors which might contribute positively or negatively to change across all of the highly diverse case studies. Exploratory analyses might indicate factors that could deserve more attention after the study but no firm conclusions about the importance of individual factors could be drawn in such a short project (3 years). Indeed, the period of more than a year needed to define a (mostly) agreed set of social measures (see Section 4.6) meant that the timescale for measurements within the project was only a single year. Although social changes may be measurable in a year, a year is unlikely to be adequate to measure ecological changes, due to annual variation caused by factors such as weather. A main benefit of the IAM was to refine measurements for use during the seven years following the project or to compare with other situations having comparable ecology or social issues. For the required massive scale-out online, work on the IAM is a reminder that it will be necessary to have more detailed indicators of success, to be agreed by communities and stakeholder groups early in the Deep Change Model process, than are available in the broad Conservation and Human-use Index to follow.

A number of additional lessons emerged during the implementation process in Case Studies, as recorded in D5.3, notably that stakeholder engagement should not be considered a supporting activity but rather a core implementation mechanism for collaborative biodiversity governance. Moreover:

- Stakeholder engagement should begin before implementation and continue throughout the project lifecycle.
- Co-creation is an iterative process requiring continuous adaptation rather than one-off consultation.
- Local Change Agents play a crucial role in maintaining trust, communication, and stakeholder motivation.
- Capacity building through peer learning significantly strengthens implementation quality.
- Adaptive governance increases the resilience of biodiversity interventions under changing local conditions.
- Long-term relationships between stakeholders create stronger foundations for sustaining project outcomes beyond project completion.

Overall, the PRO-COAST implementation experience demonstrates that successful biodiversity restoration depends not only on technical interventions but equally on governance processes that foster trust, collaboration, shared ownership, and collective learning. These findings complement the detailed methodological descriptions provided in Deliverables D6.1 and D6.2 while illustrating how stakeholder engagement and co-creation were operationalised throughout the implementation phase of the project.

4.6. The Conservation Human-Use Index

The Conservation and Human-use Index (CHUI) was designed to show that a single index of conservation status of an area could be developed to assess the impact of human use on species and ecosystem services. The CHUI is a practical, efficient, and adaptable tool for assessing the relationships between conservation and human activities (Vayanou et al., 2026, Deliverable 3.3). With a strong focus on social-ecological conflicts, it provides rapid insights into key environmental, governance, and societal issues arising from competing interests between conservation and human use.

It enables conservation practitioners, local authorities, CS leaders, and stakeholders to conduct a structured and rapid assessment of strengths and weaknesses in governance, ecological conditions, and societal interactions within a given area. Its participatory and flexible nature allows for use across a wide range of settings and supports collaborative, informed decision-making.

The CHUI comprises 134 qualitative questions (Figure 4) structured across four equally weighted dimensions: (i) Natural Values and Ecosystem Services (with maximum 99 points), (ii) Threats and Pressures (114 points), (iii) Governance (75 points), and (iv) Social Perceptions (111 points). Using an ordinal 0-3 scale with a “Not Applicable” option, the Index enables consistent, flexible application through both desk-based assessments and participatory processes. It generates aggregate and disaggregated outputs that help identify pressure hotspots, governance gaps, and conservation–use synergies (Figure 5). CHUI’s primary innovation lies in translating SESF into a pragmatic and participatory instrument that supports real-world decision-making. Rather than replacing detailed ecological or socio-economic assessments, it functions as a collaborative diagnostic compass to guide targeted investigation and



intervention. Its participatory design fosters shared learning, transparency, and co-production of context-specific management pathways, supporting adaptive stewardship and community empowerment.

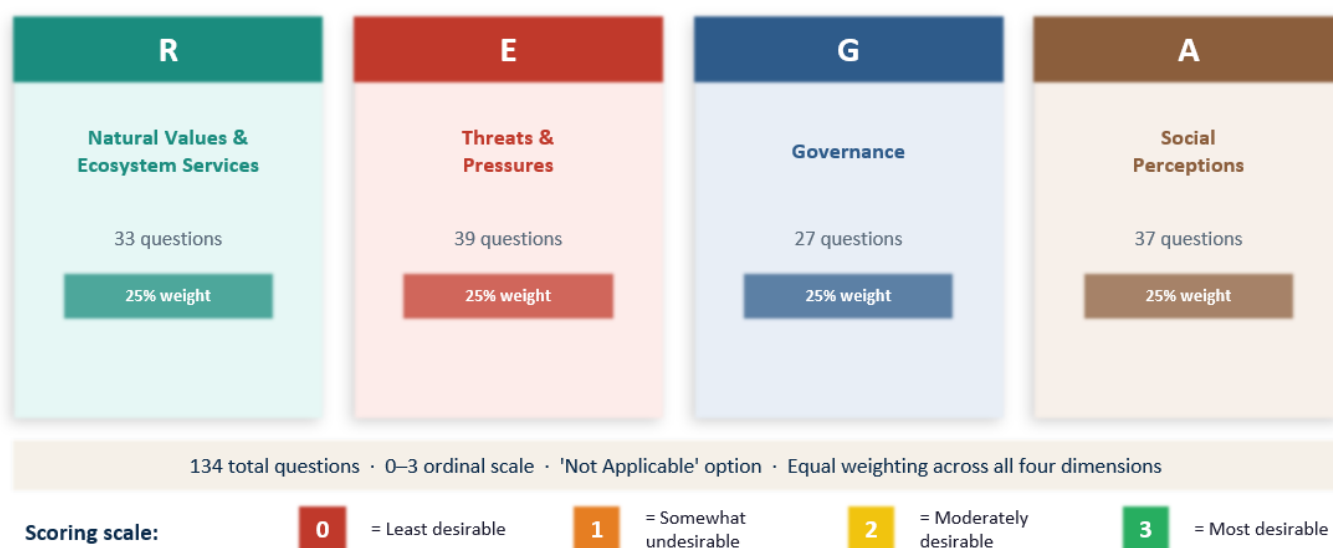


Figure 4: Illustration of CHUI Structure & Scoring System.

Individual dimension scores → colour-coded performance levels:



Overall score (0–100) → recommended management pathway:

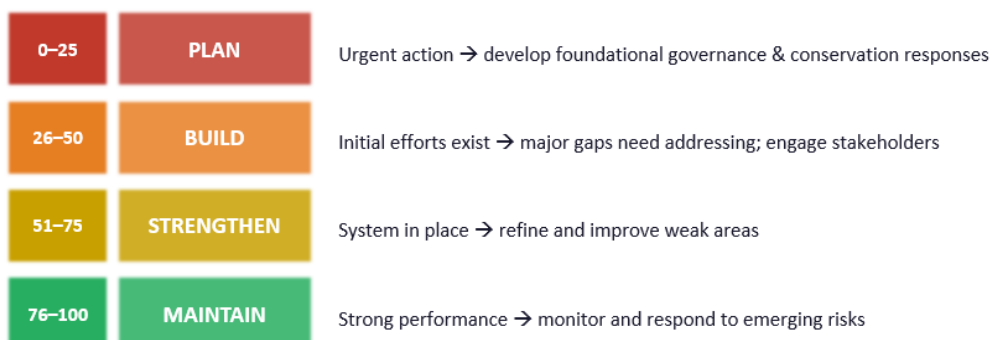


Figure 5: Illustration of CHUI Scoring System.

For scoring the different features, the CHUI was informed by questions developed for the SESF work in GEMCONBIO, and by more recently published work that had produced a number of different indicators (see D3.3) but none as deeply based in behavioural science (see Section 4.6) except perhaps a very recent approach to assessing wildlife trade (Timoshyna *et al.* 2025). In a slightly older review (Mahajan *et al.* 2024) of SESF that could be considered similar to CHUI, a long list of requirements was most comprehensively met by ELINOR (<https://elinordata.org/>). CHUI may be considered more comprehensive

than ELINOR in terms of social science and more robust in terms of quantifying the answers to most questions on Likert scales, whereas ELINOR uses binary responses. CHUI is a publicly accessible tool and can be accessed here: <https://chui.pro-coast.eu/>.

It should be noted that the CHUI represents a social ecological assessment of the whole study area and not merely of the issue being addressed by each case study project. Social ecological projects conducted in the case studies could be expected to increase the values scored by the overall index, but probably not within a year or two.

Testing for each case study showed that scoring for the index can be completed as a desk-study by one person with very broad knowledge and/or excellent access to data, or better by a small team of 2-3 people, or by a larger group. A key question is how much the scoring by different stakeholder interests might differ from that of the case study teams (mostly with an academic bias) and between stakeholder interests. The testing for this aspect of the CHUI is underway at time of writing. The great diversity of case study coasts will give confidence that the index is robust for widespread use, provided that the variation in scores between areas remains much greater than within areas.

4.7. Surveys, Intersectionality and Social Landscapes

Early in the PRO-COAST project, literature reviews in WPs 2-4 highlighted the importance of SESF and informed the development of two surveys examining local attitudes and pro-environmental behaviour in relation to gender, religion, ethnic origin, education, sense of economic well-being, and other contextual factors. Surveys within the case study communities were intended to provide quantitative evidence on individual attitudes and behaviours and, through repeated measurement, to explore potential changes over the course of the project. This approach built on earlier social-ecological research by four PRO-COAST partners within the TESS project (Section 2.4). Drawing on this previous experience, PRO-COAST partners agreed to preregister hypotheses and develop a common analytical framework that could support robust cross-case analysis and subsequent scientific publication.

Implementation nevertheless revealed an important challenge. Most case study teams had originally developed their activities around ecological rather than social-science research and had not anticipated conducting surveys containing potentially sensitive questions relating to gender, ethnicity, and other aspects of social identity. Considerable consultation was therefore required to ensure that the questions were both scientifically meaningful and appropriate within the local contexts. As a result, completion of the baseline survey was delayed until May 2025, leaving approximately one year before the follow-up survey.

4.7.1. Lessons from survey

The survey process generated an important methodological lesson. Survey questions that are appropriate in an anonymous academic research setting may require adaptation when administered within small communities where those collecting the data are known to respondents. Questions concerning identity, values, or social attitudes may be interpreted differently when they are perceived as coming from local organisations or individuals with whom respondents have an existing relationship. Local authorities also raised concerns that, despite individual-level anonymisation, aggregated findings could potentially be interpreted as characterising or “labelling” particular communities.

More broadly, this experience suggests that integrating theoretically relevant but potentially sensitive social-science constructs requires early interdisciplinary agreement. Differences in disciplinary traditions, local sensitivities, and implementation responsibilities can lead to negotiation over the wording and inclusion of survey items; these processes are best understood as a structural challenge of interdisciplinary research. At the same time, where theoretically necessary constructs are substantially altered or omitted, construct validity and cross-case comparability can be reduced. Future consortia should therefore agree early on a scientifically justified core set of constructs and measures, while allowing contextual flexibility in how sensitive questions are introduced and administered.

These experiences led to further refinement of the survey approach and informed implementation of the second survey. The initial survey also included questions addressing pluralistic ignorance in relation to potentially controversial aspects of individual case studies. Results across stakeholder groups provided sufficiently robust evidence to support further analysis and publication, while lessons from the first round enabled improvements to the design and implementation of the follow-up survey one year later.

A subsequent PRO-COAST analysis across eight case-study contexts found that participants tended to underestimate other stakeholders' pro-environmental attitudes (Kenward et al., submitted). This suggests a practical lesson for participatory projects: **surveying attitudes early and feeding aggregate results back to communities may help make existing pro-environmental support more visible and reduce misperceptions about local norms**, as an important part of the first, Awareness-Raising, stage of the Deep Change process (Section 4.4).

Response rates nevertheless remained an important methodological challenge and prompted additional consideration of potential non-response bias. Experience from one case study illustrates the importance of local legitimacy, recruitment strategy and appropriate incentives. Previous surveys conducted by the local council had achieved responses for approximately 40% of households. For the first PRO-COAST survey, however, the council chose not to be formally associated with questions it considered intrusive. An initial distribution to 560 households achieved a response rate of approximately 12%, which subsequently increased to more than 20% through door-to-door follow-up, email contact, and engagement with parents through the local school.

For the second survey, 400 households were randomly approached and offered a small incentive worth approximately €7 for completing the questionnaire. This generated 96 responses (24%), predominantly from residents who had not participated in the first survey. Across both survey rounds, there was a combined participation equivalent to approximately 35% of the targeted local population/households. Further comparison with existing community data will be important in assessing the extent of any remaining non-response bias.

The surveys also generated findings relevant to the wider objective of supporting transformational change across communities. Within the PRO-COAST sample, individual engagement in pro-environmental action showed no meaningful association with the extent of personal religious commitment. Initial analysis on work being prepared for publication at the time this deliverable is submitted suggest that social conservatism/political orientation is more clearly associated with civic pro-environmental behaviour than self-reported religiosity. Apparent differences between genders, meanwhile, were substantially reduced when other characteristics, including respondents' education, were considered. These findings underline the importance of avoiding simplistic assumptions about demographic groups when designing community-based environmental interventions and of considering the broader social and contextual factors associated with environmental engagement.

Furthermore, the value of preregistration also depends on the quality of the research design that precedes it. In interdisciplinary projects, surveys should be theory-driven from the outset, and partners should recognise the relevance of established theoretical perspectives from all participating disciplines, including, where appropriate, social-scientific research on democracy, diversity, intersectionality, racism and discrimination, and social dominance orientation. Preregistration cannot compensate for a design in which theoretically necessary constructs have been omitted or substantially weakened through later compromise. Consortia should therefore agree early on a theoretically justified core set of constructs and measures, while allowing contextual flexibility in how sensitive questions are introduced and administered.

4.7.2. Lessons from Cross-Case social landscapes

Task 2.4 added a specific implementation perspective to the PRO-COAST approach, namely to understand the role of transitional communities. Different strands of analysis in Task 2.4 highlighted an important distinction between broad support for environmental objectives, the acceptance of concrete measures and the practical conditions for their implementation. The cross-case analysis shows that implementation challenges can arise when environmental objectives have to be translated into concrete decisions concerning tourism, land use, infrastructure, agriculture, fisheries or other economic activities.

This distinction is important. People may broadly support environmental protection while being less willing or able to support particular measures once these involve restrictions on tourism, land use, infrastructure development, agriculture, fisheries or other economic activities. At this stage, biodiversity protection becomes not only a question of environmental attitudes or participation, but also a question of who bears the costs of change, who receives its benefits, and which competing interests are affected. The social landscape mapping therefore points to a potential gap between support for environmental objectives in principle and the acceptance or feasibility of specific measures in practice.

The case studies also show that implementation depends on more than public acceptance. Coastal biodiversity governance frequently involves several institutions and policy sectors, including conservation, spatial planning, tourism, transport, agriculture and economic development. Responsibilities and resources may be fragmented across different levels of governance. Consequently, even measures that enjoy substantial support may be difficult to implement where authority is unclear, administrative capacity is limited, enforcement is weak, or sufficient financial resources are unavailable.

Taken together, these findings suggest that social landscape mapping can serve a more specific purpose than simply describing local context. Before key transformation pathways are fixed, it can help decision-makers consider three related but distinct questions: Do relevant actors broadly support the environmental objective? What concrete consequences and trade-offs are associated with particular measures, and how are these likely to affect the actors involved? And are the institutional, political and financial capacities available to implement the proposed measures?

Identifying these questions early does not remove the underlying conflicts, nor does it imply that all interests can be reconciled. In some cases, environmental objectives, economic interests and available resources will remain in tension. The value of social landscape analysis is therefore also to make such trade-offs visible before decisions are taken, allowing them to be addressed explicitly rather than assuming that participation or general environmental support will by themselves produce an implementable solution.



4.8. Prospects for Certification of Beaches

The Council of Europe's request to ESUSG in 2001 for a paper on innovations in agriculture was initially expected to focus on certification rather than the scope for decision support tools. The Forest Stewardship Council (FSC), founded in 1993, had started such certification less than a decade earlier and this was already considered a success. Environmental certification has subsequently become very widespread. Although indicators of water quality are well established, there is no certificate of sustainability for activities on a beach. PRO-COAST has offered this prospect and some excellent drone and sub-aqua footage. However, the translation of those efforts into certification will not be completed before submission of this deliverable.

4.9. Citizen Science

PRO-COAST was committed in the Grant Agreement to investigate the value of Citizen Science for solving social ecological issues of the type addressed in case studies. Indeed, the project committed to the use of Extreme Citizen Science (Hakley, 2013) for its engagement with communities. This is an approach that proposes the use of Citizen Science, beyond engagement of citizens in data collection and perhaps some basic analysis, to involve them also in the definition of a problem and acting to address it – and not just the well-educated and nature-inclined citizens but all of them. This approach is not accommodated in current tools for Citizen Science, which are primarily for collection of data on the location of species albeit sometimes with display of the collated data on maps. Software tools for identification of problems, and for decisions on action against the problems, takes one also into the field of Environmental Decision Support.

PRO-COAST also committed in the Grant agreement to the use of the Bristol Approach, involving participation of citizens in co-creation of procedures to find the optimum solution for the problems / social dilemmas / challenges being faced through biodiversity loss drivers in case studies. As described in Section 4.3, the Theory-U approach, in a marriage of participatory engagement of communities with the stepwise behavioural science approach of Kotter, producing the Deep Change approach at the 'half-way' meeting in Estonia.

At the same meeting in Estonia, case studies were asked to address which technologies for Citizen Science they would be using, if not doing so already. Three of the case studies were already using technologies suitable to a greater or lesser extent for Citizen Science, including eDNA sampling, camera-trapping, and phone-based applications (apps) for recording locations of species. One of the case studies was comparing all three technologies. Another was building new software that could not only combine locations of species with maps of habitat to provide decision support for local gardeners and wildlife managers but also self-improve its decision support based on their data, thereby providing Reciprocal Environmental Decision Support (REDS). It had been hoped that this fusion of software for Citizen Science and Environmental Decision Support (EDS) could provide the tool necessary for Extreme Citizen Science with the participatory co-creation of solutions called for in the Bristol Approach and to aid Deep Change transformation.

4.10. REDS technology and its implications

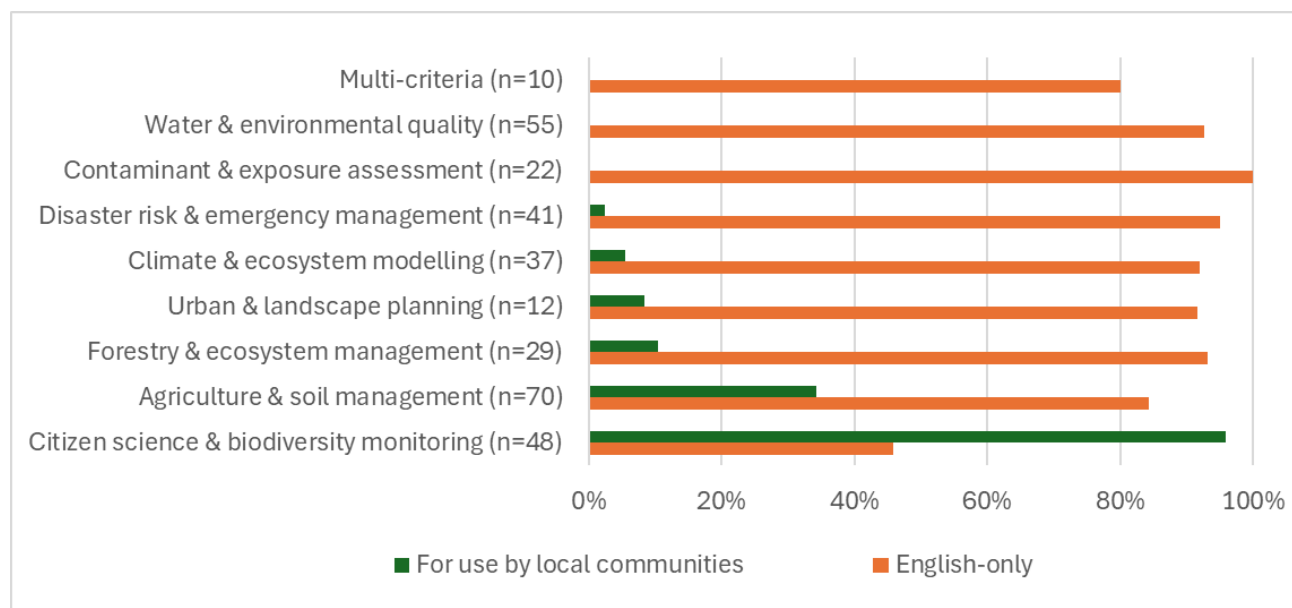
The REDS concept, developed within PRO-COAST based on forerunner concepts from the TESS project, is to combine Citizen Science (where automated platforms allow citizens to provide data to experts) with Environmental Decision Support (where platforms provide automated expert advice to citizens) [https://earthadvice.org/documents/better_citizen_observations_in_return_for_better_conservation_advice_introducing_reds.pdf]. The REDS software was originally built as a 'Garden Advice' app for recording House Sparrows (*Passer domesticus*) in gardens, because sparrows and gardens were present in all case studies (accepting *Passer hispaniola* in the same niche on Malta). It was initially tested in the UK by 71 citizens who were offered a small fee on the Prolific platform [Kenward et al., submitted]. Without the need to produce a version best suited for each case study due to the selection of iNaturalist data collection for most case studies (i.e., to test the built-in translatability and to import national map data everywhere), a 'Woodland-Advice' app was produced for scaled-up use by local squirrel managers across the UK – reflecting the goal of the UK case study to devise a plan to restore red squirrels to the local environment. A prototype 'Farmland-Advice' app was also created.

However, by the time of the 'half-way' meeting in Estonia, case studies were already burdened by responsibilities for survey and other reporting of social ecological factors. Those without a Citizen Science aspect were reluctant to the testing of new software or to the expense of analysing eDNA from subsequent samples taken by citizens, both of which were suggested as possible Citizen Science approaches. Case Studies decided to adopt iNaturalist as a platform for recording by citizens in their areas, not least because iNaturalist data was already available for baseline biodiversity recording in some case study areas.

Across the case studies adopting iNaturalist, the platform was used both to document citizen-generated biodiversity records and to compare changes in biodiversity-recording activity over the project period. Pre-project observations were compared with cumulative observations at the final assessment as a proxy for engagement with biodiversity recording. Increases in records indicate stronger observation effort and provide a richer citizen-generated evidence base for documenting local biodiversity but should not be interpreted directly as increases in biodiversity or species abundance. The detailed case-study comparisons are presented in D5.3 Case Study Implementation Report.

To further demonstrate the potential importance of REDS as a conservation platform technology for providing local environmental decision support through Citizen Science, a literature review for the REDS proof-of-concept paper was expanded to investigate the development of EDS software. This review found 114 tools still accessible from 386 EDS tools recorded for TESS by 2011, 155 new tools in eight current databases of tools for environmental decision making and 55 new tools by searching Web of Science for tools to provide "participatory" or "citizen science" or "crowdsourced" knowledge. Categorisation assigned 48 of the 324 tools for "Citizen Science and Monitoring", while the other 276 were determined to be mainly for modelling climate and ecosystems, assessing contaminants and quality of water and other environments or managing farmland, forestry and disasters. The languages in which all tools could be used were recorded and an independent expert assessed whether each tool could be used by non-expert local stakeholders (Figure 6). Apart from the tools specifically for Citizen Science and Monitoring, fewer than 10% of tools in most categories were available in languages of other than English and (except for Agriculture) no more than 10% of tools were deemed suitable for non-experts [REF – Sustainability MS].

Figure 6: The categories assigned to 324 tools for supporting environmental research that are available online, ranked for increasing utility by non-expert local stakeholders and in languages other than English.



The TESS project had previously listed 26 websites for recording the geographic location of species. Fifteen years ago, these sites were the equivalent of the 48 modern apps for species identification and recording (SIR). Of the 26 sites found in TESS, 15 (58%) could be used in languages other than English at that time, comparable to the 46% in Figure 6. Remarkably, although utility for non-experts was deemed to have improved to 20% for the modern EDS, from 4% in the TESS database, multilingual capability was no better for modern EDS than 15 years ago. Thus, the PRO-COAST paper on this topic is titled “Species recording has gone viral; environmental decision support has not: the difference matters” (Bastid et al. in review).

The REDS technology developed in PRO-COAST is provided as open-source software. It is based on ‘model boxes’, through which a variety of decision support tools can be provided in different coding languages, and it has a simple user interface that is targeted for use on smartphones more than desktops. The content streams are subject to ‘just-in-time-translation’ with back-office capability for expert supervision. It fulfills the requirements four of the eight requirements for Extreme Citizen Science as listed in the Grant Agreement, while the CUSP (below) fulfils the other four. We have not had time in the project to develop a ‘must have’ implementation that is liable to go viral. However, we consider that tools for monitoring biodiversity and ecosystem services, that also provide decision support for local environmental managers, can best be met by a combination of REDS technologies and micro-incentives for engagement. These tools would meet the suggestions for PEBLDS in 2002, the aspirations of TESS in 2011, and the recommendations of the IPBES Nexus report in 2024.

4.11. CUSP development

PRO-COAST is also committed to exploring the implementation of Nature-based Solutions in relation to behaviour, lifestyles, religious, societal, and cultural values of citizens. PRO-COAST partners recognized

at an early stage, in association with the work of WP2 (notably in D2.2), that tools for use in conservation (and which would feature on the CUSP) included conceptual tools, protocols (e.g. for the Deep Change process), and analytic frameworks (e.g. CHUI), as well as model-based decision support tools (e.g. REDS, Section 4.9). Nature-based solutions are a conceptual tool which can benefit from all the other tools and are therefore already promoted on the CUSP in relation to relevant case studies. We note that socio-technological tools useful for Nature-based Solutions are also likely to have value in many other contexts.

The PRO-COAST Grant Agreement gives ESUG responsibility to maintain the CUSP until 2033. This will encourage partners to continue recording from the case studies, using those case-study KPI's which are practical to monitor on a voluntary basis. However, the main role of the CUSP will be to maintain and increase awareness-building and other stepwise procedures for community transitions. This will be through horizontal scaling-out to signpost the best tools for monitoring and adaptive management by volunteers and will also, where possible, scale-up to influence adaptive governance, for example through the provision of micro-incentives.

The CUSP depends on the Multilingual Online Restoration Project Hosting software (built originally for TESS but here as <https://www.pro-coast.eu>), which serves as a hub both for vertical networking and for linking to national-language satellites in the System for Community Liaison (select language-area on link above and then click adjacent "Go Local", or e.g. <https://pro-coast-ukraine.sycl.net>). These satellites are currently based on single case studies but will in turn link with Naturalliance nodes that can also provide management forums for those who maintain the network. It is hoped that these socio-technological nodes based on development of SYCL can avoid the issues that AI is creating for the maintenance of raw open-source code on the internet [REF].

We consider that raising awareness of environmental issues, in terms of solutions (e.g. Nature-based) as well as problems, needs to be networked vertically for adaptive governance, as well as being networked horizontally to provide tools for socio-environmental adaptive management. Horizontal networking needs to be multilingual to facilitate pan-European adaptive management.

The idea for a system of local community websites that could also deliver environmental decision support was developed by ESUG and UKCEH in 2003-4 with a view to subscription-based maintenance. It was not implemented due to the high cost of coding and the discovery of imminent competition from a company offering free community websites based on rights to advertise on the sites. However, advertising was not popular on local council sites and sophisticated libraries of code reduced development costs, enabling the System for Community Liaison to be built in 2012 and trialed for local use. This led to a subscription-based hub-and-satellite system (Section 2.5), under a licensing agreement that kept the multilingual networking software non-commercial. The value of maintaining such a system in the civic sector became clear, with several messaging groups being taken private and Wikipedia the only other large multilingual civic system.

AI has now rendered coding so copious yet flaw-prone that maintenance of open-source software currently risks being overwhelmed and replaced by commercial products. However, the effects of AI may be more positive in a civic system for environmental management and governance. Such a system is likely to benefit from AI for mundane tasks, such as 'first-draft' translation that is then corrected by experts or to create model-boxes for other species given prior coding for house sparrows and squirrels. The subsequent models in a REDS system then self-correct based on observations of the natural world. Moreover, the forum capability built into SYCL satellites facilitates human supervision (including frugal administration) of a socio-technical system that is likely to remain unattractive for commercial profit but be attractive for volunteering (i.e. citizen-led) approaches, if content-creation remains human.

However, to avoid undue politically based influence from states and profit-based influence from the corporate sector, it seems essential for such an initiative to remain in the civic sector. Noting that denial of environmental needs and championing of corporate influence both tend to be linked to right-wing politics and further informed by events that prevented the implementation of a Transactional Environmental Single Support Area (TESSA) in 2012, we are especially concerned that right-wing pressure on European institutions and NGOs through funding allocations has already adversely affected development of environmental monitoring and decision support systems.

Especially in view of issues from AI for maintaining open-source software and credible information, we believe that this environmental networking (which is frugal thanks to volunteering) should receive support at international level (UN and EU) for maintenance in the civic sector. It behooves Europe to attend more to the pro-environmental science potential in its voluntary sector.



5. GUIDELINES FOR POLICY-MAKERS

The European Sustainable Use Group was formed as a part of IUCN and its members remain committed to the process of guiding policy at all levels of human society, from international to local. During the last 25 years ESUG, has been especially privileged to conduct research in four projects for Research Frameworks of the European Union. On behalf of all the partners of PRO-COAST, we now share the findings made within this project those derived directly from this research and including its interactions with other European research organisations during PRO-COAST's lifetime of three years to date.

Through living and working with state funding in Europe, we all also have responsibilities for the success of the large global governance experiment that is the European Union. ESUG therefore also takes the opportunity to share its own findings made because of interactions with European Institutions during the last quarter century.

We do this in four sections, based

- (i) on governance of activities within the theme of PRO-COAST at local level;
- (ii) on communication in research for European Commission through CORDIS and clustering;
- (iii) on organisation of research by European Commission within DG R&I as a whole; and
- (iv) on governance of research at EU and National Government levels more widely.

5.1. For the conduct of projects with local communities

As discussed in Section 2.6, international approaches to biodiversity conservation and sustainability increasingly recognise that effective and durable transformation requires the meaningful involvement of local communities. Top-down policy frameworks, information, and regulation remain important, but they need to be complemented by bottom-up processes that enable communities to participate in identifying problems, developing responses, and implementing locally appropriate solutions.

This principle has been central to PRO-COAST. Across its case studies (see Section 4.2), the project has explored how community-based socio-ecological transformation can be supported through stakeholder engagement, behavioural-change approaches, Change Agents, citizen science, participatory methods and systematic social-science research. The experience demonstrates that community transformation cannot simply be transferred from established organisational change models to local socio-ecological settings. Rather, approaches need to be adapted to existing relationships, local knowledge, institutional conditions, and the different interests and vulnerabilities of stakeholders.

The development of the PRO-COAST Deep Change Model reflects this learning (Section 4.3). Drawing on established change approaches, including Kotter (1998) and Theory U (2007; 2016), as well as participatory approaches such as Extreme Citizen Science (Haklay, 2013) and the Bristol Approach (Hassen et al. 2015), PRO-COAST increasingly moved towards an understanding of change as a process of awareness building, relationship development, co-creation, small actions that build momentum, communication, and continuous reflection.

Evidence from the case studies also highlights the importance of combining practical community engagement with systematic social-science evidence. Surveys, interviews, and stakeholder engagement

provided complementary insights into attitudes, behavioural intentions, perceived barriers, trust, social relationships, and the contextual conditions affecting participation and change. At the same time, the project demonstrated that methods developed for anonymous academic research cannot necessarily be transferred unchanged to small community settings (Section 4.6). The perceived legitimacy of those collecting data, sensitivity of questions, existing stakeholder relationships, and the burden placed on participants can all affect engagement and the quality of evidence obtained.

The recommendations below therefore reflect both the practical experience of the PRO-COAST case studies and the behavioural and social-science work undertaken alongside them. Given the current evidence base, they should be understood as evidence-informed principles for the design of future community-based sustainability initiatives, rather than as universally established causal prescriptions. Their systematic application and evaluation across a larger number of communities would provide an important opportunity for further validation and refinement. Based on our work in the 10 Case Studies, we present four recommendations below, which depend mostly on work described in D6.2. At the level of evidence required by IPBES (Section 1.2) we would currently not claim that these are stronger than “established but incomplete”. However, our detailed behavioural science surveys of attitudes and activities at the individual (micro) level would be capable of providing quantitative data (which can also be aggregated for analysis across communities - meso level - and up to international level) systematically if the methods were scaled out across communities, as we hope may be possible on the CUSP. ESUG has done such survey previously, with 80% response rate for sampling local communities at random across Europe in work on environmental decision-making (Section 2.4). It would be interesting to see whether such an approach can be combined with micro-incentives to establish such work effectively.

5.1.1. Recommendation and Guidelines 1

Enable community transformation through supportive multi-level governance.

Societal transitions must happen at all levels. Those at higher levels must support thinking and actions at community levels, while higher-level governance should remain responsive to locally articulated needs and priorities. It is the responsibility of citizens to hold higher levels of governance to account, reflecting their concerns in their interactions with government and, ultimately, at the ballot box.

5.1.2. Recommendation and Guidelines 2

Educate communities about the diversity of environmental opinion within them.

It is common for individuals within communities to underestimate the level of support for environmental progress within that community. This effect can be so strong that it has been referred to as a “false social reality” (Kenward et al., submitted). This can lead to a spiral of silence where supporters are in the majority but believe they are in the minority and so do not speak out, reinforcing the misperceptions. This may be countered by surveying opinion and using it as part of education early in the process.

5.1.3. Recommendation and Guidelines 3

Co-create change with communities rather than imposing it.



Community actions and pathways should be envisioned, codesigned, and enacted through cooperation with affected stakeholders wherever feasible, while maintaining scientific integrity, inclusiveness, and relevant regulatory requirements.

Co-creation should therefore include an explicit assessment of implementation conditions and trade-offs. In addition to identifying and involving relevant stakeholders, projects should examine who is likely to bear the costs and receive the benefits of proposed measures, which competing interests are affected, and whether the responsible institutions have sufficient authority, resources and capacity for implementation. Where substantial costs fall disproportionately on particular groups, possible mitigating measures, alternative implementation options or, where feasible, compensation should be considered. Where competing objectives or resource constraints cannot be fully reconciled, these trade-offs should be made explicit and addressed transparently as part of the decision-making process (Section 4.7.2). Measuring pluralistic ignorance at an early stage may be important to help converge attitudes (Section 4.7.1).

5.1.4. Recommendation and Guidelines 4

Involve all relevant stakeholders in co-creating the change.

Both in PRO-COAST and in previous projects, ESUG has worked with many stakeholders (Tourism operators, farmers, foresters, hunters, fishers) and other conservation groups as well as local authorities and local communities who have played a part as Country Coordinators (COCO's) previously and in PRO-COAST. Failing to do this can create delays and even prejudice outcomes.

5.1.5. Recommendation and Guidelines 5

Measure, communicate, and reflect on socio-environmental progress.

Progress along pathways should be measured as a socio-environmental scale, be recorded, and welcomed by those held in respect by the community. Communication at the beginning of transformation projects should, where possible, address and discuss not only wishes and visions, but also concerns and fears that may be associated with transformation within local communities. Where feasible, projects should also measure perceived social norms and communicate aggregate attitudinal findings back to participants, because underestimating others' pro-environmental support may inhibit collective action.

5.1.6. Recommendation and Guidelines 6

Provide accessible and engaging tools that enable and sustain community action.

Tools to assist actions and record progress should not only be accessible to all but also be rewarding to use. Rewards can be in terms of personal knowledge and contribution to knowledge that assists adaptive management of the environment if tools improve environmental decision support.



5.2. For project communication (CORDIS & clustering)

Through the literature search processes in a number of WorkPackages, and subsequent attempts to make contact with projects or gain information on tools used in them, we came to some conclusions concerning practical measures which could facilitate collaboration and clustering among EU-funded projects. They merely reflect our opinions but may support ideas being developed for the Science Frameworks to come. We are especially concerned about loss of information after projects have finished. Several of the recommendations in this section could help to reduce loss of information from what are relatively short-term projects. Here too, from discussion with other contemporary projects as well as our own experiences in PRO-COAST and former projects we consider the Recommendations and Guidelines “Established but incomplete”.

5.2.1. Recommendation and Guidelines 7

Improve the information on CORDIS and the ease of searching for it.

CORDIS searches can be challenging, due to the large number of projects. Navigation and partner identification would be improved by creating dedicated sections within CORDIS, or even satellite platforms, organised by theme. Projects should provide clear contact details for communication with scientific leads and should set internal protocols to handle collaboration requests efficiently.

There are at least two themes which could be considered for an upgraded CORDIS with improved search, possibly on satellites. Links to existing publications are already uploaded to the system, but not to results presented only in PU deliverables. A searchable database of abstracts to such results would be very useful, with a list of keywords concerning the results and links to the deliverables concerned as presented on project webpages. A second database could be created to collate words used in one science discipline that have a substantially different meaning in another, such that partners in multi-disciplinary projects could be advised or required to visit the different definitions in this glossary on starting a project. PRO-COAST is building a glossary of such words to inform ecologists and social scientists, and we note that, were such a glossary to become multilingual, it could assist AI-based translation for some of the most advanced concepts that need to move between languages and different scientific disciplines.

5.2.2. Recommendation and Guidelines 8

Encourage the exchange of tools, frameworks, and methods.

Projects should clearly present on their websites the tools used in their case studies, describing their purpose, scope, and practical applications. They should provide contact details to relevant partners so that those interested in adopting these tools can access information and support on how to do this – ideally also after a project has finished. We consider that the provision on the PRO-COAST CUSP of a PRO-COAST-developed tool to generate a Conservation Human-Use Index (CHUI, Section 4.5) is a good example of how this can be done.

5.2.3. Recommendation and Guidelines 9

Consider the provision of a publication budget that is available after a project finishes.

Such a budget, to cover the cost of open-access publication, would support publication of analyses, in high quality, peer-reviewed journals for which the data had already been collected and preregistered during the project. Payments could be managed by coordinating partners and paid only on eventual publication within a time-scale set by European Commission.

The advent of preregistration for scientific publication, of the hypotheses and analysis to be applied to data collected in defined ways to test the hypotheses, is welcomed as a process for improving the rigour and hence credibility of science. Where data have already been collected, a transparently registered prospective analysis plan can still be valuable but should be clearly distinguished from preregistration conducted before data collection or before the relevant results are known. Such plans can help ensure that important project data are analysed and published even when this cannot be completed within the funded project period.

5.2.4. Recommendation and Guidelines 10

Consider providing improved incentives for clustering and actions that continue project liaisons.

Efforts to encourage clustering by particular projects as official requirements, unless very carefully designed by DG R&I to include projects that Project Officers know should work together (both for synergies and to avoid problems better recognised in a particular project), risk detracting from the research that is able to be conducted within projects. Arranging incentives for clustering, through financial support for multi-project conferences – provided separately to project financing - and cooperation actions that provide continuation funding, are likely to be the most fruitful methods of engineering cross-project partnerships.

Effective clustering in PRO-COAST was based on searches (Section 3.2), assisted by personal contacts and networking at conferences, both online and physical, mostly organised by BioAgora. This group were also very effectively involved, with partner SYKE as part of the PEER network, in organising the TC4B conference (Section 3.4). . Their use of direct meetings between project leaders, which are now relatively easy to arrange online, was very effective in leading to meaningful dialogue and concrete outcomes. To ensure that PRO-COAST remains aligned with current priorities and needs, at least until responsibility for the CUSP ends in 2033, ESUG (as a policy-orientated organisation tightly linked to IUCN) will be maintaining regular contact with other Horizon projects, EU organisations, and stakeholder organisations to exchange and discuss policy recommendations based on their experiences. From our experience in this context:

5.3. Other recommendations and guidelines for DG R&I

Changes in European governance do not proceed as rapidly as in single states. However, maintaining the welfare of citizens in a world with rapid changes in technology and the environment requires organizational resilience. In particular, Large Language Models (LLMs) are facilitating bidding without necessarily improving the ability of bidders to design practical projects or deliver useful science, if funded. This raises the question of how to design future Science Frameworks to deliver the science most likely to benefit the

EU and its citizens. The demands on the coordination team, in ambitious interdisciplinary projects, may substantially exceed the resources initially allocated to them. ESUG, as a voluntary non-profit, was able to meet this challenge by including a high proportion of volunteer effort in coordination. Other organisations cannot easily arrange this. We consider that the pressures on PRO-COAST, not only on Case Studies to deliver detectable change within a short timeframe (1 year) after procedures had been agreed with social science partners (Section 4.4), but also on coordination to supervise this while the key partner (Coventry University) was in difficulty, would have been more manageable if the project had been longer.

Preparing bids for such challenging and detailed projects as two-stage bids would reduce work by bidders and reviewers on projects unlikely to be funded. However, the two-stage bid process can still be problematic as evidenced by ESUG's previous two-stage bid experience. This previous bid, that was successful in the first stage process, to develop and test decision-support tools for communities, was not funded due to a decision by the call panel, after first stage bids had been processed, not to fund bids with pan-European work at community level. We therefore propose, as "established but incomplete":

5.3.1. Recommendation and Guidelines 11

The duration of interdisciplinary projects with case studies should be considered carefully.

Ambitious interdisciplinary projects may require four years or more and sufficient time to build cross-disciplinary understanding between partners at the outset. Both interdisciplinary conceptualisation and discussion, as well as attention to local contexts, are crucial for analysing and addressing complex environmental problems. Project timelines should also allocate sufficient time to develop an adequate understanding of local contexts. We recommend cross-discipline, monthly online meetings, and continuous evaluation of the utility of all initial KPI's set out at the beginning of projects in order to focus on those that provide the greatest value.

5.3.2. Recommendation and Guidelines 12

That bids for all long duration projects and a higher proportion of all bids should be two-stage.

Bids that are two-stage reduce work by bidders and reviewers on projects unlikely to be funded. This is especially important for long projects because it also gives partners longer to plan their work, although two-stage bidding would save work for all for shorter projects too. Call panels should never revise call requirements after first stage bids have been submitted.

5.3.3. Recommendation and Guidelines 13

Encourage innovation beyond that of those who create calls.

With AI now able to fit text very precisely to requirements of calls, there is increasing risk that all projects will be tightly defined by calls, thus reducing the scope for original ideas on which the future of Europe will depend. To avoid disadvantage for inter-disciplinary work in particular, calls could be less tightly specified, to allow originality of researchers more expression. To encourage innovation, we suggest that each call could have a budget to fund one or two projects within each field (e.g. Biodiversity) which are innovative and inter-disciplinary in ways not defined in the call.

Any relaxation of bidding requirements is likely to enhance the numbers of bids. This makes it especially important to move more extensively to a two-stage bidding process. This process could perhaps also be used to check, between first and second stage, that partners with key roles do not already also have key roles in a project from a previous call for which funding has been delayed. In that case, a choice could be given to the consortium to accept the first bid funding or proceed with the second bid.

5.3.4. Recommendation and Guidelines 14

Encourage participation of volunteer-based SMEs in demonstrator projects for new technology.

The clustering procedure and literature review in PRO-COAST found that, despite research, the accessibility of Decision Support for socio-environmental decisions showed little increase in technology during the last 15 years and negligible increase in languages beyond English (Sections 4.8 and 4.9). This gives a special opportunity for Europe, experienced as it is in social science and accommodating its diversity in languages and associated cultures, to take a global lead. Appropriate technology could promote not only European science (soft power) but also economic growth through development of environmental technology, as sensors, climate mitigation technology, and software platforms in the civic sector for credible information and support.

However, that will require incubation through demonstrator projects and especially in the Civic Sector. It is in this sector that the globally dominant but US-based viral Citizen Science applications Merlin (Cornell University) and iNaturalist (University of California, Berkeley) have originated. Non-Government Organisations treated as SMEs by European Commission can also play such a role if supported by membership fees, but funding is more problematic for civic sector organisations that are treated as SMEs but are in fact based on voluntarism rather than membership fees. Such demonstrator projects are also needed to assess the efficiency of micro-incentives for local community survey and other engagement. Therefore, we suggest that DG R&I might give more consideration to the funding of volunteer SMEs in demonstrator projects with an emphasis on multilingual platforms for engaging local communities across and beyond Europe, using attractive software tools and micro-incentives to enhance citizen engagement, based in the civic sector to avoid political and commercial pressures.

5.4. European Commission & National Governments

The recommendations in this section are explained in Sections 4.9 and 4.10, where they were shown to align with recommendations of IPBES and previous UN recommendations (and may therefore be considered “well established”). They reflect the searches that were conducted in PRO-COAST WP2 and WP7, for multilingual socio-ecological tools to be promoted on the Community Sustainability Platform to assist local communities to adopt transformational change. They also reflect work done in previous ESUG projects for EU Science Frameworks, and in the unfunded periods between, to develop frugal socio-technical networking for coordination in different language areas (Section 2). Finally, they reflect several publications, including calls by international organisations (e.g. IPBES) for such tools, and may therefore be considered ‘well-established’.



5.4.1. Recommendation and Guidelines 15

We recommend that tools for monitoring biodiversity and ecosystem services should also provide decision support for local environmental managers.

Managers of biodiversity and ecosystem services still lack support that was proposed two decades ago. Such support can now rapidly be made available, for example through a combination of REDS technologies and micro-incentives for engagement.

5.4.2. Recommendation and Guidelines 16

We recommend that governments promote multilingual environmental support systems.

There is general agreement that management of environmental issues, in terms of solutions (e.g. Nature-based) as well as problems, needs to be networked vertically for adaptive governance, as well as being networked horizontally to provide tools for socio-environmental adaptive management. Horizontal networking needs to be multilingual to facilitate pan-European adaptive management.

5.4.3. Recommendation and Guidelines 17

We recommend that governments support environmental science potential in the voluntary sector.

Especially in view of issues from AI for maintaining open-source software and credible information, we believe that environmental networking in the civic sector (which is frugal thanks to volunteering) should receive more support at national and international level. It behooves Europe in particular to attend more to the pro-environmental science potential in its voluntary sector.



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7. ANNEXES

Annex 1: “Practical Guidelines” from AEMBAC.

These Practical Guidelines are from the FP5 project Agri-Environmental Measures for Biodiversity Assessment and Conservation (AEMBAC) which was designed by ESUSG as part of IUCN in 2001-04.

Identifying agriculture's environmental impacts and related pressures.

1. Identify agricultural areas and important environmental functions.
2. Identify environmental state indicators and identify their Environmental Minimal Requirement.
3. Identify agricultural pressure indicators.
4. Relate pressure indicators to state indicators.

Creating agri-environmental measures

5. Identify ways to change agricultural pressures and their environmental consequence.
6. Conduct socio-economic analyses and economic evaluations in order to identify possible agri-environmental measures.
7. Identify locally appropriate agri-environmental policy targets and instruments.
8. Involve stakeholders and produce accounting and reporting systems.
9. Produce contracts and implement AEMs.



Annex 2. Recommendations for PEDLDS.

These recommendations are from the paper on “Innovative approaches to sustainable use of biodiversity and landscape in the farmed countryside” (Kenward & Visi-Garcia 2004), invited from ESU(S)G for the 2002 Strategic Conference “towards integrating biological and landscape diversity for sustainable agriculture in Europe” which was part of a ‘Pan-European Biological and Landscape Diversity Strategy’ (PEBLDS) being developed by Council for Europe and United Nations.

We recommend that governments, relevant institutions and organisations

1. re-direct agricultural production subsidies not only to enhance biodiversity in the short-term, but also to develop systems that can sustain biodiversity in the long term with income from recreational and other non-agricultural uses of land and its biodiversity;
2. develop and apply conceptual tools to identify processes that degrade biodiversity, and thereby to design socio-economic approaches that enhance and sustain biodiversity;
3. fund work in Europe to identify and encourage all sustainable uses of land that benefit from enhanced biodiversity and can pay for it in the long-term;
4. encourage research to develop land management that, with minimal loss of agricultural yield, would maximise both biodiversity and consequent income from sustainable use of biodiversity;
5. support investigation of how much funding can be found at local level to enhance biodiversity, how that funding can best be applied, and how it can be sustained long-term;
6. replace centralised perverse restrictions and incentives by distribution of knowledge and responsibilities that encourages local communities to appreciate biodiversity, informs them how to enhance it economically and empowers them to motivate land managers accordingly.



Annex 3. Policy Recommendations in GEMCONBIO.

Considerations for improving governance for biodiversity conservation at ecosystem/local level in the EU.

1. Employing and co-ordinating as many natural, social, cultural, economic and institutional resources and capacities of an area enhances governance effectiveness for biodiversity conservation
2. Adopting, also at local level, a mix of different types of governance to manage ecosystems according to site specific ecological, social and economic needs can help to increase effectiveness of biodiversity conservation.
3. Governance is more likely to be effective in areas where there is a predominance of state (or regional/federal) ownerships and a large proportion of land is covered by woodland, forest and other wooded land ecosystems.
4. Strong leadership by individuals and/or organisations can enhance effectiveness of governance. Biodiversity conservation benefits from strong commitment by institutions and by high levels of vertical and horizontal integration amongst and within these institutions
5. When developing and implementing management plans, and in order to achieve biodiversity conservation, there is a need to take into account and support all the environmental functions provided by ecosystems (i.e. supporting, regulating, provisioning, and cultural goods and services)
6. Governance effectiveness increases when biodiversity conservation objectives are explicitly set and integrated with social and economic objectives in management plans.
7. To achieve biodiversity conservation both participative processes and regulatory tools are necessary. Market tools and/or quasi-market measures (e.g. agri-environmental payments) may also have to be used particularly where conservation measures pose real or opportunity costs for competing economic activities.
8. Adaptive management requires good monitoring in order to be effective.

Considerations for improving governance for biodiversity conservation at National/International level in EU

9. In order to be effective for biodiversity conservation, Governance of ecosystem management at EU level (top down) inevitably needs to consider all the ecological, social, economic, cultural, historical, institutional aspects and diversity among and within European Countries
10. Decisions on Governance and ecosystem management for biodiversity conservation taken at National/international levels need a better communication of the strategies adopted to achieve active collaboration by local stakeholders towards conservation goals set at higher levels
11. Governance at national/international levels needs to equally take into account all ecosystem services (supporting, regulating, provisioning and cultural services) in order to achieve sustainability of natural resource uses and biodiversity conservation

12. There is a need to raise awareness on the value of biodiversity for socio-economic activities and on its impact on the quality of life of the European citizen
13. A mix of regulatory, economic and social/cultural tools is necessary to achieve biodiversity conservation.
14. Monitoring and control of the state of biodiversity may require the development and adoption of new monitoring tools, which could also be used to assess the effectiveness of Governance

Considerations for improving governance for biodiversity conservation at ecosystem/local level in non-western countries

15. The adoption of co-management governance structures results in increased conservation of biodiversity (i.e. shared governance between local community and other stakeholders such as governments at local and central levels)
16. Recognise and respect customary institutions for natural resource management
17. Adopt a landscape approach to natural resource management and conservation
18. Support participatory action research, community-based analyses, and learning by doing
19. Promote fairness in sharing the costs and benefits of conservation
20. Ensure both sound local governance and a supportive policy environment, including the respect of basic rights

Further research needs:

Besides highlighting the need of applying the GEM-CON-BIO analytical framework to carry out further case studies, the analysis of case studies reports and the comparison of case studies outcomes also provided some interesting feedbacks on what aspects need to be addressed by future research. Here following some important aspects are proposed to be considered for further research on governance effectiveness and biodiversity conservation:

- The GEM-CON-BIO analytical framework initiated the process of developing and selecting a scientifically sound set of ecological, economic/financial, social, cultural, and institutional functioning indicators and relative value ranking systems for assessing the effectiveness of governance in relation to the conservation of biodiversity. This set of indicators should be further refined, and internationally agreed and adopted to assess the effectiveness of governance for biodiversity conservation at different spatial levels.
- There is a specific need to support one particular indicator in relation to the actual spend on biodiversity resources in Europe, therefore understanding the impact that biodiversity has in the European economy. Such an indicator could be promoted through a vehicle such as Eurostat, documenting how the contribution of biodiversity to the EU economy changes in time.
- Scale is important a) to assess the impacts on biodiversity at ecosystem level by drivers originated at higher spatial levels (e.g. global environmental changes like climate change) b) to assess the impact of international/European policy (e.g. Common Agricultural Policy), c) to understand the



interactions between local and national/global governance levels and their effect on ecosystem management practices, thus understanding their effect for biodiversity conservation as well.

- Especially for the interactions between local and national/global governance levels, the need for complex decision support is apparent. Policy makers need support to integrate knowledge that exists in the regional and local level (e.g. numbers of species, biotopes quality, etc) into the decision making process, while local people need expert guidance to collectively maintain and restore these ecosystem services that are required at a national/global scale. A system that links these two levels for the benefit of biodiversity should be promoted.
- There is a need for further analysis on the relationships between external drivers (direct and indirect) and the effectiveness of governance for biodiversity conservation. Such a relationship could be, for example, the relationship between the impact of CAP and CFP on biodiversity conservation at local level.
- There is a need to raise awareness among all levels (local, national, international) on the economic value derived from the use of biodiversity resources and on the value of ecosystem services. Such value is provided by ecosystems in monetary terms (direct income), in life support services, and in cultural / aesthetic / recreational services (e.g. tourism, bird-watching, hunting, etc). Such awareness could be also raised through the Eurostat survey suggested above.
- Research on social/cultural values of present and past societies where biodiversity conservation has been successful and comparison with current predominant economic theories and values which persistently underestimate the value of biodiversity, so leading to unprecedented high rates of loss of biodiversity, should be promoted and carried out.
- Further research on the state of biodiversity and the functioning and carrying capacity of ecosystems should focus in particular on ecological critical thresholds upon which to measure the sustainability of socio-economic activities.
- Development of scenario analysis on the relationship between governance structures and conservation of biodiversity will facilitate communication of governance effects to the general public, and communication of problems and opportunities related to the management of ecosystems to the policy makers.
- The identification and documentation of best practices on sustainable use of biodiversity (achieving conservation), under different governance types and processes, could enable the transfer of these best practices to wider contexts and areas. The linkage of such practices to Natura 2000 areas should also be explored.
- Finally, given the very critical state of biodiversity at places worldwide, forthcoming major threats such as climate change and widespread introduction of invasive species, and the so far too slow reaction in policy development and implementation, it is highly advisable to promote research on governance and management of environmental, social and economic emergencies and on development of adaptation strategies. In conclusion: Governance for sustainable development is still a valid theme both for research and for policy making.



Annex 4. Policy Guidelines and Recommendations from TESS.

Policy Guidelines and Recommendations from the project to design a Transactional Environmental Support System were derived from direct and indirect surveys of stakeholders in 30 European countries associated with the EU and from related analytical work. A particular purpose was to investigate environmental decision-making at all levels.

The TESS project first considered higher echelons of governance at the EU and national or immediately sub-national government levels.

Information for higher-level assessments

1. The SEA and EIA Directives should be reconsidered with a view to their integration and formal application at comparable levels across member states.
2. Member States should be required to give regular accounts of how their planning and other decision-making systems incorporate the principles of environmental and sustainability impact assessment in cases which lie outside the scope of formal SEA and EIA.
3. The Commission and Member States should develop environmental cross-compliance requirements to include assessments of significant changes in agricultural and forestry land use and management, which are currently covered by the EIA Directive, while promoting the integration of biodiversity and other environmental information into single farm payment regimes.
4. Member States should increase co-operation with the European Environment Agency by ensuring that information gathered for formal assessments is shared with them and the wider public and by supporting efforts under the INSPIRE Directive and other initiatives to improve the quality and compatibility of environmental data generally.
5. The Commission and Member States should consider encouraging the Biodiversity Action Plan model of collaboration between stakeholders for biodiversity restoration to provide regional and local frameworks for information gathering and monitoring.
6. Steps should be taken to integrate knowledge and data provided by individual land-users into formal environmental decision making to support SEA's, EIA's and assessments for land-use planning decisions.

Understanding information needs and making information available

Decision making within the environmental sector is a complex process that relies on dense patterns of data exchange between stakeholders and local, regional and central levels of government. Accordingly, the following guidelines are suggested:

7. The design of an effective environmental information system needs to standardise and centrally collate a wide variety of ecological and socio-economic data that can be scaled for delivery at all levels. However, the precise data requirements need to be understood and, as far as possible, quantified in more detail.
8. In order to refine information needs for different statutory authorities and stakeholder groups further Pan-European survey work will be needed. This would be enormously facilitated if Eurostat were able

to establish rigorous sampling frames across Europe for the groups of land users identified by TESS and for local governments with specific functions.

9. Pending the creation of any widely available interactive decision support system, simple guides to what information is available at local level and what purposes it is suitable for would be of value for many users and would save both time and the expense of hiring consultants to extract routine information. Central coordination would assist the production of such guides.

Participation in and attitudes towards wildlife-related activities

To estimate engagement and spending in rural activities, direct interviews in 10 case studies revealed 70% of households engaged in gardening, 53% in gathering wild fruits, fungi and invertebrates, 35% in fishing, 18% in hunting, 13% in horse-riding and 70% in taking any exercise in the countryside. Random sampling of those administering local councils gave much lower estimates: 44% for gardening, 15% in gathering, 18% in fishing, 8% in hunting, 6% in forestry and only 27% for exercise activities including 4% riding horses. In view of spending on recreational activities alone at a level comparable to the Common Agricultural Policy, confirming GEMCONBIO findings that that many millions of EU citizens benefit from wildlife-related activities and spend their own money on them, it was recommended that:

10. The relevance of participation in wildlife-related activities by millions of EU citizens and the direct and indirect spending associated with these activities should be appreciated by policy-makers.

11. Accordingly, Eurostat should be invited to carry out assessments of these activities across EU Member States by appropriate sampling methods, as has been practised for a number of decades in the United States.

Clear majorities valued biodiversity for use as food and for recreational activities associated with it. Attitudes appeared to be pragmatic rather than sentimental, in contrast to what is sometimes seen at national level where well-organised groups with a non-pragmatic approach may have an undue influence on conservation policy.

12. Biodiversity conservation policies need to take full account of the perceptions and attitudes of the people who live closest to wildlife and the countryside if their support for and active participation in conservation is to be secured. These attitudes should be regularly surveyed by the Commission, using the highly developed tools available to Eurostat.

Citizen capability for biodiversity mapping

With 80% of 46 local volunteer mappers likely or very likely to participate in such projects in the future and no less than 97% of participants considered that their governments should support mapping projects of this kind, we make the following recommendation:

13. Noting the rapid progress made in the development of digital tablets, the fall in prices and their dramatic uptake by the public over the last two years, European institutions, national governments and agencies should promote further experiments and training for local people in mapping for the monitoring and conservation of biodiversity and related socio-economic purposes.

Biodiversity trends associated with high-level assessment practices

CORINE data, relating to land cover change across the Continent, raised questions about the extent to which protection status was reducing rates of conversion from other land-cover categories to artificial

surfaces across countries. Artificialisation increased significantly between the periods 1990-2000 and 2000-2006, with no significant differences between areas inside and outside Natura 2000. However, no conclusion about protective value of Natura 2000 status could be drawn because many areas had only just achieved Natura 2000 status. Another interesting CORINE finding was that the area of semi-natural habitats increased between 2000 and 2006, possibly at the expense of intensive agriculture.

14. Land-use changes are of fundamental importance for conservation policy. Those recorded by recent CORINE data merit urgent investigation. A locally-based recording and mapping system such as is being developed by TESS could rapidly feed information to higher governmental levels, enabling policy adjustments to be made as appropriate.

Correlations also showed that the proportion of hunters in the population was generally highest in countries with low human density and an abundance of semi-natural habitat. These were also countries with more positive species conservation status. There was also most knowledge of fish conservation status where there are most anglers (and most influence of NGOs). Therefore:

15. Conservation policy and practice should recognise the legitimate interests and, indeed, positive contribution of such users of land and water as recreational shooters and anglers. Stakeholder partnerships using monitoring and adaptive management will maximise the input of human and financial resources.

The Pan-European survey asked local administrations to score how strongly residents perceived benefit from biodiversity (in terms of food, materials, recreation, tourism, etc), and also how strongly their perceived costs (in terms of pests or risks from disease or wildlife, etc). The scores for perception of benefit and cost for 28 countries were used to derive a 'nature positivity' index, which correlated most strongly with the World Bank governance capacity variable 'Political Stability' (50% of variation explained). Therefore:

16. Further examination of the nature-positivity index is needed. This should cover both the elements that make it up and the external factors that may influence it.

Working towards an environmental decision-support system

TESS searched widely for decision support models that might be useful for local land managers and could perhaps be made easily available in exchange for mapping. Of 198 models volunteered or selected as suitable for TESS from about 2,400 in databases, 72% were still traceable on line, 49% were suitable for consultation at a local level and 39% were accessible as downloads or web-services. However, only 5% were considered usable by ordinary people for local level (a proportion which fell below 3% in a larger sample). Only 2 of the 205 traceable used large external databases (both of these were based on data in the USA). The only substantial decision support available was for agricultural and forestry production, with little on wild biodiversity and almost none for non-experts to use. To support management decisions to the same standard across Europe requires a system operating in many languages and bringing together the best models and practice in many languages.

17. The case for a comprehensive decision support system for local land users to integrate environmental, social and economic goals is very strong. However, it will take substantial resources and time to achieve such a system in practice. There are some decision support tools available to use in the short-term but they are limited in application, coverage and the availability of languages other than English, with the consequence that much development work is needed to improve technology transfer in this area.

After a successful online survey in 21 languages via the portal at www.naturalliance.eu, the final recommendations were:

18. In developing internet-based advice and support for land managers using simple mapping tools, attention should be given to what works and is practical for them, using feedback and market testing and bringing together best practice guidance from a wide variety of sources.
19. Support should be given to the portal for ideas and knowledge exchange via
 - (a) publicity aimed at land-users from governments and national associations,
 - (b) data and best practice case study material from researchers and environmental institutions; and,
 - (c) where feasible, appropriate finance from any quarter.



Annex 5. The 12 recommendations in the Ecosystem Approach and AAPG as condensed for the Council of Europe's Bern Convention by ESUSG in 2007.

1. Favour multi-level governance that maximises benefit for conservation and society.
2. Ensure that regulations are understandable and respected.
3. Ensure that harvest is ecologically sustainable.
4. Maintain wild populations of indigenous species with adaptive gene pools.
5. Maintain environments that support healthy and robust populations of harvestable species.
6. Encourage use to provide economic incentives for conservation.
7. Ensure that harvest is properly utilised and wastage avoided.
8. Empower local stakeholders and hold them accountable.
9. Competence and responsibility are desirable among wild resource users.
10. Minimise avoidable suffering by animals.
11. Encourage cooperation between all stakeholders in management of harvested species, associated species and their habitats.
12. Encourage acceptance of sustainable and consumptive use as a conservation tool by the public and other conservation interests.



Annex 6. Key Messages and Background Messages from the Summary for Policymakers of IPBES Report on Transitional Change.

KEY MESSAGES

A. Transformative change is urgent, necessary and challenging – but possible

Key Message 1. Transformative change for a just and sustainable world is urgent and necessary in order to address the global interconnected crises related to biodiversity loss, nature's decline and the projected collapse of key ecosystem functions. Delaying action to achieve global sustainability is costly compared with the benefits of taking action now.

Key Message 2. Transformative change is defined as fundamental, system-wide shifts in views, structures and practices. Deliberate transformative change for a just and sustainable world shifts views, structures and practices in ways that address the underlying causes of biodiversity loss and nature's decline. At the same time, it remains important to recognize and strengthen views, structures and practices that are aligned with the goal of creating a just and sustainable world, such as those of many Indigenous Peoples and local communities.

Key Message 3. Four key principles are responsive to and address the underlying causes of biodiversity loss and nature's decline and guide the process of deliberate transformative change. These principles are equity and justice, pluralism and inclusion, respectful and reciprocal human-nature relationships, and adaptive learning and action.

Key Message 4. Transformative change for a just and sustainable world faces challenges that are systemic, persistent and pervasive. Systemic challenges manifest as barriers that impede or prevent transformative change and reinforce the status quo.

Key Message 5. Weaving together insights from diverse approaches and knowledge systems, including Indigenous and local knowledge, enhances strategies and actions for transformative change.

Key Message 6. Transformative change is possible, and it is characterized by the quality and direction of change. Both small-scale and large-scale changes contribute to transformative change for a just and sustainable world when they address the underlying causes of biodiversity loss and nature's decline.

B. Strategies and actions for transformative change.

Key Message 7. Five key strategies and associated actions have complementary and synergistic effects and substantial potential to advance deliberate transformative change for global sustainability. An integrated set of actions for each strategy shifts entrenched views, structures and practices in an adaptive way.

Key Message 8. Conservation that involves sustainable stewardship, notably by Indigenous Peoples and local communities, contributes to transformative change when it is inclusive, well resourced, and focused on places of high value to nature and people, and when the rights of Indigenous Peoples are recognized.

Key Message 9. Transformative changes in sectors that heavily contribute to biodiversity loss, including the agriculture and livestock, fisheries, forestry, infrastructure, mining and fossil fuel sectors, are crucial

and urgent for advancing global sustainability and delivering social benefits to reach the 2050 Vision for Biodiversity.

Key Message 10. Transformative change strategies include transforming dominant economic and financial paradigms so that they prioritize nature and social equity over private interests.

Key Message 11. Inclusive, accountable and adaptive governance systems play a pivotal role in driving transformative change by involving diverse stakeholders in decision-making and addressing governance challenges

Key Message 12. Shifting dominant societal views and values to recognize and prioritize human-nature interconnectedness is a powerful strategy for transformative change. These shifts can be facilitated through cultural narratives and by changing dominant social norms, facilitating transformative learning processes, co-creating new knowledge and weaving together different knowledge systems, world views and values that recognize human-nature interdependencies and ethics of care

C. Enabling transformative change: roles for all.

Key Message 13. Shared positive visions and their development are especially important for recognizing socioecological interdependencies, the agency of non-human life forms and an ethics of care, and thereby for inspiring transformative change. Visions, which include narratives and stories, are desirable future states of people and nature, including Mother Earth, shaped by values and world views, and often include defined goals and intentional efforts to attain such future states.

Key Message 14. Transformative change is system-wide; therefore, achieving it requires a whole-of-society and whole-of-government approach that engages all actors and sectors in visioning and contributing collaboratively to transformative change.

Key Message 15. Governments are powerful enablers of transformative change when they foster policy coherence, enact and enforce stronger regulations to benefit nature and its contributions to people in policies and plans (e.g., regulations, taxes, fees and tradable permits) across various sectors, deploy innovative economic (including financial) and fiscal tools, eliminate, phase out or reform environmentally harmful subsidies, and promote international cooperation.

Key Message 16. Civil society organizations, by fighting against biodiversity loss and nature's decline, point to the need for transformative change. Social mobilizations to pursue change, however, have often triggered responses that do not possess key aspects of transformative change. Civil society initiatives and environmental defenders have faced violence and rights violations. Protecting them supports transformative change.

Key Message 17. Well-designed policies, as well as business and private sector initiatives and tools, aimed at transformative change for a just and sustainable world provide economic incentives that influence socioeconomic development and consumption practices.

BACKGROUND MESSAGES

A. Transformative change is urgent, necessary and challenging – but possible

A1 Transformative change is urgent because there is a closing window of opportunity to avoid further biodiversity loss and prevent triggering the potentially irreversible decline and projected collapse of key ecosystem functions. Delaying action to achieve global sustainability is costly compared with the benefits of taking action now.

A2 Transformative change is necessary globally because previous and currently dominant approaches have failed to address interconnected global challenges and crises, including biodiversity loss, climate



change and pollution. These pose serious and potentially irreversible threats to nature and good quality of life

A3 Transformative change is a process that involves fundamental, system-wide shifts in views, structures and practices.

A4 Underlying causes influence all indirect and direct drivers of biodiversity loss and nature's decline. Transformative change that addresses these underlying causes is vital for a just and sustainable world

A5 Four principles address the underlying causes of biodiversity loss and nature's decline and guide transformative change towards global sustainability: (a) equity and justice; (b) pluralism and inclusion; (c) respectful and reciprocal human-nature relationships; and (d) adaptive learning and action.

A6 The challenges to transformative change are complex, systemic, persistent, pervasive and power-laden. Five overarching challenges to transformative change were identified in the assessment: (a) persistent relations of domination, especially those that emerged and were propagated in colonial eras; (b) economic and political inequalities; (c) inadequate policies and unfit institutions; (d) unsustainable consumption and production patterns and individual habits and practices; and (e) limited access to clean technologies and uncoordinated knowledge and innovation systems.

A7 The challenges to transformative change manifest across contexts as a wide range of barriers that perpetuate and reinforce existing patterns and relationships, contributing to biodiversity loss and nature's decline.

A8 Pathways to transformative change entail overcoming context-specific challenges and barriers through strategic decisions, willingness, courage and actions aligned with principles of transformative change.

A9 Six broad approaches highlight complementary insights for promoting and accelerating deliberate transformative change. Each provides unique insights to understand, describe, analyse, trigger and navigate how transformative change occurs. Weaving together multiple approaches can lead to synergies that reinforce pathways towards a just and sustainable world.

A10 Despite challenges, transformative change for a just and sustainable world is possible. A wide range of case studies demonstrate transformative potential and exhibit substantial positive environmental and social consequences for nature and people within a decade.

A11 Transformative change concerns the quality and direction of change. Both small-scale and large-scale initiatives contribute to transformative change when they address the underlying causes of biodiversity loss and nature's decline and include explicit visions of desirable futures. They have the potential to scale when they overcome challenges and barriers and are guided by the principles of transformative change.

B. Strategies and actions for transformative change.

B1 A key strategy for transformative change for global sustainability is to conserve, restore and regenerate places of value to nature and people that exemplify biocultural diversity.

B2 Achieving the 2050 Vision for Biodiversity involves driving systemic change and mainstreaming biodiversity in the sectors that heavily contribute to its loss and to nature's decline, including agriculture and livestock, fisheries, forestry, infrastructure, mining and energy, in particular fossil fuel sectors.

B3 Technologies can redirect development towards sustainability and equity when embedded in transformative frameworks.



B4 Efforts to conserve, restore and sustainably use biodiversity, nature and nature's contributions to people, including ecosystem services, are significantly under-resourced in relation to the global economic value generated by activities dependent on nature.

B5 Current global supply chain arrangements encourage unsustainable sourcing and overproduction, leading to overexploitation of nature. Ensuring sustainability, including through targeted and just downscaling of consumption and production, alongside cultures of sufficiency, contributes to reducing global footprints to sustainable levels across all countries. Overcoming inequities in consumption and production patterns, through governance that is coherent and effective along the whole supply chain, is essential for transformative change.

B6 Redefining goals, metrics and indicators to acknowledge economic, social (including cultural) and environmental dimensions as well as the many different values of nature can promote new paradigms of progress that centre on justice and sustainability.

B7 Governance systems that effectively reduce biodiversity loss and nature's decline integrate biodiversity into sector policies and decision-making, engage diverse actors and hold actors accountable.

B8 Adaptive learning and action address uncertainties associated with transformative change.

B9 Strengthening human-nature interconnectedness addresses underlying causes of biodiversity loss and nature's decline and is a powerful driver of transformative change. Shifting dominant societal views and values, alongside transforming cultural narratives and social norms around production and consumption, fosters a just and sustainable world.

B10 Transformative learning promotes holistic and experiential understandings and engagement with biodiversity and sustainability challenges. It reshapes identities and fosters a sense of responsibility towards nature.

B11 Embracing Indigenous and local knowledge and processes of knowledge co-creation fosters transformative change for a just and sustainable world.

B12 Context-specific, timely and dynamic communication can convey powerful messages to trigger actions for transformative change.

C. Enabling transformative change: roles for all.

C1 Visions of a sustainable world for nature and people are shaped by values and world views. They are of fundamental importance for inspiring transformative change. The diversity of societies, economies, cultures and peoples in the world means that no single vision is appropriate across contexts and scales and that shared transformative visions for a just and sustainable world are more likely to inspire change.

C2 Values play an important role in supporting visions of transformative change. Of the three types of nature-related values recognized by IPBES, which include intrinsic (nature for nature), relational (nature as culture/one with nature) and instrumental (nature for society), relational values are considered essential for humans to live in harmony with and as part of nature and Mother Earth as recognized in the IPBES Nature Futures Framework.

C3 Deliberate transformative change is founded on visions grounded in sustainability-aligned values that are equitable, inclusive, respectful and adaptive and have impacts beyond any single scale.

C4 New ways of imagining the future are critical to shift people's relationships with nature. One way to achieve such changes is through stronger imaginative efforts across different partners and stakeholder groups, including Indigenous Peoples' and local communities' world views, values and knowledge to envision positive futures for a just and sustainable world.

C5 Diverse actors and actor groups play important roles in transformative change based on their capacities, goals and contexts. Different roles of actors include innovating and creating change, adopting and following change, raising awareness, unlocking changes for others and/or influencing powerful actors to create change (well established). The diversity in their capacities and interests means that there is substantial potential for more collaboration among actor groups and for the development of new coalitions.

C6 The underlying causes of biodiversity loss and nature's decline also create inequalities and injustices. Those who have benefited most from economic activities associated with biodiversity loss and nature's decline have greater capacity to act. Upholding the principle of equity and justice depends on mobilizing these capacities. Doing so while involving others in balanced decision-making processes can unleash agency as well as resources to effect change.

C7 Coalitions of actors and actor groups are more effective for transformative change than when actors pursue change individually. Such coalitions for change run the risk of co-optation by higher-level or more powerful actor groups.

C8 The pursuit of transformative change by Governments contributes to policy coherence when it is based on a whole-of-government and nexus approach. Such an approach reinforces support for policies and plans across different sectors, minimizes the likelihood that policies will be at cross purposes across agencies and reduces unintended tensions.

C9 Many existing policies that comprise financial, economic and regulatory instruments (e.g., regulations, taxes, fees and tradable permits) have substantial negative effects on nature-friendly practices. However, these instruments have the potential to become transformative. Some Governments have revised their regulatory instruments, as exemplified by subsidies that are based on environmental criteria.

C10 Civil society plays an important role in bringing about transformative change, and it is more effective in an enabling environment. It does so by mobilizing citizens, creating initiatives that propagate and holding governments and the private sector accountable for harmful environmental practices. Supporting and amplifying civil society initiatives for a just and sustainable world, and protecting environmental defenders from violence and rights violations, support transformative change.

C11 Pathways to transformative change involve diverse actors working collectively to implement integrated and purposive actions associated with strategies to achieve desired visions. Many context-specific initiatives have promoted, accelerated and scaled transformative change for a just and sustainable world where humans and nature thrive together.



Annex 7. Key Messages from PRO-COAST

Deliverable 3.2.

CONCLUSION AND KEY MESSAGES

The aim of this report is to review current practices implemented across Europe to manage coastal ecosystems, to identify what are the key characteristics of successful management practises, as well as the challenges that, if not addressed, lead to ineffective or failed management systems.

To achieve this aim, the evolution of coastal ecosystem management policies in the EU is presented, through the key legislative frameworks. This analysis highlights the main directions and thematic areas of these frameworks and explores how these have influenced the management design, implementation and practices of coastal areas and ecosystems at various levels.

Additionally, the key messages of the 2024 IPBES “*Thematic Assessment of the Interlinkages among biodiversity, water, food and health (nexus assessment)*” and “*Thematic assessment of the underlying causes of biodiversity loss and the determinants of transformative change and options for achieving the 2050 Vision for Biodiversity*” are presented in order to identify opportunities for collaboration across sectors and scales, which in turn can contribute to synergistic and holistic management and governance.

Finally, a review was made based on the available scientific literature and relevant projects on implemented management practices for coastal areas, ecosystems, habitats, and species in Europe, identifying best practices and complexities involved in coastal ecosystem management. At the same time, this review aims to uncover the various interconnected components of management systems, each playing a crucial role in the overall success of coastal ecosystems management.

Through this multi-level analysis, there are key messages and trends that keep coming up at various levels (international, European, national, regional, and local) related to the achievement of transformative change, to successfully address biodiversity loss. These are depicted in Figure 4-1 and summarised in the following paragraphs.

The **EU policy framework for coastal ecosystem management**, developed through the years, has achieved notable progress in addressing the complexities of managing coastal environments. The EU policy framework is important in shaping national policies and in providing guidance and direction to management strategies at national, regional, and even local level. The key trends and successes relate to:

- **Policies integration among different sectors and levels** --> EU policies have made a significant shift from sectoral management and fragmented legislation to a more holistic and interconnected policy framework (e.g., WFD, MSFD, ICZM, MSP, Natura 2000, etc.).
- **Promotion of adaptive management** --> Adaptive management mechanisms, based on new data and changing conditions, allows flexibility in dealing with the dynamic nature of coastal ecosystems and addressing unforeseen challenges, such as climate change impacts.
- **Adoption of more inclusive governance structures that involve stakeholder participation in decision-making processes** --> Local communities, NGOs, private sector representatives, and other groups now have a more significant role in shaping policies, ensuring that diverse perspectives are considered in coastal management.
- **Shift towards Ecosystem-Based Approaches** --> This approach fosters better integration of

biodiversity conservation into sectoral policies and ensures that the ecological health of marine and coastal ecosystems is prioritised, alongside economic activities, to maintain the balance between development and environmental protection.

- **Balancing and planning for multiple uses** --> Through tools like Marine Spatial Planning (MSP), the EU has promoted the coexistence of these activities, aiming to minimize conflicts, and ensuring sustainable resource use.
- **Formal designation of Protected Areas** --> The establishment of Natura 2000 Protected Areas and the expansion of Marine Protected Areas (MPAs) has been a significant achievement, contributing significantly to the protection of vulnerable habitats and species.
- **Data Collection and Standardization** --> Most EU policies require monitoring programs to serve as implementation progress indicators and to provide better feedback to decision-making processes, i.e., adaptive management. This approach supports evidence-based resource management and enhances the overall effectiveness of the policies.
- **Public Awareness Raising** --> Public awareness campaigns and education initiatives have been an integral part of the EU direction, aiming at increasing the public understanding of the importance of coastal ecosystems. This has helped to gain support for conservation measures and to foster more sustainable practices among local communities, businesses, and society.
- **Financial Support** --> The EU has provided substantial financial support through mechanisms like the EMFF, LIFE, and European Cohesion Fund, helping coastal communities and industries transition to more sustainable practices and at the same time supporting ecosystem restoration projects, biodiversity conservation, and climate adaptation initiatives.
- **Fostering Partnerships** --> Collaborative efforts between Member States, local authorities, NGOs, research institutions, and the private sector have been the foundation of the EU's success. Partnerships have facilitated the sharing of knowledge, resources, and expertise, leading to more cohesive and integrated coastal management policies and strategies.
- **Legally binding nature restoration targets** --> Through the Biodiversity Strategy for 2030 and the Nature Restoration Law, the EU introduced, for the first time, legally binding nature restoration targets to restore degraded ecosystems, aiming for the long-term recovery of nature in Europe.

At the same time, the key direction for future actions by the 2024 IPBES “*Thematic Assessment of the Interlinkages among biodiversity, water, food and health (nexus assessment)*” and “*Thematic assessment of the underlying causes of biodiversity loss and the determinants of transformative change and options for achieving the 2050 Vision for Biodiversity*” relate to:

Integrated Governance --> Promotion of holistic governance structures that incorporate biodiversity, water, food, health, and climate change. Policies must be coordinated across sectors and scales to avoid siloed decision-making and reduce negative trade-offs.

Collaborative Approaches --> Engagement of a wide range of stakeholders, including Indigenous and local communities, through inclusive and participatory governance. Co-designing response options fosters greater legitimacy, adoption, and effectiveness.

Restoration and Conservation --> Prioritisation of conserving ecosystems of high ecological integrity and restoring degraded ecosystems, especially in coastal and marine areas. Ecosystem restoration efforts, like mangroves and seagrass, can simultaneously benefit biodiversity, climate resilience, and livelihoods.

Sustainable Resource Use --> Shifting towards sustainable consumption and production, reduction of pollution and waste, promotion of sustainable agriculture, fisheries, and forestry. Key sectors contributing to biodiversity loss, such as agriculture and infrastructure, must undergo systemic change.



Equitable Economic Transformation --> Transformation of economic systems to prioritise biodiversity and social equity. Economic incentives like green bonds, payments for ecosystem services, and reforms of harmful subsidies are crucial for redirecting resources towards sustainable development.

Strengthening Financial Support --> Address disparities in funding allocation by ensuring low-income countries and marginalized groups have access to resources. Increasing financial flows for biodiversity and climate resilience is essential for achieving the global goals.

Long-term Vision and Whole-of-Society Engagement --> Promotion of shared visions that acknowledge interdependencies between humans and nature. Governments, civil society, and the private sector must collaborate to drive transformative change towards regenerative economies, community rights, and ecosystem health.

Urgency in Action --> Delaying action will lead to significantly higher economic costs. Immediate and bold interventions are needed to reverse biodiversity loss and address the climate crisis effectively. Finally, the **review of implemented management practices** for coastal areas, ecosystems, habitats, and species in Europe, uncovered the various interconnected and key components of management systems, which play a crucial role in the overall success of coastal ecosystems management.

Holistic and integrated governance approaches --> Successful management of coastal areas can only be achieved through a holistic and integrated governance approach, which combines several key aspects. These include institutional coordination and collaboration, inclusive and participatory processes, political will, diversity of expertise, resource allocation, dedicated local/regional management structures, and strong capacity building. These elements interact constructively to address the complex challenges of coastal environments, which involve both ecological and socio-economic dimensions.

Conservation & Restoration --> Conservation and restoration targeted efforts aiming to protect, conserve, restore or enhance threatened species, ecosystems, and habitat types, are crucially important for mitigating biodiversity loss, preserving ecosystem functions and promoting natural resource sustainability.

Promotion of practices that enhance understanding of systems, processes, and their interlinkages --> Practices such as systematic and continuous monitoring systems, supplemented by ad-hoc monitoring to fill data gaps, along with dataset analysis through various methods and refinement of conceptual definitions, improve our understanding of the multifaceted interactions between environmental, social, and economic factors in coastal areas. They also shed light on the intricate interactions between species, habitats, and ecosystem processes. These efforts help to address current and emerging challenges, while promoting adaptive and informed management cycles. The use of innovative technologies offers new insights into these systems.

Education and raising public awareness --> Educational actions, raising public awareness, and encouraging citizen involvement are essential for effective management and conservation in general, as well as for coastal biodiversity. These initiatives, which are targeted both at groups of stakeholders, e.g., local communities, resource users, schools, and at the public, encourage sustainable behaviours, promote a deeper understanding of environmental values and challenges, and encourage active participation in conservation efforts. They are crucial for building long-term conservation, as well as motivating collective action and responsibility.

Policies Integration & Coordination --> Integration and alignment of a variety of sectoral policies are crucial for effective coastal areas management, helping decision-makers to better address cross-cutting issues like biodiversity conservation, disaster risk reduction, and pollution control, while also considering the livelihoods of coastal communities.

Ecosystem-Based Approaches --> Incorporation of an ecosystem services approach into development and implementation of policies for coastal areas, as well as the promotion of nature-based solutions, promotes the understanding and assessment of the ecosystem services provided by coastal ecosystems and fosters better integration of biodiversity conservation into sectoral policies.

Designation of Protected Areas --> The legal designation of protected areas, as well as their appropriate design is a fundamental tool for the protection of ecosystems, habitats, and species by restricting, prohibiting and/or better managing activities that negatively impact biodiversity and creating a space for more sustainable practices.



Figure 4-1: Recurring key messages and trends at various levels (international, European, national, regional and local) to achieve transformative changes to successfully address biodiversity loss in coastal areas

The recurring key directions, messages, and trends described above highlight the essential elements of effective policies and practices for coastal management systems at various levels, aimed at successfully addressing biodiversity loss. These elements form the foundation for creating adaptive, integrated, inclusive, and informed management strategies that promote sustainable use of coastal resources, while

tackling environmental and socioeconomic challenges. These are schematically depicted in Figure 4-2, as they were identified and categorised in this report.

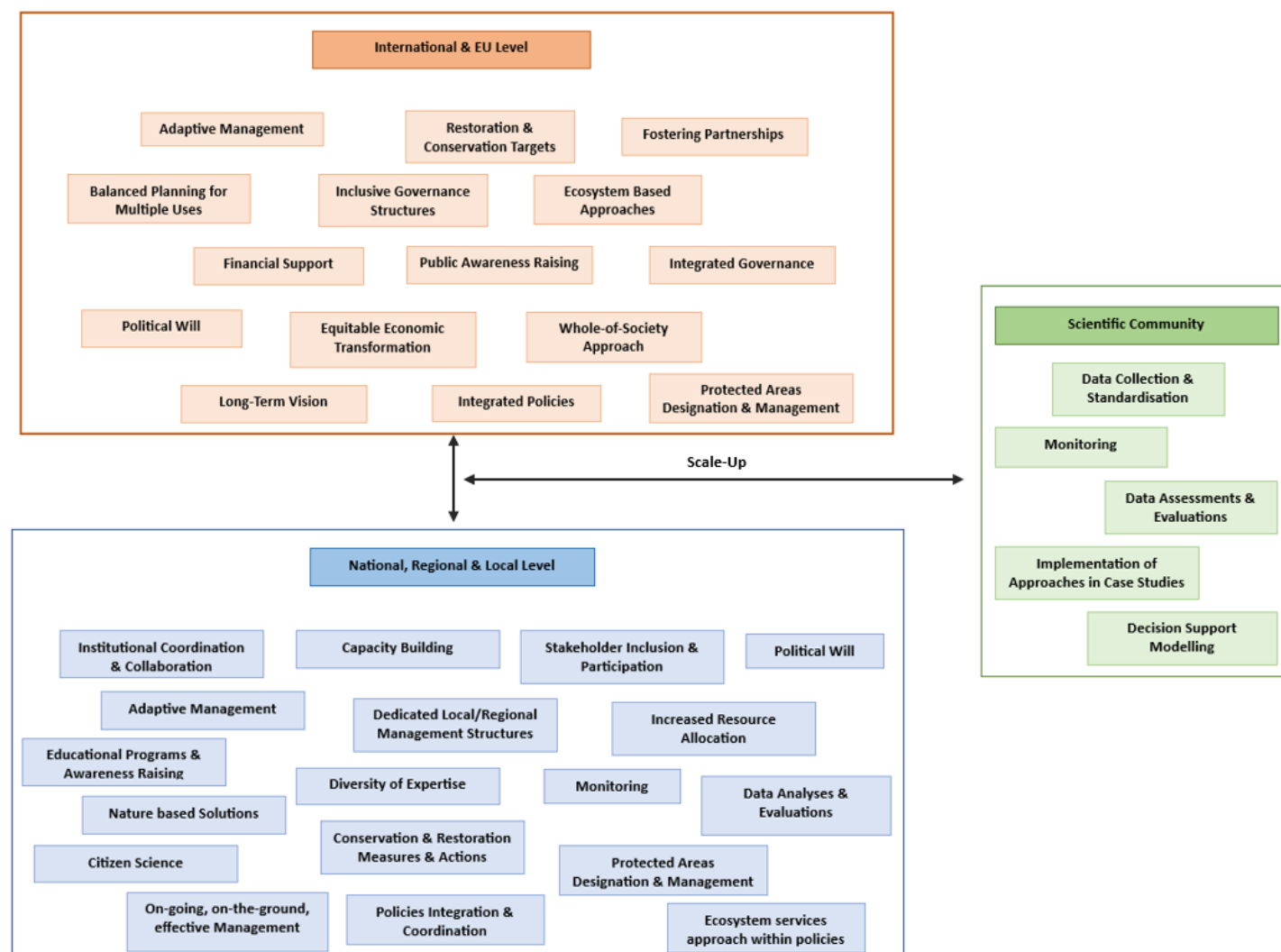


Figure 4-2: Essential elements of effective policies and practices for coastal management systems at various levels, aimed at successfully addressing biodiversity loss as decoded in the frame of this report.

Looking towards the future, significant challenges remain at all levels, to drive the transformative change required to address global biodiversity loss and achieve a just and sustainable futures. As identified in IPBES (2024), one of the key barriers is the disconnection from and domination over nature and people, where humans are often perceived as separate from and superior to the natural world, treating it primarily as a resource to be exploited. Moreover, prioritization of short-term, individual, and material gains over the long-term well-being of communities and ecosystems creates systemic challenges. Persistent inequalities -both economic and political- further impede conservation efforts, as these inequalities stem from historical legacies such as colonialism, which continue to dominate modern relations. Unsustainable consumption and production patterns, coupled with inadequate policies and institutions that fail to address the true scale of biodiversity loss, can hinder progress. Limited access to clean technologies and a lack of coordinated

knowledge systems also hinder innovation, making it difficult to achieve the global goals necessary to safeguard biodiversity and promote equitable development.

However, over the last 30 years, the global community has made remarkable progress by uniting at every level (global, regional, national, local and individually) and across diverse sectors (policy, science, NGO, the public and private sectors, local communities, etc) to propose and implement solutions to address biodiversity loss and foster sustainable human coexistence with and within nature. Innovative technologies, emerging nature-based solutions, numerous conservation and restoration actions and initiatives, better integration and coordination within policies, institutions and stakeholders, ecosystem-based approaches, and participatory governance are few examples that demonstrate that transformative change is within reach. Local coastal communities, if empowered by collective action, scientific support, coupled with strategic policy interventions and increased resource allocation, can lead -and in many cases are already leading- the effort to restore and protect their environments and reshape their path to a more sustainable future.



Annex 8. Policy Briefs from BIOTraCes, BIONEXT and CirchIVE

BIOTraCes - Biodiversity Interdependencies of Sustainable Development Goals (SDGs) - has produced two Policy Briefs. The **first Policy Brief** focussed on:

Lessons Learned From How SDGs Are Implemented and Experienced in Local and Diverse Contexts

1. SDGs take on unique meanings in different cases and contexts.
2. Non-human entities (i.e. various forms of biodiversity) are rarely seen as primary beneficiaries of achieved SDGs.
3. Biodiversity and secured ecosystem services are important in achieving SDGs; however, the terms 'ecosystem services' and 'SDGs' are problematic. The former may be seen as 'exploiting' biodiversity, while the latter overlooks marginalized communities.
4. Biodiversity is interdependent with non-biodiversity-related SDGs across cases; however, inequalities and imbalance between human activities and ecosystems compromise this relationship.
5. Despite their benefits, SDGs are seen as abstract and disconnected from local social, environmental and political practices, which complicates their application. SDGs' focus on reconciling economic growth with environmental sustainability is seen as contradictory and insufficient to foster systemic transformation. The SDGs are criticized for lacking empowerment initiatives and being disconnected from everyday discourse.

Recommendations for Policy

1. Tailor SDG implementation strategies to local contexts and acknowledge that the interpretation and relevance of SDGs vary. Promote SDGs' flexibility and alignment with local needs and priorities.
2. Recognize and integrate the role of non-human entities as key beneficiaries to promote holistic and sustainable outcomes of SDGs. Encourage policies that prioritize ecosystems alongside human development, without prioritizing the latter.
3. Look for inclusive ways to define ecosystem services. Promote a focus within the SDGs on the empowerment of marginalized communities.
4. Promote policies that recognize the interdependence between biodiversity recovery and non-biodiversity-related SDGs. Focus on reducing inequalities and fostering balanced relationships between human activities and ecosystems.
5. Develop publicly accessible guidelines and practical tools to translate SDGs into tangible, actionable steps tailored to local contexts and marginalized communities. Reconceptualize the SDG framework by transparently addressing its colonial and capitalist roots and limitations (e.g. growth-centric and Global North-centric focus and neglect of underrepresented populations). Ensure that intersectionalities, such as gender, ethnicity, and socioeconomic status are considered to address overlapping challenges and barriers.

Incorporate measures to make biodiversity relevant SDGs relatable to enhance public understanding and engagement.

A key criticism is that the SDGs were designed to achieve a global consensus without aiming for transformative change. Rather than fostering systemic transformation, they promote a continuation of existing economic models by reconciling infinite economic growth with environmental sustainability (P7). This leads to a focus on reformist changes within the current capitalist system, addressing issues like health, unemployment, and poverty, while making production systems more environmentally efficient rather than advocating for radical change (P7). The SDGs function as an inspirational tool or soft law mechanism and lack binding efficacy (P8).

The SDGs are also criticized for oversimplifying complex social realities. Social dynamics are intricate, and frameworks based on normative visions of environmental social justice rarely align with local lived experiences (P8). Additionally, while the SDGs focus on reducing inequalities, they do not actively promote empowerment (P9). Outside of academic and institutional contexts, the SDGs remain a niche topic with limited presence in everyday discourse and practices (P3; P8).

The **second Policy Brief** gave, and discussed, simple recommendations to reduce the problems which were recognised earlier. These recommendations are:

1. Cherish local biodiversity innovations;
2. Make room for marginalised voices;
3. Foster cross-scale learning and amplification;
4. Encourage civic engagement and contestation of biodiversity policy priorities;
5. Mainstream biodiversity together with social justice across broader policy agendas;
6. Imagine nature-positive and just futures.



Three reasons why policymakers need to stay attentive to bottom-up action

1. Bottom-up action can point to processes and arrangements crucial for biodiversity protection.

Reforms are needed in land-use, landscape planning and resource management practices, but also, for example, in the operation of private banks which finance biodiversity degrading businesses. Bottom-up actors can provide ideas and insights on problematic practices and arrangements. At the same time, they indicate how biodiversity concerns can be turned into attainable and 'action-able' issues. For example, bottom-up actors across Europe view land-use planning as both as a potential hindrance and as an opportunity for the actualisation of transformative change. Bottom-up action may also rest on the introduction of policy initiatives, management experiments and business models, among others.

2. Recognising the diversity of bottom-up action enables the integration of 'top-down' and 'bottom-up' aspirations, while also acknowledging the synergies and potential conflicts between them.

Although bottom-up actors often seek to influence how biodiversity is governed, they do not always view public governance bodies as allies. In some cases, governance is seen as part of the biodiversity problem. For example, some bottom-up actors argue that policymakers systematically prioritise the interests of forest industries or agribusiness over biodiversity concerns. At the same time, public bodies can generate the conditions for bottom-up action through the provision (or lack) of resources, data and visibility. For innovative companies, governance can create forerunning positions and favourable market conditions. Additionally, regulations and voluntary schemes may provide tools that support integration of biodiversity concerns into existing practices.

3. Attentiveness to bottom-up action opens up new pathways for citizen and stakeholder engagement.

Public engagement can be expanded so that it reaches beyond the town halls, websites and process phases specifically dedicated to consultation. Public governance structures and official problem formulations tend to determine how and in what terms participation can unfold. However, when policymakers engage with practices and aspirations that evolve spontaneously, it is the bottom-up actors who set the stage for dialogue. Engagement does not always need to occur face-to-face; but it can materialise as policymakers reflect and learn from bottom-up activities.

Navigating the diversity of bottom-up action: Seven modes of intervention (from Valve *et al.* 2025):

Destabilising management regimes and production systems
Reappropriating or reallocating land and water
Initiating and orchestrating collective action
Capturing economic value from biodiversity and biodiversity protection
Integrating biodiversity with business operations and infrastructure development
Making biodiversity matter for local and regional development and wellbeing
Environmental education and awareness-raising

Addressing the problems raised by bottom-up actors

- **Public governance bodies need to develop new approaches that prioritise biodiversity protection over short-term interests.** Bottom-up actors concerned about biodiversity loss across



Europe argue that currently public policies permit natural resources management practices that often harm biodiversity. This questions the effectiveness and legitimacy of biodiversity governance as it is practiced within the European Union, the nation states, and the regional and local jurisdictions.

- **European regulators and policymakers should alter institutional and political arrangements hindering transformative change.** Bottom-up actors draw attention to the detrimental influence of financial dependencies and lobbying power that shape policymaking and resource management. These entrenched relationships contribute significantly to biodiversity problems and must be addressed and dismantled.
- **The underperformance of biodiversity governance institutions must be addressed.** At present, voluntary initiatives and time-limited projects carry a disproportionate burden because public institutions are failing to meet their agreed-upon commitments to biodiversity protection. The problem may not always lie with existing policies and regulations, but with their poor implementation at national and regional levels. Across Europe, biodiversity governance institutions often suffer from insufficient expertise and financial capacity.
- **Intermediation should be more widely applied as a governance instrument to boost transformative efforts.** Bottom-up actors frequently cite bureaucracy and unclear regulations as barriers to their work, while emphasising the importance of learning from others as an enabler of bottom-up action. For example, individuals and groups seeking to harness regional development programmes to the nurturing of biodiversity could benefit from an intermediating organisation that supports transformation-seeking initiatives. At the same time, regulations must be reviewed and revised to eliminate obstacles that hinder bottom-up contributions.
- **Policymakers need to remain attentive to the diverse ways in which transformative change is driven 'from below'.** It is not enough to expect bottom-up actors to merely respond to predefined policy plans and agendas. Policymakers should actively support the proactive, innovative and even resisting capacities of those aiming to drive transformative change from below. Recognising the emerging 'modes of intervention' can offer valuable guidance for policymakers in engaging with and learning from the diversity of biodiversity actions taking place across Europe.



CirchIVE focusses on biodiversity footprinting and natural capital accounting as processes for enhancing biodiversity. The project has produced 3 Policy Briefs, on:

- How to advance the implementation of the EU Soil Monitoring Law? <https://doi.org/10.36333/pb14>
- Biodiversity credits: How to ensure their integrity and impact? <https://doi.org/10.36333/pb13>
- Forest resilience and disturbance: What role does biodiversity play? <https://doi.org/10.36333/pb12>

Also, in the context of PRO-COAST a Review and [set of] Recommendations for Mainstreaming of Biodiversity in EU Policy in the context of biodiversity footprinting and natural capital accounting: <https://circhive.eu/beehive/resource/d34review-and-recommendations-mainstreaming-biodiversity-eu-policy>

Five Guidance documents are also valuable in specific contexts for top-down approach in areas which could hold interest for particular actors visiting the CUSP being established by PRO-COAST. These follow in chronological order. The first gives an overview of existing standards and standardization activities in the fields of biodiversity footprinting and natural capital accounting.

- Standardization Landscape <https://circhive.eu/beehive/resource/d54standardization-landscape>
- Review of inclusion of NC & BD criteria in labelling and certification schemes, development of “ideal framework” <https://circhive.eu/beehive/resource/d312review-inclusion-nc-bd-criteria-labelling-and-certification-schemes-development-ideal>
- The Ideal Framework for Food & Biodiversity – A Guide for Standards and Sourcing Rules <https://circhive.eu/beehive/resource/ideal-framework-food-biodiversity-guide-standards-and-sourcing-rules>
- Uptake of EU Taxonomy and Substantial BD Contribution, Reporting Practice Under CSRD and Green Investment Practice. Development of BD-centric Investment Criteria Based on Learnings. <https://circhive.eu/beehive/resource/d3.1.3%E2%94%82review-uptake-of-eu-taxonomy-and-substantial-bd-contribution%2C-reporting-practice-under-csrd-and-green-investment-practice.-development-of-bd-centric-investment-criteria-based-on-learnings>
- The Ideal Framework for Food & Biodiversity: a guide for standards and sourcing rules <https://circhive.eu/circhive/resource/ideal-framework-food-biodiversity-guide-standards-and-sourcing-rules>

