NETBIOME-CSA

STRENGTHENING EUROPEAN RESEARCH COOPERATION FOR SMART AND SUSTAINABLE MANAGEMENT OF TROPICAL AND SUBTROPICAL BIODIVERSITY IN OUTERMOST REGIONS AND OVERSEAS COUNTRIES AND TERRITORIES

MANAGEMENT OF EUROPEAN OVERSEAS (SUB)TROPICAL BIODIVERSITY

IN SUPPORT OF SUSTAINABLE DEVELOPMENT












Policy Recommendations and Priorities for Research Cooperation

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MANAGEMENT OF EUROPEAN OVERSEAS (SUB)TROPICAL BIODIVERSITY IN SUPPORT OF SUSTAINABLE DEVELOPMENT: POLICY RECOMMENDATIONS AND PRIORITIES FOR RESEARCH COOPERATION

MANAGEMENT OF EUROPEAN OVERSEAS (SUB)TROPICAL BIODIVERSITY IN SUPPORT OF SUSTAINABLE DEVELOPMENT

Policy Recommendations and Priorities for Research Cooperation

March, 2016

List of Acronyms

ABS - Access and Benefit Sharing

AMC - Avoidance-Mitigation-Compensation

BES - Biodiversity and Ecosystem Services

BIP - The Biodiversity Indicators Partnership

CBD - Convention on Biological Diversity

CITES - Convention on International Trade in Endangered Species of Wild Fauna and Flora

EAFM - Ecosystem Approach to Fisheries Management

EBVs - Essential Biodiversity Variables

EC - European Commission

EEA - European Environment Agency

EIA - Environmental Impact Assessment

EU - European Union

EU Overseas – Used in the current document to collectively refer to both European ORs and OCTs

FP - Framework Programme

GEO BON - Group on Earth Observation's Biodiversity Observation Network

H2020 - Horizon 2020 EU Research and Innovation programme

IPBES - Intergovernmental Platform on Biodiversity & Ecosystem Services

IPCC - Intergovernmental Panel on Climate Change

IUCN - International Union for Conservation of Nature

MEA - Multilateral Environmental Agreements

MPA - Marine Protected Areas

OCTA - Association of Overseas Countries and Territories

OCTs - Overseas Countries and Territories

ORs - Outermost Regions

SEA - Strategic Environmental Assessment

SEBI - Streamlining European Biodiversity Indicators

SGD - Sustainable Development Goals

Executive Summary

The 34 European Overseas entities, including nine Outermost Regions (ORs) and 25 Overseas Countries and Territories (OCTs), are among the most intriguing and important zones in the world for biodiversity conservation. The rich biodiversity of the European Overseas Territories has nurtured generations of local populations and communities, and is a pillar for their future economic development and crucial for their long term prosperity and sustainability. However, this exceptional biodiversity in ORs and OCTs is faced with severe threats as a result of unregulated human activities and the negative impact of climate change.

In the framework of the NetBiome-CSA project, a co-design process was developed and implemented in order to mobilize panels of experts and build bridges across geographic regions. Adopting a bottom-up approach and going beyond the expertise of the scientific community and policy makers, specific attention was given to ensure that the perceptions of civil society and private economic stakeholders, which are key players in the field of biodiversity management, were taken into account. Through cooperation and the linking of expertise spread across three oceans and continental Europe, a scientific critical mass and capability was established.

NetBiome-CSA is a European funded project that aims to extend and strengthen research partnerships and cooperation for smart and sustainable management of tropical and subtropical biodiversity in Outermost Regions (ORs) and Overseas Countries and Territories (OCTs).

This exercise enabled the identification of four major research topics on biodiversity management. ORs and OCTs in the tropical and subtropical regions are in the best position to respond to these in terms of scientific value, their ability to provide answers to local societal needs and to contribute to the objectives of the European Research Area. The identified **Research Priorities**, as innovative approaches from the Overseas benefiting the whole ERA, are:

- **Improve tools for effective participation in biodiversity management,** aiming to facilitate the co-design of management and the development of scenarios and solutions using the best available scientific and local knowledge whilst managing various uncertainty factors;

- **Predict effects of climate change on natural resource uses**, carrying out broad-scale investigations that go beyond studies directed at specific regions or specific natural resources. Regional strategies are required for climate research and optimisation of natural resource use to reflect the specificities of ORs and OCTs;

- **Increase the consideration of biodiversity and ecosystem services in environmental assessment and valuation methods,** taking them into account when designing legislation and undertaking infrastructure design and spatial planning processes;

- **Map ecological limits to extractive activities,** examining linkages across habitats and species to guide decisions on limits to activities.

Addressing these Research Priorities in a collaborative approach presents significant advantages, allowing scientific experimentation at various hierarchical scales (island, archipelago, oceanic region) thereby providing a better generalization of research results to give fundamental insights into mechanisms shaping biodiversity and ecosystem processes.

This selection does not exclude additional Research Priorities being identified in future discussions.

By adopting a transregional and collaborative approach to these challenges, new knowledge is expected to be acquired and used in the implementation of a set of **Policy Recommendations** identified in the course of the NetBiome-CSA consultation process:

- **Adopt a more coherent approach to spatial planning, accounting for ecological and societal considerations**, incorporating cross-sectorial and interdisciplinary cooperation to balance long-term biodiversity related issues and short-term social and economic dynamics and make decisions in a context of uncertainty;

- **Adapt international legislation to national/regional context**, to better address the challenges faced by European Overseas regions and territories with regard to biodiversity conservation and adaptation to climate change;

- **Promote more efficient and sustainable usage of natural resources**, enhancing local genetic diversity while meeting society's needs and demands and facilitating a circular economy approach;

- **Put ecosystem-based management principles into practice**, adopting management approaches that take into consideration the full array of interactions within an ecosystem, including human activities;

- **Establish Biodiversity Indicators specific for European Overseas Regions and Territories**, since existing biodiversity indicators based on European policy models and funding strategies designed for continental contexts and needs, are very often inadequate, insufficient or too general.

It is believed that these Policy Recommendations and Research Priorities would be able to effectively address the common challenges identified that, if not tackled, would endanger biodiversity in the European ORs and OCTs and jeopardise their future.

The NetBiome network, stretching from continental Europe to many different European ORs and OCTs in tropical and sub-tropical regions, brings together solid scientific know-how that, through cooperation in research and anchored in local needs, is able to find the most appropriate answers to local and global challenges in biodiversity management.

Matching Policy Recommendations to Research Priorities		RESEARCH PRIORITIES			
		3.1 Improve tools for effective participation in biodiversity management	3.2 Predict effects of climate change on natural resource use	3.3 Increase the consideration of biodiversity and ecosystem services in environmental assessment and valuation methods	3.4 Map ecological limits to extractive activities
POLICY RECOMMENDATIONS	2.1 Adopt a more coherent approach to spatial planning, accounting for ecological and societal considerations	Develop tools to integrate and cope with multiple knowledge, interest and values	Inform spatial planning processes	Consider fully values and interests the different stakeholders give to biodiversity	Establish thresholds
	2.2 Adapt international legislation to national/regional context	Design devolved context adapted regulation, incentives and tools	Inform adaptive regulation and policies	Conserve biodiversity and maintain ecosystem services in line with CBD targets	Ensure international standards are used to manage extractive activities
	2.3 Promote more efficient and sustainable usage of natural resources	Improve governance of economic/social system	Anticipate impacts and needed adaptations	Identify nature based solutions	Establish limits to resource use
	2.4 Put ecosystem-based management principles into practice	Reach consensus on objectives and management decisions	Feed management plans with future trends	Consider the full array of interactions in the ecosystem	Support management recommen-dations
	2.5 Establish Biodiversity Indicators specific for EU Overseas	Co-design biodiversity indicators	Monitor changes in resources and uses	Incorporate societal values and attitudes towards biodiversity	Use overseas context specific indicators to set precautionary ecological limits

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MANAGEMENT OF EUROPEAN OVERSEAS (SUB)TROPICAL BIODIVERSITY IN SUPPORT OF SUSTAINABLE DEVELOPMENT: POLICY RECOMMENDATIONS AND PRIORITIES FOR RESEARCH COOPERATION

1. Assets and opportunities in European Union Overseas

Chapter 1

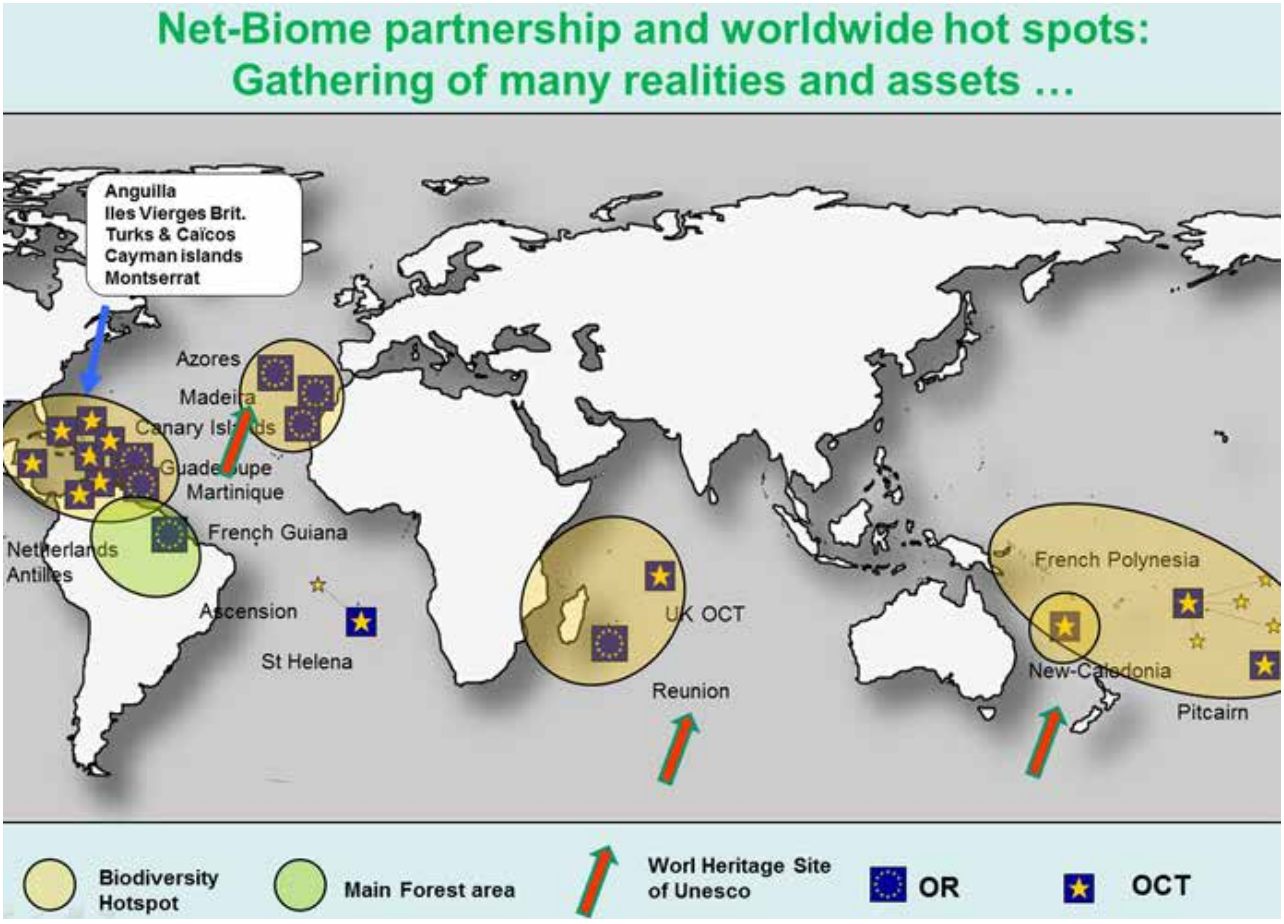
Assets and opportunities in European Union Overseas

Outermost Regions (ORs) and Overseas Countries and Territories (OCTs)

The European Union (EU) Overseas territories comprise nine Outermost Regions (ORs) and 25 Overseas Countries and Territories (OCTs). The ORs are part of three EU Member States (France, Portugal and Spain), and are an integral part of Europe. The OCTs are associated to the EU and constitutionally depend on Denmark, France, the Netherlands and the United Kingdom. OCT's nationals are in principle EU citizens, although their relation with the EU is based on EU law and not the law of the Member State to which they are linked[1]. For the purpose of this report, the term "EU Overseas" will be used to collectively refer to both European ORs and OCTs.

The relevance of ORs and OCTs for global biodiversity

The EU Overseas are of strategic importance to Europe and its Member States. In terms of natural resources, the EU Overseas host an impressive range of species, landscapes and ecosystems, whose global significance has been widely recognised. The EU Overseas are especially well-known for their terrestrial, freshwater and marine biodiversity. The EU Overseas support unique ecosystems which are home to an estimated one-third of the globally threatened species[2], including many endemic species.



Source: adapted from IUCN by Région Réunion

The EU Overseas in the tropical and subtropical regions share remarkable characteristics, including high and distinctive biological diversity with a high level of endemism (overlapping 5 biodiversity hotspots[i]); common aspiration for socio-economic development and human well-being, which is largely dependent on natural resources (living and non-living, terrestrial and marine); limited land space that is impacted by human activities, resulting from different settlement histories; local knowledge and traditional approaches to exploiting natural resources sustainably; and geographic isolation and insularity, coupled with the required levels of interrelations and cooperation, with their respective Member State, the EU and within their regional environment.

Biodiversity is a fundamental asset for economic development of the EU Overseas, and changes that affect biodiversity have a major impact on the local economies and development capacities. The primary sector (fisheries, agriculture, husbandry and forestry) is economically and socially important, as well as tourism that builds on the cultural services of biodiversity. The human imprint on nature keeps increasing, due to the demographic growth within limited areas (through urbanization and industry). This strong interdependence between economic activity and the natural environment, and the "value" of natural and endogenous resources, is not always fully recognized in small islands where most extinction events happens. The management of these conflicts between nature and society are critical challenges for the EU Overseas.

Another key feature of EU Overseas economies is the high level of interactions between and within the various levels of society. Compared to mainland it is apparent that production and other economic cycles are shorter, with fewer intermediate levels that tighten the links between producers and end-users. EU Overseas administrative structures are often as or even more complex than the continental ones, but with limited human resources to run them. An integrated vision is required to cope with the various sectors and stakeholders that could be impacted by any particular activity. For this reason, EU Overseas entities have been pioneers in the multi-actor approach - a methodology recommended by the EC to foster demand driven innovation.

The relevance of research cooperation in biodiversity management

Most ORs and OCTs are islands or archipelagoes in four regions (Caribbean, Macaronesia, Indian Ocean, Pacific), with a large range of geoclimatic characteristics and drivers. A mosaic of geological history, variety of land forms and climatic features provide a network of evolutionary settings in which biodiversity and ecosystem processes can be studied at relevant scales in a comparative manner. One of the largest tropical forests in relatively good condition is also linked to this network (in French Guyana).

European tropical and subtropical areas are also characterized by high ecosystem diversity over short distances. Such models are especially relevant for the study of connectivity and consequences of habitat fragmentation. Research cooperation allows scientific approaches at various hierarchical scales (island, archipelago, oceanic region) and a better generalization of research results to give fundamental insights into mechanisms shaping biodiversity and ecosystem processes.

In addition, nature-society interactions in islands provide rich and varied assets to enable the understanding of how biodiversity management can support sustainable development. While history and the trajectory of human settlements and social interaction can be specific to each entity, ORs and OCTs face common human pressures on limited areas of land and sea. Socio-cultural traits and histories of each OR and OCT have led to locally adapted practices in use and conservation of biodiversity, for food security, health and cultural purposes. These allow a comparative approach whilst also providing opportunities for sharing of best practices.

Research cooperation over this hierarchy of scales and biogeographic regions will provide robust trends, free from context specific background noise.

[i] A biodiversity hotspot is a biogeographic region that is both a significant reservoir of biodiversity and is threatened with destruction.

There are thus a range of advantages that justify research cooperation between ORs and OCT's in the tropical and subtropical regions, to feed and develop knowledge-based recommendations and actions in the field of biodiversity management in support of sustainable development.

Bottom-up initiatives to improve biodiversity management in ORs and OCTs

The rich biodiversity of EU Overseas is under a series of pressures, such as various direct human activities, invasive alien species, natural hazards and/or climate change. To actively tackle these pressures, a number of committed entities in the ORs and OCTs set up the NetBiome (ERA-NET) partnership in 2007. NetBiome-CSA, as the follow-on EC Framework Programme (FP) project started in May 2013, aims to tackle the specific challenges, capitalizing on EU Overseas societies' strong ties and biodiversity assets.

The NetBiome-CSA project extends and strengthens research partnerships and cooperation for smart and sustainable management of tropical and subtropical biodiversity in the EU Overseas. The project mobilizes stakeholders and end-users at all levels of the quadruple helix (knowledge institutions, enterprises, governments and civil societies) through project initiatives such as policy and research priority analysis, multi-stakeholder dialogues, exchange of good practices, interviews and workshops. Such proactive involvement of stakeholders aims to address perceived priority challenges in reconciling conservation and sustainable management of tropical biodiversity with the sustainable development of Europe's ORs and OCTs.

Co-design process to define challenges for the management of biodiversity

A co-design process was developed and implemented in order to mobilize panels of experts and build bridges between geographic regions. Going beyond the expertise of the scientific community and policy makers, specific attention was given to ensure that the perceptions of civil society and private economic stakeholders, which are key players in the field of biodiversity management, were taken into account.

There is a pressing societal expectation to improve the sustainability of human activities that could, otherwise, jeopardise biodiversity, ecosystem functioning and services, with direct or indirect consequences for livelihood, sustainable development and adaptation to environmental hazards and changes. Agriculture (and forestry) and fisheries are particularly emphasized, among other types of human induced drivers (industry, housing and transport). Taking in the broader picture, all human activities should be considered together with nature services to search for compatible uses. A main aspect of the methodology used for dialogue in NetBiome-CSA was to structure the discussions on a limited number (four) of challenges.

The four challenges identified are common societal needs for improving the sustainability of human activities which impact biodiversity and that could, considering current practices, jeopardise future EU Overseas aspirations for development. This selection does not exclude additional challenges being identified in future discussions.

If not tackled, these four challenges are believed to endanger biodiversity in the EU Overseas and thus jeopardise their future.

The four major challenges were used as a framework for structured in-depth dialogue sessions, which resulted in the collective definition of research cooperation priorities and policy recommendations.

Four challenges as key interdependencies between sustainable development and biodiversity conservation

The four challenges that were identified for the management of European Overseas (sub)tropical biodiversity in support of sustainable development are: 1) Integrated biodiversity conservation through spatial planning; 2) Sustainable agriculture and forestry practices; 3) Sustainable management and effective conservation of biodiversity; 4) Knowledge based decision-making in marine and coastal issues.

This report focuses on these challenges, aiming to address the interest of stakeholder groups, including policy makers, scientific communities

and representatives of civil societies in European Member States and EU Overseas.

Organisation of this report

Following this Introduction, the report is structured as follows:

Chapter 2 identifies five tangible and feasible Policy Recommendations:

- Adopt a more coherent approach to spatial planning, accounting for ecological and societal considerations
- Adapt international legislation to national/ regional context
- Promote more efficient and sustainable usage of natural resources
- Put ecosystem-based management principles into practice
- Establish Biodiversity Indicators Specific for EU Overseas

Chapter 3 proposes four Research Priorities, designed to lead to future funding support and aligned with H2020 societal challenges and the EU Biodiversity Strategy and the recommendations of its Mid-Term review[3]:

- Improve tools for effective participation in biodiversity management;
- Predict effects of climate change on natural resource use;
- Increase the consideration of biodiversity and ecosystem services in environmental assessment and valuation methods;
- Map ecological limits to extractive activities.

The NetBiome-CSA partners, responsible for this document, acknowledge all those that contributed to the process and its outcomes. A full list of names is included in the Annex.

MANAGEMENT OF EUROPEAN OVERSEAS (SUB)TROPICAL BIODIVERSITY IN SUPPORT OF SUSTAINABLE DEVELOPMENT: POLICY RECOMMENDATIONS AND PRIORITIES FOR RESEARCH COOPERATION

2. POLICY RECOMMENDATIONS

Chapter 2
Policy Recommendations

2.1 Adopt a more coherent approach to spatial planning, accounting for ecological and societal considerations

Spatial planning aims to optimise the distribution of human activities within a given area to achieve a desired set of ecological, economic and social objectives. The process includes land dedicated to urban, industrial and rural activities, e.g. agriculture, forestry and fisheries. Spatial plans are subject to public consultation, legal adjudication and periodic review, aiming to optimise and monitor economic human activities affecting the resilience of ecosystems at all temporal and spatial scales. Spatial planning thus helps to identify the trade-offs between socio-economic performance, the need to maintain a healthy, robust and productive environment, and ability to reach consensus.

A well designed and integrated spatial planning strategy requires that several dimensions be addressed in parallel.

Such strategies must 1) account for the impacts of climate change and safeguard the resilience of ecosystems[4, 5], 2) prevent and manage natural and technological hazards[6], and 3) ensure the sustainable use of resources to preserve ecosystem functioning and integrity[7].

Spatial plans aim to foster sustainable economic, social, and cultural development while enhancing environmental preservation.

Spatial planning instruments not only provide ways of simulating the impact and interactions of human activities, but also contribute to a coherent basis for cross-sectoral and interdisciplinary cooperation across spatial scales. Temporal scales are also a central factor in spatial planning, requiring a balance between the long-term approaches necessary for biodiversity-related issues and the shorter-term social and economic dynamics. While biodiversity loss and ecosystem alteration may jeopardise economic development and human well-being, other factors such as high unemployment rates, sectoral competitiveness and growth often take preference over biodiversity conservation. As knowledge is sometimes lacking on forecasting future biodiversity conditions on islands, long-term planning becomes a greater challenge. Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA) are important decision-making tools to take these considerations into account. Such tools help to predict significant negative long-term impacts during the planning process and assist decision-makers in supporting developments and plans that maximise ecological sustainability.

In order to increase the acceptance and uptake of an area's plan the decision-making processes associated with spatial planning should be inclusive and collaborative. Engaging the wider public and key stakeholders in such processes requires the application of appropriate communication methods to acquire and manage locally relevant information (e.g. on perspectives, values and priorities, interests, attitudes) and evaluate alternative scenarios[8].

Present situation

Spatial plans "should integrate all the issues that affect the development and use of land within a specific territorial area, whether social, economic or environmental"[9]. In the EU Overseas, these issues are concentrated within very small territories, which exacerbates the tension between different competing needs. The typical human concentration in coastal areas in EU Overseas poses a further challenge to spatial planning[10].

While existing plans are promising starts to integrating diverse objectives, there is still potencial to improve the balance between economic, social and environmental goals in the long-term. Inconsistent regional and sectoral policies and legislation in the EU Overseas, as well as the diverse application of EU policies, can make difficult to embrace a multi-scale approach. Furthermore, while EU Overseas often have some form of EIA regulation, its implementation tends to be problematic[11]. Issues include a lack of experts, inadequate consideration of alternatives to a project, inappropriate valuation of ecosystem services, and a failure to follow-up and monitor impacts after a decision has been taken. There is also significant potential to more adequately integrate scenario analysis in EIAs, in order to define "future developments for cumulative effects assessment and consider the influence of contextual change (e.g. climate change) on impact forecasts for specific projects"[12]. Unlike EIA, legislation for SEA tends to be largely absent[13].

Recommended Measures

→ Use the tools and methods available in order to manage uncertainties efficiently and make decisions despite this uncertain context;

→ Harmonise sectorial policies and strategies, and adapt objectives of different policies to regional and local priorities in order to enable a coordinated approach to spatial planning that fosters innovative solutions;

→ Establish and enforce planning regulations and standards which limit the amount of new greenfield development[ii] and instead promote infill development[iii] within urban areas;

→ Encourage sustainable urbanisation practices via the setting of clear density standards for new development projects, or provision of incentives for brownfield[iv] conversion;

→ Improve and integrate innovative participatory measures and tools in spatial planning decision-making processes to engage stakeholders and experts, acquire locally relevant information, evaluate alternative scenarios and ensure applicability of outcomes to local demands/needs;

→ Increase the integration of scenario analysis in, for example, EIA/SEA, in order to better integrate foreseen climate change vulnerabilities and related concerns in the decision-making and planning processes, so as to minimise associated societal risks;

→ Increase the consideration of ecosystem service values (not necessarily in monetary terms) in decision-making processes alongside economic and social concerns, via the application of cost-benefit or multi-criteria analyses;

→ Promote lifelong learning at all levels within the public and private sectors to accelerate the integration of an evolving juridical context and put it into action.

[ii] Greenfield development is the creation of planned communities on previously undeveloped land. This land may be rural, agricultural or unused areas on the outskirts of urban areas.

[iii] Infill development is the process of developing vacant or under-used parcels within existing urban areas that are already largely developed. Most communities have significant vacant land within city limits, which, for various reasons, has been passed over in the normal course of urbanization.

[iv] Brownfield is a term used in urban planning to describe land previously used for industrial purposes or some commercial uses.

2.2 Adapt international legislation to national/regional context

Harmonisation of international regulations with national and sub-national legislation is necessary to enable a common pursuit of clearly defined objectives. Nonetheless, "one size fits all" policy responses often fail to meet the context-specific (long-term) needs on a regional or local scale, and can even be in conflict with community aspirations and traditional practices (e.g. landscape management, agriculture, fisheries). For the EU Overseas, the scope and approach are particularly relevant, as regulatory frameworks are a tool to facilitate collaboration and knowledge exchange and best practices.

Locally adapted regulations are essential to address the challenges faced by EU Overseas with regard to biodiversity conservation and adaptation to climate change.

While mitigation strategies to minimise negative impacts on biodiversity are already taken into account in most regulations, improvements are needed to increase the consideration of ecosystem services. Spatial planning is one example of a process that is, by definition, tied to the local geography and which often explores potential impacts on biodiversity via environmental impacts assessments studies. Policies relating to spatial planning should thus be sufficiently flexible to take the biophysical, socio-economic and cultural specificities of each OR and OCT into account and increase the consideration of ecosystem services, particularly when related to societal well-being.

Furthermore, the EU Overseas have in some cases developed distinctive land management systems that are highly adapted to the local environment. Logically, they require adapted agro-forestry regulations in order to avoid applying ill-suited policies based on foreign models and that will not help existing practices become more sustainable. Contextualised regulations are important to match EU guidelines to the unique situations of EU Overseas with regard to the sustainable management and effective conservation of biodiversity. Finally, the EU Overseas need to give a voice to local stakeholders in decision-making to tackle the challenge of marine and coastal issues. This could be done with the support of adapted regulations.

Present Situation

EU Overseas are characterised by their limited spatial area, geographical isolation, small economy, high endemism and strong dependency on a restricted number of products. While Article 349-2[14] of the Treaty on the Functioning of the European Union states that EU law should be adapted to take into account ORs specificities, and many EU guidelines and indicators (notably for biodiversity management and monitoring) are available for continental Europe, these tools and policies do not necessarily fit the conditions of Europe's OCTs and ORs, making the implementation of some regulations more difficult than in other signatory countries. For example, compensatory mechanisms for infrastructure developments such as those promoted within the "No Net Loss" framework[15] are challenging in EU Overseas, given the limited physical space and alternative sites available.

In addition to European legislation, EU Overseas have to comply with international and regional conventions and regulations such as the Convention on Biological Diversity (CBD), the Ramsar Convention (for the conservation of wetlands), and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). The international recognition afforded by these legislative items is an asset for EU Overseas, but there remains room for fostering the increased exploration of such topics as Access and Benefit Sharing (ABS). It is crucial that the transcription of ABS in national law, as well as future international negociations, take in account overseas specificities.

The wealth of biodiversity and high levels of endemism are potential sources of commercially valuable genetic and biochemical resources. Bio-

discovery, characterisation and further commercial exploitation require new practices and frameworks that recognise the genetic origin and the traditional knowledge from which a natural product was sourced.

More generally, there is a complex patchwork of regulations dealing with biodiversity, natural resources (such as water) and ecosystems. From the international and EU level down to the national and local levels, it is not easy to find the most effective regulation to address local issues.

Given these considerations, it is therefore crucial to implement international conventions and goals such as CBD Aichi targets and Sustainable Development Goals (SDG) in a way that reflects the specific realities of EU Overseas and fosters the exchange of experiences and good practices in addressing the challenges. Through the ORs' Presidents Conference, for example, ORs jointly work on shared issues in the field of adapting regulations and addressing unemployment issues. They support joint initiatives to foster ORs recognition at the EU level. Similarly, for OCTs, the Association of Overseas Countries and Territories (OCTA) promote OCTs' profiles and common positions notably through the Ministerial conference, its highest decision-making authority.

Recommended Measures

→ Invest resources in participating in new EU laws and regulation developments in order to influence and adapt them to ORs and OCTs context and status as early as possible;

→ Strengthen national administrative, legislative and economic capacity for highlighting regional needs when developing coastal and marine, agricultural, forestry, and natural resource management plans and strategies in accordance with international standards and obligations;

→ Increase the application of available scientific evidence, including traditional ecological knowledge and practices, in planning and legislative decision-making processes;

→ Develop additional forums for regional collaboration through a regional framework or council to share knowledge about common experiences, challenges and tools for integrating regional specificities in policy development and implementation (e.g. establish a Fisheries Advisory Council for the ORs[16,17] and to facilitate regional discussion of European common policies and encourage stakeholder participation);

→ Support the exchange of experiences and best practices regarding the attainment of ABS objectives, for integration of these considerations from the local to the national level and to facilitate behavioural change amongst researchers, businesses and local policy makers.

2.3 Promote more efficient and sustainable usage of natural resources

The expansion of industrial processes, intensive agricultural practices and the wider development of infrastructures threaten biodiversity and the resilience of ecosystems. While environmental impact assessments and financial penalties have been widely applied to reduce these negative effects, their effectiveness is not always optimised and environmental perils persist. The constructed facilities are also often misaligned with local demands, reducing their societal benefit.

While some local solutions which utilise nature's capacities exist, the potential of a more widespread application of nature-based solutions should be investigated. Such innovative approaches could be more widely used to, for example, treat sewage with bamboo filtration swamps or regulate building temperatures with green roofs and facades. If planned in advance a more systemic perspective could also be applied to connect multiple processes for increased efficiency, such as using the waste from one source as raw material for another (e.g. using warm sewage sludge to heat water installations). This circular approach could preserve resources and reduce the financial constraints placed on local governments and industries.

Policy makers, farmers and researchers increasingly acknowledge the limitations and drawbacks of intensive agriculture. Negative consequences can include ecological crisis due to excessive and mis-use of pesticides (e.g. chlordecone in Guadeloupe and Martinique) and a decrease of yields, such as with bananas in the Canary Islands. This emerging shift draws attention to agro-ecology based on a greater use of agro-biodiversity and circular economies to provide ecosystem services. These kinds of alternative systems demonstrate how land can be used effectively to provide resources without harming biodiversity or the provision of ecosystem services. Similar conclusions were recently formulated regarding the marine realm Similar conclusions were recently formulated regarding the marine realm.[18]

Indigenous knowledge and traditional sustainable practices can also foster smart natural resource use and reduce damaging practices. "Jardin créole" - a spontaneously adapted form of agroforestry - is an example of a sustainable practice which increases agricultural productivity while maintaining biodiversity. Smaller, traditional farming systems have the potential to contribute to improved social cohesion while enhancing the ecological modernisation of agriculture as compared to conventional systems[19, 20]. However, traditional funding schemes in agriculture, which are based on special, large, single crop farming systems make it difficult to support these transformative approaches.

Conserving biodiversity requires new resource efficient production systems to enhance local genetic diversity while meeting society's needs and demands.

Exploring nature-based solutions and implementing a circular economy will lead to reduced impacts on the environment and foster ecosystem service provision.

Present Situation

While EU Overseas are renowned for the richness of their ecosystems, their biotic and abiotic resources are restricted and increasingly under threat from unsustainable human activities and climate change. The limited space, isolated and closed nature of these territories also result in a high dependency on imported goods. Invasive alien species[21], the overexploitation of resources, pollution and habitat destruction are threats to natural resources and biodiversity. Finally, insular EU Overseas are particularly vulnerable to natural hazards and to the forecast effects of climate change.

Consequently, small islands are under significantly higher pressure to "balance ecological integrity with economic development and collective quality

of life"[22]. This entails improving socio-economic systems to reduce costs, save energy and better adapt to climate change. However, establishing a sustainable balance among demands requires sufficient knowledge and evidence upon which to base decisions, including inhabitants' needs alongside environmental and socio-economic models, and a shift to a more holistic perspective spanning spatial and temporal scales.

This aim is supported by Europe's commitments for a bio-economy through both the EC´s Bioeconomy Strategy[23] and Horizon 2020 research activities.

Recommended Measures

→ Foster public and private incentives (e.g. certification schemes, targeted subsidies) encouraging sustainable practices and the development of innovative organizations and adapted technologies which aim to increase resource efficiency and facilitate a circular economy;

→ Explore the potential added value of implementing nature-based solutions in new developments to replace or complement grey infrastructure, and design incentives to promote these approaches;

→ Maintain and/or create forums and organizations where regional stakeholders have the opportunity to discuss ongoing resource management measures in order to facilitate knowledge and technology exchange, capacity building and the sharing of good planning and management practices;

→ Support the growth of eco-tourism by sustainably developing the required infrastructure and building management capacity within the local population, in order to drive this emerging sustainable market forward;

→ Encourage the uptake of adaptive management approaches which are designed to integrate gained experiences and new knowledge regarding, for example, projected climate change impacts and changing vulnerabilities;

→ Support research on the potential of indigenous species and traditional management practices as valuable tools for adapting to climate change and minimizing the risks posed by natural hazards;

→ Provide incentives for relevant agricultural initiatives such as farmers´ associations and agricultural diversification to foster the optimization of production systems in addition to the development of adapted technology (for small farmers and mixed-farming systems);

→ Develop agroecological strategies and innovations to increase population's food self-sufficiency.

2.4 Put ecosystem-based management principles into practice

Efforts towards effective management and conservation of natural resources often fail because they target only a single set of sectors/objectives or they overlook the value of ecosystem services in decision-making[24]. To overcome this, scientists and managers have been advocating a management approach that takes into consideration the full array of interactions within an ecosystem, including human activities. To be more effective, ecosystem-based management must clearly state its goals and criteria to redefine management units (based on meaningful biophysical and human features).

Consensus should be developed on multiple interactions within and among management units so as to define the appropriate planning and management structure[25]. These should include a final validation stage with standard phases of monitoring (to measure, on a regular basis, the key social-ecological aspects that have significant impact on the environment) and periodic system auditing to assess the level of conformity of the programmes in the management plan and the effectiveness of these programmes in achieving the vision[26].

Agro-ecology leads to reconciliation of human needs for food and raw materials with the preservation of biodiversity and ecosystem services.

The modern approach of fisheries management, emphasised in key international agreements adopted over the last two decades[27,28], and in the new European Commission Common Fisheries Policy[29], also highlights the need for knowledge by requiring the adoption of an Ecosystem Approach to Fisheries Management (EAFM).

Present Situation

Examples of ecosystem-based management can be found in a number of publications, many of which are identified as good practices by stakeholders of the NetBiome-CSA project. However, there is still much to explore.

A recent analysis of the Caribbean Sea[30] concludes that, due to the lack of firm political commitment and a clearly defined ecosystem strategy, the "ecosystem management of the marine environment is not being seriously considered and is often ´compromised´". The authors are critical about the lack of commitment in the Caribbean EU Overseas to regional environmental programmes, thereby weakening their effectiveness. A revision of the Marine Protected Areas (MPA) in Latin America and the Caribbean[31] highlights the need for an integrated approach: the Caribbean Sea has the greatest number of MPAs, but their distribution in relation to habitat type is uneven. Management strategies that complement MPAs are urgently needed, especially in terms of protecting vulnerable habitats like coral reefs from global warming and pollution.

In regard to farming and forestry systems, the development of locally adapted, ecosystem-based approaches in management is hindered by the lack of information on their nature and diversity. This leaves the systems at risk from social and economic changes caused by well-intended but inappropriate policy measures and technologies. Lack of knowledge about these biological resources also undermines their potential for supporting sustainable growth and delivering culturally relevant and life-enhancing services.

Recommended Measures

→ Reach a consensus on ecosystem objectives at various levels (protection of species and habitats, maintenance of ecosystem services, ensuring human well-being) through a stakeholder engagement process, that will serve as a cross-sectoral consultation body including different perspectives from resource users, citizens, managers and experts;

→ Define management units that are relevant to the scale of the processes to be tackled, and ensure that they are operational. The most effective management frameworks tend to have a flat hierarchy, clear allocation of responsibility and a sound decision-making mechanism;

→ Choose indicators to facilitate tracking of the ecosystem status and trends relevant to objectives. Set thresholds for each ecosystem indicator, both at upper and lower levels. Simulation models can help set thresholds for multiple criteria;

→ Assess the current state of each indicator related to threats in the system, using conceptual models and maps of threat intensity and frequency;

→ Adopt an adaptive management approach: incorporate modelling as well as expert opinions to define the management strategy; design and install a monitoring programme to identify how management action(s) impact the chosen indicators.

2.5 Establish biodiversity indicators specific for EU Overseas

Biodiversity indicators provide information relevant to management plans and policy decisions that help halt the loss of biodiversity and the degradation of ecosystem services.

An indicator is "a measure based on verifiable data that conveys information about more than itself". They are purpose dependent – the interpretation or meaning given to the data depends on the purpose or issues concerned. National and regional governments use biodiversity indicators to guide the establishment of policies for conservation and sustainable use of biodiversity, to seek support and justification for their decisions, to report on the impact of their policies, and to track progress towards global and national targets.

Effective biodiversity indicators are essential for biodiversity management in support of sustainable development.

Monitoring the quality and functioning of ecosystems is also a means for determining potential long-term changes induced by land use and climatic fluctuations. For instance, indicators can help monitor change in land cover, change in species composition and change in people's attitude towards biodiversity.

At the global level, two main biodiversity indicator initiatives are being developed:

- The Biodiversity Indicators Partnership (BIP)[32] is a global initiative mandated by the Convention on Biological Biodiversity (CBD) to promote and coordinate development and delivery of biodiversity indicators in support of the CBD, other Multilateral Environmental Agreements (MEAs), Intergovernmental Platform on Biodiversity & Ecosystem Services (IPBES), national and regional governments and a range of other sectors.

- The Group on Earth Observation's Biodiversity Observation Network (GEO BON), mainly technical, is developing a set of Essential Biodiversity Variables (EBVs)[33] to facilitate the harmonization of existing monitoring schemes and guide the implementation of new ones, especially in areas which information on biodiversity change is still very limited.

At the EU level, the Streamlining European Biodiversity Indicators (SEBI) 2010 partnership led by the EEA established a first set of indicators to address the EC target of halting the loss of biodiversity by 2010[34]. In 2014, a feasibility study on a common set of indicators specific to EU OCTs and ORs was commissioned by the EEA to IUCN[35].

National initiatives are underway in France, the UK and the Dutch Caribbean. Twelve indicators specific to French Overseas have been identified and are currently under evaluation[36]. Work is being undertaken to elaborate biodiversity indicators for the UK OCTs; and a study[37] to identify robust indicators of the status and trends of biodiversity of the Dutch Caribbean was commissioned and released in June 2015.

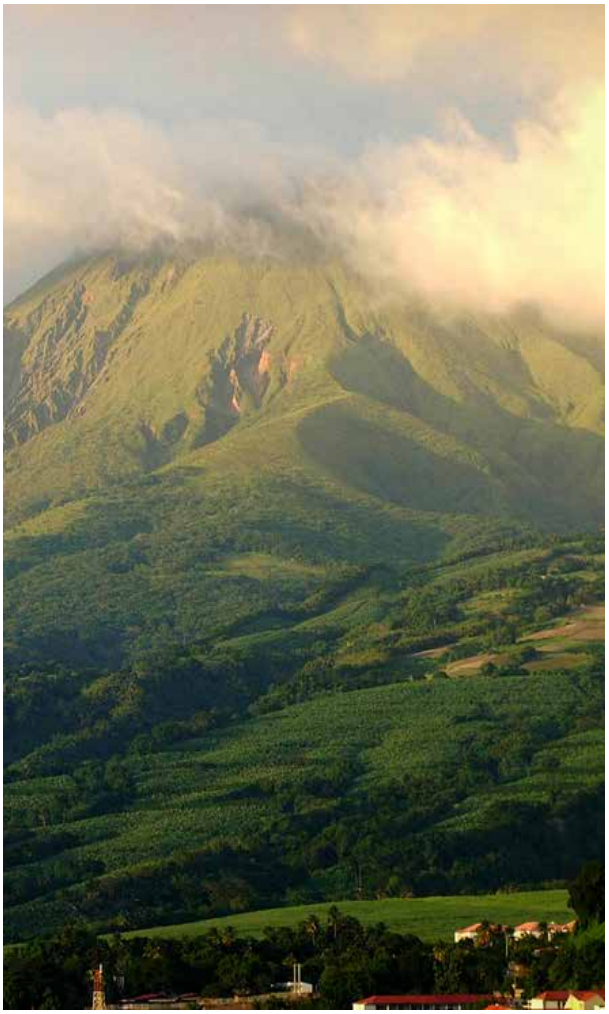
Present Situation

Governmental land-management agencies are required to monitor the quality and functioning of ecosystems. In order for the EU to properly safeguard its rich biodiversity, appropriate monitoring of the quality and function of the EU Overseas ecosystems is required. Existing biodiversity indicators of change based on European policy models and funding strategies designed for continental contexts and needs, are offen regarded as inadequate[38].

At present, existing monitoring programmes in the EU Overseas do not cover all required biodiversity and nature topics, and in some cases methods that are not suitable to assess the relevance of the indicators are used. The distribution of species (particularly endemic) should be monitored at a much finer temporal and spatial scale than indicated in the continental European rules. Despite the need for biodiversity indicators[39,40], to date no joint monitoring programmes have been set up. This situation is not allowing the monitoring of the EU Overseas' biodiversity adequately, and neither the efficiency

of the policies nor funds that have been dedicated to them. This creates an impediment for the completion of the assessment of implementation of EU Biodiversity Strategy.

Given the international scope of the endeavour, creating and capitalizing synergies between related projects and initiatives is crucial to avoid duplicating efforts. Coordination in the conceptualization, application, testing and maintenance of common sets of EU Overseas' biodiversity indicators will require enhanced cooperation and integration of indicators across the fields of biodiversity, ecology, social sciences, economy, and environmental policy. It will also require improvement of regional, national and local initiatives following the lessons learnt. Technical and political support at the local, national, regional and European levels is a pre-requisite, as it will help to develop synergies between ongoing initiatives, mobilize expertise and make financial resources available.



Recommended Measures

→ Develop biodiversity indicators for the EU OCTs and ORs that fulfil a similar purpose to those developed for continental Europe. This is important for supporting a sound assessment of the EU Biodiversity Strategy. These indicators should be comparable within similar biogeographical regions and data collected using a methodology that involves local actors and builds local capacity;

→ Carry out a consultation process and define the (mutually) desired state of biodiversity and ecosystem services in the EU Overseas;

→ Set up expert working groups experienced in (sub-)tropical biodiversity research with strong local expertise and contacts. These working groups will be established to:

- Identify (present and previous) local biodiversity and ecosystem services;
- Agree on the key species that provide 'rapid' indication on the state of health of habitats and resources, for instance species and habitats on which data already exist and/or species that are known to be good indicators for evaluating a state of an ecosystem;
- Create an inventory of (minimum) required indicators for habitats/ecosystems, species, and agro-systems health, based on treaty requirements and local needs.

MANAGEMENT OF EUROPEAN OVERSEAS (SUB)TROPICAL BIODIVERSITY IN SUPPORT OF SUSTAINABLE DEVELOPMENT: POLICY RECOMMENDATIONS AND PRIORITIES FOR RESEARCH COOPERATION

3. Research Priorities

Chapter 3
Research Priorities

3.1 Improve tools for effective participation in biodiversity management

Rationale

The early involvement of a range of stakeholders and the exchange of their knowledge and perspectives are widely accepted as key factors of success for any form of planning and decision-making, in which a common ownership of results and decisions is desired. An increasing number of regulations (such as the European Water Framework Directive) and recommendations (such as H2020 responsible research and innovation and multi-actor approach) prescribe the active involvement of various actors, and particularly end-users in any action of societal interest, given the significant weaknesses found with more traditional top-down approaches.

Even with strong scientific knowledge as a basis, management decisions will rarely be optimised without a transparent and participatory governance process[41]. For natural resources management, processes in which the preferences and knowledge of scientists and other stakeholders are taken into account have proven to have effective impacts.[42]

A key consideration is to facilitate the co-design of management or development of solutions using the best available scientific and local knowledge.

Similar reflections have been applied within the sphere of innovation, where the classic linear approach has failed due to 1) the default tendency to seek out high technology solutions; and 2) the lack of tools or processes to reconcile local needs with those making scientific and technical decisions. This disconnection prevents the generation of adapted, locally relevant solutions and greatly inhibits the success of the actions.

This is a cross-cutting priority, requiring integration of the various societal interests. It also requires the establishment of natural resource management mechanisms at all scales that could 1) build on and integrate expert and empirical knowledge and perspectives in cohesive solutions; 2) cope with uncertainties in dealing with climate change, imperfect knowledge regarding nature more generally, natural hazards, and individual/cultural differences in the ways individuals interact, react to events and make decisions; and 3) adapt the collectively agreed decisions to new knowledge. It can also improve the governance of research and connect priorities and activities to socio-economic expectations.

Investments in research aimed at capturing local knowledge through participatory tools and approaches to bring together science and society are essential. Finally, as vulnerable groups are and will remain the most affected by biodiversity management given their high dependency on natural resources and short-term livelihood concerns, their perceptions and interests must be taken into account for the definition of relevant priorities and projects.

Unique Overseas Assets

Societies in EU Overseas have fewer hierarchical levels of organisation, easier interactions between and within these levels, and shorter economic cycles – thus resulting in closer links between the various stakeholders in biodiversity conservation. Furthermore, socio-cultural traits and the historical situations of each OR and OCT have led to locally adapted practices in the use and conservation of biodiversity. This provides opportunities for comparative approaches and the sharing of best practices.

How to Address the Research Priority

→ Investigate the diversity of interactions between society and ecosystem components to understand how these influence participation and decision-making;

→ Investigate the influence of social systems on the perception of biodiversity and ecosystem services;

→ Conduct a comparative analysis of tools, models and processes from the fields of biodiversity management and beyond;

→ Evaluate the impact of stakeholder engagement on a) the quality and impact of the research; and b) the efficiency of biodiversity management measures;

→ Develop comparative approaches to the impacts of governance/social systems on decision-making processes and management efficiency;

→ Develop participatory methods that a) incorporate short-term interests within long-term frameworks; b) increase visibility of local livelihood requirements in management processes; and c) coherently combine local perceptions and scientific knowledge on biodiversity;

→ Use a (participatory) appraisal tool to identify various uncertainty factors (e.g. climate, season, technology, land-use options, user practices, etc) that lead to specific impacts on biodiversity[v].

Expected Impact

- Tools to implement shared governance and facilitate the development and application of adaptive management approaches for natural resources;
- Effective and balanced integration of both long and short-term goals reconciling biodiversity conservation and societal development;
- Recommendations or improved criteria for assessing societal impacts of research/defining research priorities;
- Production of methodological guidelines for improving the participatory nature of decision-making processes and increasing stakeholder awareness;
- Proposals for relevant indicators, monitoring methods and protocols;
- More efficient collaborative research and development of solutions to local challenges in cooperation with stakeholders;
- Co-design and co-production of solutions-oriented research and innovation development.

[v] An approach is needed to use models not as a specialists-tool but as a medium for active communication of ideas and concepts in a participatory manner.

3.2 Predict effects of climate change on natural resource use

Rationale

Climate change, caused by the human emissions of greenhouse gases, is one of the greatest self-inflicted threats to humankind. The effects of climate change include elevated temperatures in both atmospheric and oceanic systems, increased frequency of extreme weather events, sea-level rise and ocean acidification. Its impacts are wide-ranging. Changes in the water cycle are affecting the quality and quantity of water resources, with negative effects on crop yields, and ocean acidification among other things is destroying coral reefs. As a consequence of these changes, many terrestrial, freshwater and marine species spatial distributions shifted, with changes in their numbers, seasonal activities, migration patterns, and interactions with other species.

Under all but the most restrictive scenarios envisaged by the Intergovernmental Panel on Climate Change (IPCC) a large fraction of species faces increased extinction risk. The distribution of terrestrial species will not be able to shift sufficiently fast across continental landscapes to keep up with the expected changes in climate. This situation is even worse on islands, where species have nowhere to go. Mountains may provide limited refuge to some species, but highland communities risk disappearance. Coral reefs are threatened by ocean acidification, and coastal habitats are at risk from the rising sea levels.

All of these changes are likely to undermine food security: the distribution of marine species will change, and biodiversity will be reduced in sensitive areas (namely the coastal habitats like estuaries and mangroves) reducing fisheries productivity; on land, cultures such as wheat, rice or maize in tropical and temperate regions will be negatively impacted.

While applied studies directed at specific regions or natural resources are needed to guide local adaptation strategies, broad-scale investigations are crucial to plan regional strategies for the use of natural resources.

Unique Overseas Assets

The network of EU Overseas is in a privileged position to conduct the research needed to guide management strategies and support decision-making. As a first factor, their richness of climate gradients is unparalleled in continental Europe, providing the setting for many descriptive or experimental studies on the effect of climate change in natural resource use. In mountainous islands, for instance, tropical and temperate ecosystems may be separated by just a few kilometres; on increasingly larger scales, the complex setting of islands within archipelagos and the disposition of archipelagos across vast latitudinal differences provide the gradients of climate and connectivity over which descriptive analysis can identify general patterns and experiments can be carried out. This natural scenario is further enriched with different modes of exploitation of natural resources, from systems of subsistence agriculture and fisheries to export-driven industrial production.

How to Address the Research Priority

→ Downscale climate models to the level of islands and archipelagos;

→ Optimise production systems, adapting regional land breeds (plants and animals) or introducing new ones;

→ Analyse the effects of the spread of invasive species and pathogens on agrosystems and natural ecosystems;

→ Analyse habitat degradation and altered ecosystem services;

→ Predict the effects on fisheries, either directly (through changes in species range and metabolic rate) or indirectly (via coral bleaching or invasive species) and aquaculture;

→ Investigate the impact of extreme events on biodiversity, ecosystem resilience and socio-economic activities;

→ Establish long-term biodiversity and ecology datasets, and reinforce existing ones.

Expected Impact

• Contribution to the global body of scientific knowledge on climate change;

• Development of a sufficient understanding of the patterns and trends of climate impacts on biodiversity to enable effective interventions to preserve unique elements and sustain the corresponding ecosystem services;

• Climate proofing, i.e., integration of climate considerations into planning at territorial, sectoral and project levels.

3.3 Increase the consideration of biodiversity and ecosystem services in environmental assessment and valuation methods

Rationale

Smart investments in infrastructure are needed in many of the European overseas territories to support economic development and improve quality of life[43]. However, infrastructure expansion has offen been in conflict with biodiversity conservation. Environmental sustainability has often not been well integrated in regional or national development strategies[44].

The development of new spatial plans or the implementation of construction projects commonly require environmental assessments and potentially valuation exercises to be conducted as part of the decision-making and planning processes.

While biodiversity conservation has received some attention in this context, ecosystem services are hardly ever considered. Their integration into decision-making processes is further complicated by the lack of a generally accepted methodology for expressing the value of the services ecosystems provided to humans.

he lack of consideration of ecosystem services often results in a failure of infrastructural developments to generate the desired wider societal benefits. Research is thus of crucial importance to establish how best to consider these aspects in planning and assessment processes. A further challenge is to find an adequate approach representing the diverse set of ecosystem services provided in a given area as part of such assessments. The Millennium Ecosystem Assessment[45] outlines a broad range of services that helps to ensure that major societal benefits provided by ecosystems are not overlooked. However, the categories fail to clarify how a) a representative subset of targets should be selected and weighted; and b) potential future ecosystem services can be captured which will evolve with the human population and changing expectations.

Additional uncertainty exists about what kinds of Biodiversity and Ecosystem Services (BES) information have the greatest potential to concretely influence decision-making processes and bring about improved well-being. Significant gaps remain in translating the results of environmental assessments into practice, in order to preserve biodiversity and ecosystem services provisioning. Relevant research questions would include: Does the regulation require compensatory mitigation for the foreseen impacts? How is the Avoidance Mitigation Compensation (AMC) mechanism designed and implemented? How can BES valuation be accurately fed into the AMC mechanism, avoiding green washing attitudes?

A recent publication[46] advocates the need to move away from area and habitat-based assessments methods for biodiversity and ecosystem services and towards functional assessments at a landscape or seascape scale. This is intended to better reflect cumulative impacts and variations in environmental quality, social needs and value preferences.

Research on the aforementioned considerations could facilitate the uptake of environmental assessment and valuation outcomes in decision-making processes, ultimately improving the consideration of ecosystem services and biodiversity when designing legislation and undertaking infrastructure design and spatial planning processes. This is particularly crucial in EU Overseas, where ecosystems are closely tied to the livelihoods of the population via tourism, food production and coastal protection, and are the foundation of human well-being.

Unique Overseas Assets

The small economies of the ORs and OCTs rely, to a large extent, on the “natural capital” that is provided by their ecosystems. The fishing, agriculture and tourism sectors are examples of such natural capital. The crucial role that biodiversity and ecosystem services play for societal well-being, job creation

and food provision thus makes ORs and OCTs a fertile research ground both for environmental and resource economists as well as for social scientists. The trade-offs between biodiversity protection and economic development offer interesting case studies for the investigation of the socio-economic value of biodiversity and ecosystem services, as well as for methods to better integrate these values in decision-making processes.

How to Address the Research Priority

→ Test and compare existing monetary and non-monetary valuation methods, including benefit transfer and upscaling approaches that focus on the transfer of values between similar regions;

→ Identify indicators beyond monetary estimates that can give a better estimate of the value and attitudes of local communities towards biodiversity;

→ Develop a central framework as well as satellite accounts for natural capital;

→ Apply existing functional assessments at a landscape or seascape scale, focusing on developing methods to reflect cumulative impacts and variations in environmental quality, social needs and value preferences;

→ Explore the impact (i.e. the effectiveness or added value) that the valuation of ecosystem services has on sustainable development, including the choice of a particular prevention, mitigation and/or adaptation strategy;

→ Evaluate the design and effectiveness of available avoidance mitigation compensation mechanisms which could be applied in the case of new developments and the potential for including BES assessments.

Expected Impact

- Increased evidence base to determine the robustness of existing valuation and assessment approaches in light of BES considerations and the delivery of wider societal benefits;

- Improved consideration of ecosystem services values (natural capital) and stakeholder interests in decision-making and planning processes;

- More holistic approach to ecosystem and natural resource management that considers the full array of factors within social-ecological systems as well as future evolutions;

- Determination of numbers and thresholds for market-based policy instruments, such as taxes and compensation schemes (e.g. payments for ecosystem services);

- Increased effectiveness and improved application of nature-based solutions for natural resource management;

- Wider application of effective mitigation compensation mechanisms, ultimately increasing the conservation of biodiversity and continued provisioning of ecosystem services.

3.4 Map ecological limits to extractive activities

Rationale

Ecosystem complexity constitutes an important obstacle to management: the number of species and environmental factors simultaneously interacting in a non-linear manner is so high that it is impossible to accurately predict ecosystem evolution or, more pragmatically, the effect of any given management decision. Fortunately, complexity science has now identified patterns and properties that provide guidelines for research. It is known that if ecosystems are pushed beyond the limits of their resilience, sudden shifts (in technical terms, catastrophic shifts) can take them to new equilibria where they stay locked, even if the pressure is reduced or removed[47]. If anthropogenic stressors, in particular extractive activities such as logging or overfishing, exceed certain thresholds this can lead to new ecosystems which are much less desirable socially and economically than the original ones[48].

Research identifying phase-shift thresholds of direct and indirect stressors is urgently needed. In particular, linkages across habitats and species should be examined to guide decisions over limits to extractive activities, such as fishing or logging.

In addition, the full dynamics of the relationship between humans and the ecosystem must be approached to guide decisions on limits to extractive activities[49].

Unique Overseas Assets

The research protocol on ecosystem thresholds[50] invariably requires the examination of similar ecosystems with different levels of human impact. The diverse geo-climatic characteristics of the EU Overseas, coupled with the great variety of land/marine uses and respective management systems, create a perfect setting for descriptive or even experimental approaches to map the ecological limits to extractive activities.

How to Address the Research Priority

→ Provide multidisciplinary analysis and conceptualization of specific social-ecological systems to bridge the gap between theory and application;

→ Develop models and scenarios for optimizing extraction from multiple trophic levels;

→ Identify resilience threshold indicators and values as tipping points for maintaining ecosystem structure and functioning;

→ Develop indicators and monitoring protocols on a temporal and spatial scale relevant to the ecological threshold, and with local and regional-scale management.

Expected Impact

- Improved knowledge and understanding of resource and social as well as ecological system dynamics;
- Improved guidelines to manage extractive activities;
- Multilevel social networks to generate and transfer knowledge and develop social capital;
- Legal, political, and financial support for ecosystem management initiatives;
- Improved management strategies for sustainable natural resources.

Annex

Annex I

In order to ensure the anchoring of common priorities to local societal and development needs, a multi-actor approach was implemented, going beyond the expertise of the scientific community and policy makers, and giving specific attention to the perceptions and know-how of civil society and business interests, both of which play a key role in biodiversity management.

A co-design process was set up and implemented in order to mobilize panels of expertise and build bridges between dispersed regions (*Macronesia, Pacific, Indian Ocean, and Caribbean, and continental Europe*) and disciplines.

- Key actors from all branches of the quadruple helix (civil society, enterprise, governments, knowledge institutions) were identified. Their expertise and perceptions were sought and analysed.

- First, from August 2013 to June 2014, various levels of knowledge have been gathered, analysed and combined, coming from existing sectorial strategies, expert analysis, end-users perceptions and ad-hoc multi-stakeholder workshops, to build a consensus on four common denominators (4 challenges) for the collective definition of priorities for research cooperation and joint activities in ORs and OCTs.

- Then, from June 2014 to March 2016, challenge specific workgroups were organised (Grand Canaria Island in June 2014, Guadeloupe in October 2014 and Reunion Island in June 2015) as well as electronic consultations in order to formulate research priorities and policy recommendations that address those challenges. The conclusions were formalized and structured in a unique strategic document thanks to a committed and collective involvement.

Below are listed, in alphabetical order, all those that contributed at different stages of the process. This list does not differentiate between those who responded to the initial survey and those experts and partners who took part in the face-to-face workshops or the compilation and editing of the final document.

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Victoria Eugenia; Martin Victor; Martinez Carole; Martinez Dominique; Martins Albertino; Martins António Frias; Martín-Sosa Rodríguez Pablo; Melo Carla; Mendoza Guzmán Héctor; Menezes Gui; Meyer Jean-Yves; Mille Christian; Minatchy Nathalie; Mondesir Gisele; Moura Mónica; Moverley David; Nascimento Gisela; Neto Ana Isabel; Nossin Emmanuel; Ozier-Lafontaine Harry; Panton Janice; Paramio Luz; Patrão Neves Maria Do Céu; Pavis Claudie; Payri Claude; Pereira Alexandre; Pereira Maria; Perez Sacau Elisa Maria; Pérez Toledo Simeón; Pietrus Alain; Pinheiro de Carvalho Miguel A.A.; Pinho Mário; Piontek Steven; Prada Susana; Quartermain Alan; Raes Niels; Raigné Sèverine; Ramos Melo Juan José; Reyes Betancort Jorge Alfredo; Rivaton Adrien; Rochefort Katia; Rougier Jean-Emmanuel; Rufray Vincent; Saffache Pascal; San Blas Álvarez Antonio; Santos Pedro Afonso; Sanz Nicolas; Sequeira Miguel; Sierra Soraya; Silva Emiliana; Simal Fernando; Simancas Cruz Moisés; Sim-Sim Pinheiro Manuela; Smith-Ravin Juliette; Soares António Onofre; Souan Hélène; Sousa Nuno; Stapel Johan; Stech Michael; Taquet Marc; Thompson Douglas; Thouard Emmanuel; Tuya Cortés Fernando; Van Slobbe Frank; Védie Fabien; Ventura Maria; Vergès Charlotte; Vermeij Mark; Vieux Caroline; Villagarcia Marimar; Virginie Xavier; Weck Vanessa; Wolfs Esther; Wulff Adrien; Yvon Christophe; Zhang Kai

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MANAGEMENT OF EUROPEAN OVERSEAS (SUB)TROPICAL BIODIVERSITY IN SUPPORT OF SUSTAINABLE DEVELOPMENT: POLICY RECOMMENDATIONS AND PRIORITIES FOR RESEARCH COOPERATION

NETBIOME-CSA

STRENGTHENING EUROPEAN RESEARCH COOPERATION FOR SMART AND SUSTAINABLE MANAGEMENT OF TROPICAL AND SUBTROPICAL BIODIVERSITY IN OUTERMOST REGIONS AND OVERSEAS COUNTRIES AND TERRITORIES

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