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Research Article

Mapping and assessing ecosystem services in Europe's Overseas: A comparative analysis of MOVE case studies

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Abstract

Mapping and Assessment of Ecosystems and their Services (MAES) has been widely applied on the European Union (EU) mainland, whereas the EU Overseas entities still bear potential for implementation. This paper presents novel applications of the MAES procedure in the EU Outermost Regions and Overseas Countries and Territories ("EU Overseas"). Eight case studies from different geographical areas were analysed through a comparative assessment by applying an established framework following key steps in the MAES process, in order to stipulate lessons learned and recommendations for MAES in the EU Overseas. These key steps include the identification of policy questions, stakeholder networks and involvement, application of MAES methods, dissemination and communication and implementation. The case studies were conducted and analysed under the umbrella of the EU MOVE pilot project, including the Azores, the Canary Islands, Saint Martin, French Guiana, Martinique, Reunion Island and the Falkland Islands. Each case study represented different governance, policy and decision-making frameworks towards biodiversity and environmental protection. Case studies predominantly addressed the policy domains of *Nature and Biodiversity Conservation* and *Marine and Maritime Policy. Ecosystem Services* (ES) were assessed across a wide range of themes, biomes and scales, focusing on terrestrial, coastal and marine ecosystems. Results show that the implementation of the case studies was accompanied by extensive communication and dissemination activities. First success stories were visible, where the MAES exercise led to meaningful uptake of the ES concept to policies and decision-making. Yet, there is still work to be done - major bottlenecks were identified related to the MAES implementation centring around financial resources, training and technical expertise. Addressing these aspects can contribute to an enhanced implementation of MAES in the EU Overseas in the future.

Keywords

comparative assessment, EU Overseas, EU MAES, ecosystem services, mapping

1. Introduction

Mapping and Assessment of Ecosystems and their Services (MAES) are core components to the European Union (EU) Biodiversity (BD) Strategies for 2020 and 2030. Particularly, Action 5 of the 2020 Strategy's second target foresaw each EU Member State mapping and assessing the state of ecosystems and ecosystem services (ES) in their national territories, thus creating an EU-wide knowledge base (European Commission 2011). This is important for advancing biodiversity objectives and creating informed policies on agriculture, water, climate and landscape planning, amongst other sectors. Furthermore, it is a resource to identify areas for ecosystem restoration and a baseline against which the goal of no net loss of biodiversity and ES can be evaluated.

The Outermost Regions (ORs) and Overseas Countries and Territories (OCTs) of the EU (hereinafter referred to as "EU Overseas") are scattered around the globe, presenting hotspots of biodiversity and ES (Sieber et al. 2018). They host more than 70% of the EU biodiversity, 20% of global coral reefs and lagoons (Petit and Prudent 2008), 6% of endangered and Red-listed species globally (Martinez et al. 2017), and contain diverse and unique ecosystems from seagrass beds to mountains and tropical rainforests. Based on the high variety of ecosystems with exceptionally high biodiversity in these territories, multiple ES are provided that are relevant from local to global scale. Despite recent efforts from all EU Member States, for example, under the umbrella of the EU Project ESMERALDA (Enhancing ecoSysteM sERvices mApping for poLicy and Decision mAking; Burkhard et al. 2018a, Burkhard et al. 2018b) and EU BEST initiative (voluntary scheme for Biodiversity and Ecosystem Services in Territories of European overseas*[1]), the EU overseas still fall behind in terms of ES mapping and assessment in their territories (Sieber et al. 2018).

The MOVE pilot project ("Facilitating MAES to support regional policy in Overseas Europe, mobilising stakeholders and pooling resources"; 2018-2021*[3]) supported the implementation of MAES within the participating overseas regions. In response to the requirements of Action 5, the project intended to fill the gaps in MAES implementation between continental and the EU Overseas. The project involved policy-makers, researchers and the civil society in the development of methodologies for MAES, tested throughout case studies (CS) across selected EU overseas territories.

This paper presents and compares eight CS developed during the MOVE project in Terceira Island (Archipelago of the Azores, Portugal), the Canary Islands (Spain), Saint Martin (Dutch Caribbean and France), Martinique, French Guiana, Reunion Island (France) and the Falkland Islands (UK). With their different contexts, scopes, scales and ecosystems, these CS represent suitable examples to understand the transfer of ES mapping and assessment approaches for policy- and decision-making to the EU overseas and to draw the lessons learned in the light of existing challenges and opportunities. The eight case studies were compared through the analytical framework developed and applied under the ESMERALDA project (Geneletti et al. 2020). Hereby, the major focus was put on key stages of the MAES implementation process, including the identification of policy questions, identification of stakeholders, network creation and involvement of stakeholders, mapping and assessment process, applications, dissemination and communication and the actual implementation in policy- and decision-making.

2. Methodology

2.1 Selection of Case Studies

The following criteria were applied to select case studies. First, the CS regions needed to cover the five main global biogeographical regions in the EU Overseas (situated in the EU and the UK): Caribbean, Macaronesia, Amazonia, South Atlantic and Indian Ocean. Second, the implementation of CS took place between 2017 and 2021. Finally, the CS had a clear focus on MAES implementation and aimed for informed policy- and decision-making. Based on these criteria, eight CS were obtained with representative Overseas entities from different EU Member states, including the Canary Islands (Spain), the Azores, specifically Terceira Island (Portugal), the Caribbean Island of Saint Martin (consisting of the Dutch OCT Sint Maarten and the French OR Saint Martin), the Falkland Islands (United Kingdom) and the ORs French Guiana, Martinique and Reunion Island (France) (Fig. 1 andFig. 2).

Case study	EU Member State	Case Study	Ecosystem	Scale	Area/Length	Sources
The Azores	PT	Modelling ES - Terceira Island	Terrestrial	Local	400.3 km²	Sieber et al. (2021)
The Canary Islands	ES	Mapping and Assessment of ES related to *Cymodocea Nodosa* Meadows	Seagrass meadows	Regional	1999.6 km² (infralittoral zone)	Casas et al. (2021)
Saint Martin (1) Simpson Bay Lagoon	NL/FR	Valuing a Caribbean coastal lagoon using the choice experiment method: The case of the Simpson Bay Lagoon, Saint Martin	Coastal	Local	8.8 km	Duijndam et al. (2020)
Saint Martin (2) The whole island	NL / FR	Mapping the Economic Value of Marine ES on St. Maarten	Coastal and marine	Local	88 km	Schmiedel et al. (2020)
Martinique	FR	Assessment of marine ecosystem condition and the impact on ES provision	Marine	Local	18 km	Maréchal et al. (2020)
French Guiana	FR	Land Use Changes and ES in French Guiana	Terrestrial	Regional	83,346 km²	Sieber et al. (2020)
The Falkland Islands	UK	Valuation of kelp forest ecosystem services	Kelp forest	Regional	830.1 km²	Bayley et al. (2021)
Reunion Island	FR	Assessment of terrestrial and marine ES	Terrestrial and marine	Regional	2,512 km²	Lagabrielle et al. (2020)

Figure 1.

Overview of the selected case studies

These CS covered a broad variety of terrestrial and marine ecosystems from highly local remains of endemic Laurel forest in the Azores and seagrass meadows in the Canary Islands to tropical coral reefs in Saint Martin or large kelp forests in the South Atlantic Ocean (Bayley et al. 2021) on a regional scale, distributed across the entire territory (Sieber et al. 2021a, Anonymous 2021b). The spatial extent of the assessments varies from local lagoons (Duijndam et al. 2020), individual islands (Sieber et al. 2021,Schmiedel et al. 2020, Maréchal and Trégarot 2021,Lagabrielle and Wiefels 2020) to entire archipelagos (e.g. Canary Islands (Casas et al. 2021)). Two studies cover the OR of Saint Martin, both addressing coastal ecosystems. The first study focused specifically on the ES of the Simpson Bay Lagoon (Duijndam et al. 2020) and the second Saint Martin CS focused on ES provisioning of the entire island (Schmiedel et al. 2020).

Figure 2.
Locations of the selected case studies.

2.2 Framework for comparative analysis of case studies

The framework used for the comparative analysis follows the one developed by Geneletti et al. (2020) in the ESMERALDA project*[2] which depicts the major steps of the online platform "ESMERALDA MAES Explorer"*[6]. This operational framework provides directions on the process of how to map and assess ES as required by Action 5 of the EU Biodiversity Strategy to 2020 (European Commission 2011), as shown in previous research (see Fig. 3). For each CS, the five steps of the MAES implementation were analysed. However, the main focus of this paper is on the mapping and assessment process (step 3) (Fig. 3).

Step 1. Identification of policy questions

For meaningful ES mapping and assessment, it is important to frame concise policy, business and societal questions that drive the MAES process as a starting point (step 1) to elaborate and successfully implement ES knowledge in decision-making (Maes et al. 2012, Burkhard et al. 2018b). For this purpose, the classification of policy questions into different domains proposed by Geneletti et al. (2020) was used.

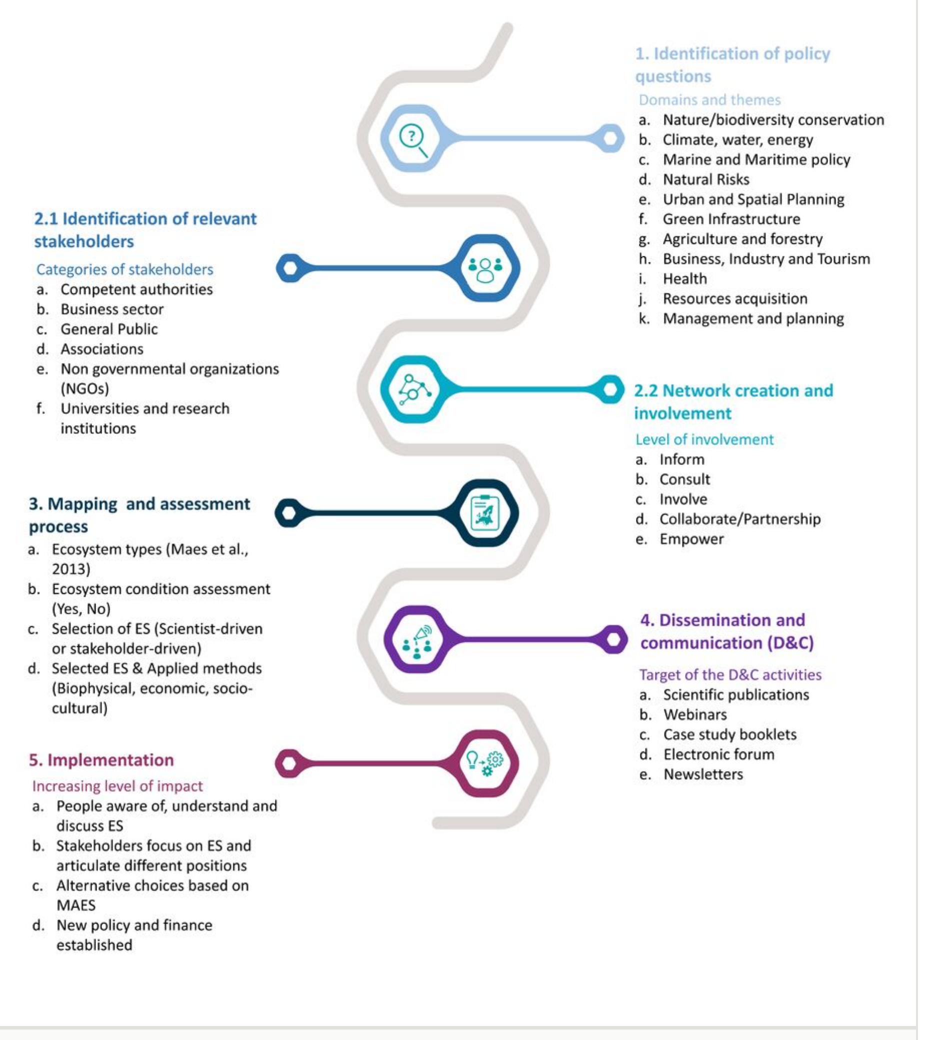


Figure 3.

Framework used for the analysis of the case studies. Adjusted from Geneletti et al. (2020).

Step 2: Identification of relevant stakeholders and network creation and involvement

Another precondition to successful MAES implementation is the presence and active participation of key stakeholders (Geneletti et al. 2020). Therefore, the CS focused on strengthening the stakeholder networks related to the topic of ES. Stakeholder identification took place using two approaches: (i) expert knowledge was used to identify existing stakeholders and networks, based on MOVE consortium members, using the "snowball" method (Goodman 1961); (ii) in addition to the stakeholder networks identified, an additional internet search took place, to collect the largest number of legal entities operating in the fields of environment, mapping and assessment of ES, including a quick analysis of public environmental policies. This internet search was completed by the MOVE partners’ expert knowledge. Representatives and contacts of each legal entity were also identified, ranked according to their geographical distribution and domains of activity in relation to ecosystem services (Cillaurren and David 2019).

We considered the framework proposed by Geneletti et al. 2020 to identify the level of stakeholder involvement and participation. The framework identifies five categories of interactions that could be established with stakeholders according to the "Spectrum of Public Participation" defined by the International Association for Public Participation (IAP2)*[10]: *inform, consult*, *involve*, *collaborate* and *empower*. These categories represent an increasing level of stakeholder entitlement in the decision-making process and, therefore, they are useful to assess the effectiveness of participation. Lower levels of the spectrum, such as *inform* and *consult*, relate to providing stakeholders with balanced and objective information and obtaining public feedback on analysis, alternatives or final decisions. More advanced levels, such as *involve*, *collaborate* and *empower*, refer to working directly with stakeholders to ensure that their concerns and preferences are incorporated through all the decision-making steps with the aim of empowering them in implementation and management decisions.

Step 3. Mapping and assessment process

In this step, we focused on the mapping and assessment process of the selected ecosystems, their condition and the services they provide. Further, the ES classification was assessed - did case studies follow the EU-wide applied CICES classification, the TEEB or Natural Capital concepts? In addition, the methods selected to map and assess ES were identified in this step.

Step 4. Dissemination and Communication

The dissemination and communication strategy of case studies on ES to policy- and decision-makers is often complex. Following the work of Geneletti et al. (2020), we distinguished between three major types of audiences for dissemination and communication:

1. specialised audiences, especially in the scientific domain;
2. competent authorities that can be reached through policy briefs, reports etc.; and
3. the general public that can be reached through newspaper articles, social media etc.

Step 5. Implementation

In this step, the actual implementation was analysed, based on the level of impact that each CS could achieve. As described in Geneletti et al. (2020), this level of impact was evaluated after the completion of each CS, based on criteria adapted from Ruckelshaus et al. (2015).

2.3 Assessment methodology to identify challenges and bottlenecks for successful MAES implementation in the EU Overseas

To build recommendations and move forward with the implementation of MAES, it was necessary to define the general limitations and main technical and political bottlenecks of the ES approach in the EU Overseas.

For each of the CS, an initial questionnaire was designed and conducted amongst local and regional stakeholders listed in the first phase of the MOVE Project in 2019 (Cillaurren and David 2019). The questionnaire's objectives were to compile the capacities for MAES implementation, to assess the current status of development of the MAES framework, the state of knowledge on ecosystem condition, the needs of stakeholders and the main bottlenecks. The questionnaire was translated from English to French, Portuguese and Spanish and was distributed through paper and online formats accompanied by information on the MOVE project and an invitation letter. Finally, interviews were selected as the most effective way to assist in completing the questionnaire.

In each CS region, stakeholders were asked to list the technical and human resources available for their mapping work and to identify priority needs and bottlenecks (after Palomo et al. 2018). Bottlenecks were defined as the absence of resources. The resources were categorised into six groups of needs to carry out mapping and assessment of ecosystems and their services and included:

1. hardware (computers) and software,
2. technical expertise,
3. access to relevant geospatial data,
4. funding,
5. the existence of a user network and
6. training.

Finally, stakeholders declared these resources as priorities or as a bottleneck. For example, a stakeholder could declare the availability of computers and financial resources, but a lack of technical expertise and limited access to training to initiate the MAES process. In this sense, the lack of technical expertise and training would be classified as two bottlenecks and financial resources would be prioritised to overcome them.

A total of 172 stakeholders filled the questionnaire. Amongst them were 20 members of South Atlantic UK Overseas Territories (SAUKOTs), 24 from Dutch Caribbean, 29 from Reunion Island, 31 from the Azores, 31 from the Canary Islands, 31 from French Guiana and six from Martinique. Stakeholders were classified into nine different groups: General Territory Administration (GTA), Regional Administration (RA), Local Administration (LA), Governmental Organisation (GO), Non-Governmental Organisation (NGO), Research Institute (RI), Funding Body (FB), Private Sector (PS) and University (U).

As shown in Fig. 4, the highest percentage of stakeholders who filled the questionnaire in Martinique, SAUKOTs and the Dutch Caribbean belongs to the private sector. In the case of the Canary Islands, the proportion of stakeholders belonging to universities and research institutes (46%) was higher than the proportion of stakeholders corresponding to the private sector (30%). Furthermore, the highest proportion of stakeholders belonging to research institutes was found in the Azores (35%), Reunion Island (38%) and French Guiana (60%).

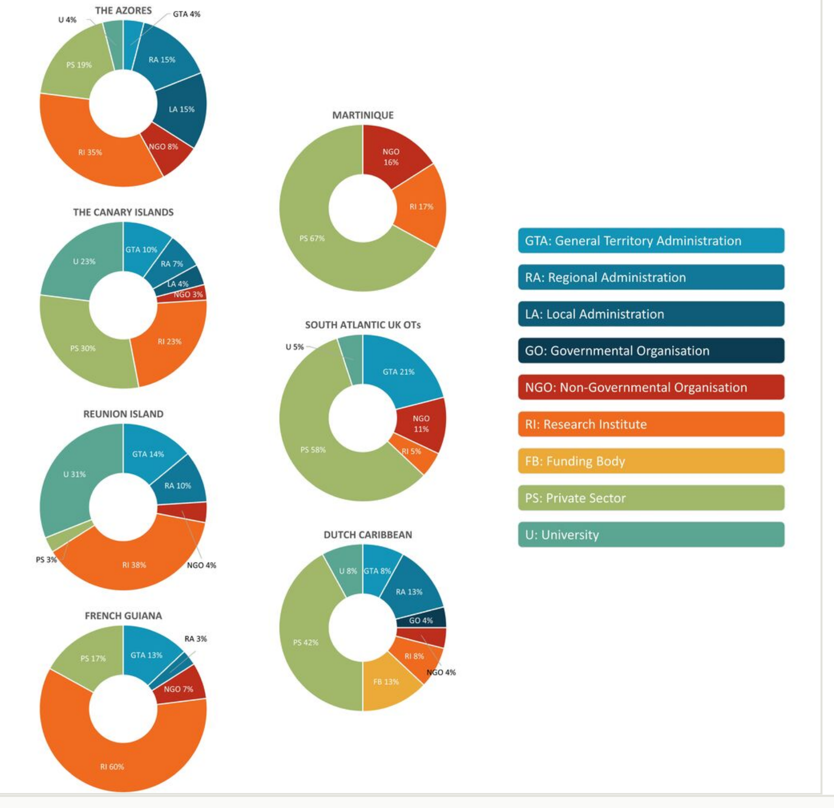


Figure 4.

Proportions of stakeholder groups that filled in the questionnaire in EU Overseas.

3. Results

This section presents the results following the steps explained in the methodology, as shown in Fig. 3.

3.1 Step 1: Identification of Policy Questions

Policy questions were analysed, based on their EU-relevant policy domains, whereby CS could address multiple domains without weighting factor. The majority of CS (88%) focused on the policy questions under the domain of *Nature and Biodiversity Conservation*, followed by *Marine and Maritime Policy* (75%) and *Management and Planning* (50%). In contrast, the least addressed were the policy domains of *Climate, Water and Energy*, *Natural Risks*, *Green Infrastructure* and *Resource acquisition* (see Fig. 5). Each assessed CS in the EU Overseas targeted 3.1 policy domains on average.

Case study	EU-Relevant policy domains										
	Nature /biodiversity conservation	Climate, water, energy	Marine and Maritime policy	Natural Risks	Urban and spatial planning	Green infrastructure	Agriculture and Forestry	Business, industry and tourism	Health	Resources acquisition	Management and planning
The Azores	●	●				●	●				●
The Canary Islands	●		●							●	●
Saint Martin (1) Simpson Bay Lagoon	●	●	●	●		●		●			●
Saint Martin (2) The whole island	●		●					●			●
Martinique	●		●				●	●		●	
French Guiana	●										
The Falkland Islands	●		●								
Reunion Island	●		●								●

Figure 5.

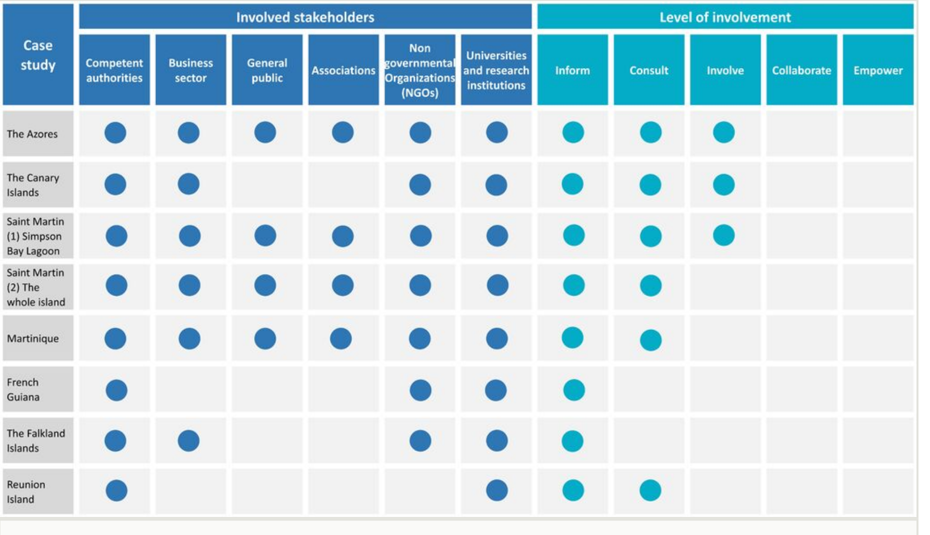
Overview of policy domains addressed in the case studies. Adapted from Geneletti et al. (2020).

Most of the CS (75%) adopted a comprehensive approach by focusing on more than one policy domain in order to tackle a wide variety of policy objectives, thus highlighting the multifunctionality and applicability of MAES results across diverse disciplines. For example, the case studies of the Canary Islands, Saint Martin, Martinique, the Falkland Islands and Reunion Island, centred around *Marine and Maritime Policies*. Some examples of the type of questions that drove these case studies were “how could the ES framework help to understand the value of Kelp forest (Bayley et al. 2021) to enhance marine spatial planning?” and “what are the societal costs and the spatial distribution of the Simpson Bay Lagoon pollution in Saint Martin?” (Duijndam et al. 2020). In Martinique, coastal ES and ecosystem condition were assessed using matrix applications to investigate and statistically analyse ecosystem condition thresholds to human and environmental pressures, which provided evidence for marine spatial planning (Maréchal and Trégarot 2021). With regards to Saint Martin, two separate lines of research were conducted: one for studying the capacity of mangrove regulating ES to address pollution problems in the Simpson Bay Lagoon and another for studying the total economic value of marine ES at the island level. These studies have been classified inside the *Marine Policy* and *Green infrastructure* domains as the knowledge acquired can be applied in a Marine Management Strategy to propose conservation or management strategies.

In the terrestrial realm, in the Azores and French Guiana region, a wide range of terrestrial ecosystems were assessed and an overview of ES supply was provided to for information regarding regional conservation and spatial planning policies (Sieber et al. 2021, Sieber et al. 2021a). In French Guiana, the collaboration with local stakeholders, such as the WWF France, was useful for the co-creation of policy questions related to the suitability of the ES framework for providing information for water management plans. Similarly, the CS of Reunion Island was driven by the need for informed maritime and terrestrial spatial planning, based on the assessment of ES such as carbon storage (Lagabrielle and Wiefels 2020).

3.2 Step 2: Identification of relevant stakeholders and network creation and involvement

As shown in Fig. 6, stakeholders from a diverse range of categories participated in the case studies, especially in Saint Martin, the Azores and Martinique which fostered active engagement and deeper levels of participation. In contrast to the stakeholders who filled the questionnaire mentioned in Section 2.3, at the initial stages of the project, this section focuses only on those stakeholders who had a direct collaboration in each CS. Regarding their involvement according to the spectrum, most of them were *informed* and *consulted* during the project, but just three regions advanced the participation level by *involving* them. Specifically, the Azores, the Canary Islands and Saint Martin involved the public in each aspect of decision-making, including the selection of relevant ES, development of alternatives and the identification of the preferred solutions.



Case study	Involved stakeholders						Level of involvement				
	Competent authorities	Business sector	General public	Associations	Non governmental Organizations (NGOs)	Universities and research institutions	Inform	Consult	Involve	Collaborate	Empower
The Azores	●	●	●	●	●	●	●	●	●		
The Canary Islands	●	●			●	●	●	●	●		
Saint Martin (1) Simpson Bay Lagoon	●	●	●	●	●	●	●	●	●		
Saint Martin (2) The whole island	●	●	●	●	●	●	●	●			
Martinique	●	●	●	●	●	●	●	●			
French Guiana	●				●	●	●				
The Falkland Islands	●	●			●	●	●				
Reunion Island	●					●	●	●			

Figure 6.

Categories of stakeholders and their level of involvement in the MAES process in the case studies. Adapted from Geneletti et al. (2020).

Regarding the Azores, local and regional stakeholders were invited to participate in individual face-to-face interviews, which contributed to identifying three different aspects:

1. their relationship with individual ES,

2. their connection and activities with ecosystems and
3. their involvement in projects relating to ES.

After that, two workshops were developed: one to inform and consult with stakeholders the results of the interviews and a final one to present the CS results and a survey to assess the CS strengths and weaknesses.

For the Canary Islands CS, constant communication with stakeholders facilitated the collection of spatially-explicit data. In later stages, local workshops took place in Gran Canaria and Tenerife Islands to get information on local priorities and methodological feasibility.

In relation to the stakeholders' involvement in the Simpson Bay Lagoon study (Saint Martin), a large household survey was conducted amongst 219 residents to gather information about their concerns and preferred solutions to protect the area, as well as to gain insights into the value of the main ES provided by the lagoon. Several environmental organisations, as well as stakeholders from industry and the government, contributed to the data collection process and/or helped to provide and clarify information (Duijndam et al. 2020). The second CS by Schmiedel et al. (2020) involved and consulted a range of stakeholders from business sectors to associations, NGOs and universities, building upon a strong local network.

In Martinique, stakeholders were consulted during the project to provide data and database access on the local environment and environmental pressures. A workshop was held in December 2020 using the official language (French) to present the results to local stakeholders.

In French Guiana, efforts were bundled with ongoing local initiatives such as the ECOSEO Interreg Project (Sieber et al. 2021), thus helping in the strengthening of existing networks on the topic of ES.

On the Falkland Islands, stakeholders were informed about the valuation study through public webinars.

On Reunion Island, the stakeholders selected were those potentially engaged in the development process and revision of a regional terrestrial and marine management spatial plan. Stakeholders were categorised into three groups. Group 1 (planning authorities) was informed about the MOVE project investigations and supported the organisation of workshops and the data collection process. Group 2 (scientists) was consulted and contributed to the collection and development of information on ecosystem distribution. Group 3 (natural and protected areas management authorities) was informed about the process and consulted, when necessary, to provide data and knowledge.

3.3 Step 3: Mapping and Assessment

3.3.1 Assessment of ecosystem condition and selection of ES

As shown in Fig. 7, a broad range of ecosystems was assessed. The French Guiana CS, for example, mapped ES across 14 different land use types across nine major ecosystem categories - together with the CS of Reunion Island, the greatest variety of ecosystem types was observed amongst the case studies. The CS of the Azores follows, where more than 20 land use types from eight categories have been assessed. Coastal ecosystems were most often evaluated (seven out of the eight CS).

Case study	Ecosystem type											Ecosystem condition	Selection of ES		
	a	b	c	d	e	f	g	h	i	j	k	Assessed (Yes/No)	Scientist-driven	Stakeholder-driven	Classification **
The Azores	●	●	●	●	●	●	●	●				NO	●		CICES
The Canary Islands										●	●	YES	●		CICES 5.1
Saint Martin (1) Simpson Bay Lagoon									●	●		NO	●	●	TEEB
Saint Martin (2) The whole island										●	●	YES	●	●	TEEB
Martinique										●		YES	●	●	CICES 5.1
French Guiana	●	●	●	●	●	●	●	●		●		NO	●		CICES
The Falkland Islands										●	●	NO	●		NC, CICES
Reunion Island	●	●	●	●	●	●			●	●	●	YES	●		CICES

Figure 7.

Overview of ecosystem types, ecosystem condition and selected ES in the eight CS. Adapted from Geneletti et al. (2020).

Ecosystem type: a. Urban; b. Cropland; c. Grassland; d. Woodland and forest; e. Heathland and shrub; f. Sparsely-vegetated land; g. Wetlands; h. Rivers and lakes; i. Marine inlet and transitional waters; j. Coastal; k. Shelf.

** ES Classification: CICES and CICES 5.1. Common Classification of ES (previous versions and current version 5.1.); NC: Natural Capital; TEEB: The Economics of Ecosystems and Biodiversity (TEEB 2010).

This third step also included ecosystem condition assessments. Ecosystem condition is the overall quality of an ecosystem unit, in terms of its main characteristics underpinning its capacity to generate ES (Czúcz and Condé 2017). Ecosystem condition can be measured using ecological indicators, agri-environmental indicators and those derived from the EU Marine Strategy Framework, Water Framework and Habitat Directives (Maes et al. 2018). In the Canary Islands, potential habitat suitability modelling and mapping procedures were used to determine the condition of seagrass meadows (Casas et al. 2021). In Martinique, researchers developed ecological condition indicators through habitat mapping, pressures' distribution and stable and transition stages of ecosystems. They also studied the impact of marine ecosystem condition on ES provision (Maréchal and Trégarot 2021). In Reunion Island, the assessment of terrestrial ecosystem condition was done by mapping the level of transformation of terrestrial habitats, including the level of invasion by alien species (Lagabrielle and Wiefels 2020).

The selection of ecosystem types, their condition and the respective services was science-driven in most of the case studies. Exceptions are represented by the cases of Saint Martin - Simpson Bay Lagoon and French Guiana, where local stakeholders were involved in the selection of suitable ES. The ES classification schemes applied in most case studies followed the CICES classification adopted by the European Commission (Haines-Young and Potschin-Young 2018). In the Falkland Islands, the Natural Capital framework was followed, which has been widely applied on the British OCTs (Bormpoudakis et al. 2019, Canelas et al. 2019, Tourangeau and Sherren 2020) (see Fig. 7).

3.3.2 Mapping and assessment methods

An overview of the ES assessed in each CS is shown in Fig. 8. In total, 50 ES were assessed in the eight case studies, altogether, 15 provisioning ES, 27 regulating & maintainance and eight cultural ES. Carbon sequestration and coastal protection were most commonly mapped and assessed in six out of eight CS. Fisheries or "wild plants (terrestrial and aquatic) for nutrition, materials or energy" provisioning ES, as described in CICES 5.1 (c.1.1.5.1), were addressed in five out of eight CS. The cultural ES tourism or recreational activities, as well as regulating ES water purification/filtration/quality, were mapped in four CS. Six out of eight CS focus on marine ecosystems and the related methodological development on coastal and marine ES. This shows a need for a better understanding of how islands depend on their coastal and marine environments to improve their spatial planning and ecosystem-based management.

All case studies applied a combination of methods or a tiered approach in which each tier adds mapping complexity and expertise (Grêt-Regamey et al. 2015, Weibel et al. 2018) to map and assess ES. The CS of French Guiana presented an expert-based matrix assessment of 22 different ES (Tier 1). An example of a higher-tiered approach was presented by the Azores CS, where more complex ES modelling was applied for six ES using the InVEST Model Suite (Tier 3).

The majority of CS applied economic ES assessments (6/8) to address coastal and marine ES, followed by biophysical ES assessments (5/8) and just two out of eight applied socio-cultural ones. In Saint Martin, value transfer was applied to estimate the economic value of marine ES and the local study on the Simpson Bay Lagoon applied a choice experiment and willingness to pay approach towards the economic valuation of ES (Duijndam et al. 2019, Duijndam et al. 2020). The Canary Islands and Falkland Islands CS both applied economic mapping and assessment methods to seagrass meadows and kelp forests, respectively (Casas et al. 2021, Bayley et al. 2021).

3.4 Step 4: Dissemination and Communication

The dissemination and communication activities focused on spreading the results of each CS to relevant authorities, associations, the general public and research institutions and on raising awareness of ES knowledge, as well as the ongoing MAES implementation in EU Overseas through six different MOVE project initiatives: an Electronic Forum, seven webinars, CS booklets, publications in scientific articles, newsletters and regular updates to the EU MAES working group*[13]. From these activities, the webinars were explicitly targeted at the general public, while the rest of them focused on communication with competent authorities, decision-makers, the general scientific community and stakeholders previously identified in each CS region. Fig. 9 shows the overview of dissemination and communication activities for the eight CS.

Case study	ES	CICES Class	Applied method	Type
The Azores	Recreation	3.1.1.1	Integrated Modelling Frameworks (InVEST)	Biophysical
	Pollination	2.2.2.1		
	Carbon storage	2.1.1.2		
	Erosion control	2.2.1.1		
	Water quality	2.2.5.1		
	Flow retention	2.2.1.3		
The Canary Islands	Maintaining nursery populations and habitats	2.2.2.3	Species Distribution Models	Biophysical
			Value transfer	Economic
Saint Martin (1) Simpson Bay Lagoon	Habitat services	2.2.2.3	Choice experiment method AND Willingness-to-pay	Economic
	Storm protection	2.2.1.4		
	Water filtration	2.1.1.2		
	Opportunities for recreation (Suitability for recreation)	3.1.1.1		
	Opportunities for tourism (Stay-over tourists)	3.1.1.2		
Saint Martin (2) The whole island	Tourism activities	3.1.1.2	Spatial analysis AND Value transfer	Biophysical AND Economic
	Carbon sequestration	2.1.1.2		
	Fisheries	1.1.5.1		
	Recreational activities	3.1.1.1		
Martinique	Coastal protection	2.2.1.3	Wave Attenuation Model	Biophysical
			Replacement cost	Economic
	Water purification	2.2.5.1	Process-based models – Nutrient uptake	Biophysical
			Replacement cost	Economic
	Fish biomass production	2.2.2.3	Statistical models - fish biodiversity abundance and size classes	Biophysical
			Replacement cost	Economic
French Guiana	Cultivated crops/food	1.1.1.1	Spatial Proxy Method (expert scoring)	Socio-cultural
	Reared animals and their outputs	1.1.3.1		
	Wild plants, algae and their outputs	1.1.5.1		
	Wild animals and their outputs	1.1.6.1		
	Freshwater supply for drinking purposes	4.2.1.1		
	Materials and fibres	1.1.1.2		
	Plants and resources for medical use	1.1.1.2		
	Carbon sequestration	2.1.1.2		
	Global and local climate regulation	2.2.6.1 and 2.2.6.2		
	Disease control	2.2.3.2		
	Pest control	2.2.3.1		
	Maintaining nursery populations and habitats	2.2.2.3		
	Pollination and seed dispersal	2.2.2.1 and 2.2.2.2		
	Hydrological cycle, water quality and flow maintenance	2.2.1.3		
	Maintaining soil quality	2.1.1.2		
	Mass stabilization and control of erosion rates	2.2.1.2		
	Storm protection	2.2.1.4		
	Flood protection	2.2.1.3		
	Emblematic or symbolic	3.2.1.1		
	Heritage (past and future) and existence	3.1.2.3		
	Aesthetic	3.1.2.4		
	Recreational activities including (eco) tourism	3.1.1.1		
The Falkland Islands	Carbon storage	2.1.1.2	Market value	Economic
	Nutrient cycling	2.2.4.2	Replacement cost	
	Fisheries	1.1.5.1	Value transfer	
	Alginate industry (non-use)	1.1.5.1	Value transfer	
Reunion Island	Carbon sequestration	2.1.1.2	Remote sensing	Biophysical
			Expert judgement	Socio-cultural
			Value transfer	Economic
	Fisheries	1.1.5.1	Remote sensing	Biophysical
			Net factor income	Economic
			Market value	
	Coastal erosion control	2.2.1.3	Damage cost avoided	
	Tourism	3.1.1.2	Net factor income	

Figure 8.

Selected ES analysed in the case studies and related methods.

The stakeholder involvement at the early stages of the process served to conceptualise interactive and user-friendly environments for communicating relevant results and for engaging with project partners. For example, an Electronic Forum was generated and updated to increase information exchange between stakeholders of the different regional case studies and to discuss the project's milestones and methodological questions that emerged during other dissemination events (e.g. public webinars), such as the use of the WebGIS-based Seasketch tool for ES mapping and biodiversity conservation in Reunion (France) and Terceira (Azores) Islands*[8].

Case study	Dissemination and communication activities				
	Scientific publications	Webinars	Case study booklet	Electronic Forum	Newsletters
The Azores	●	●	●	●	●
The Canary Islands	●	●	●		●
Saint Martin (1) Simpson Bay Lagoon	●	● Partially	●		●
Saint Martin (2) The whole island		● Partially	●		●
Martinique		●	●	●	●
French Guiana	●	●	●	●	●
The Falkland Islands	●	●	●		●
Reunion Island		●	●		●

Figure 9.

Dissemination and communication activities in the case studies.

Regarding the adoption of strategies to disseminate results to the general public, these aimed at spreading the importance of ES mapping in EU Overseas. As such, the MOVE webinars focused on reaching already involved stakeholders and on creating attractive materials for dissemination through social media channels (e.g. Facebook, Linkedin, Twitter), resulting in a gradual increase in participants and spanning a total of 260 participants for the seven events. An analysis of their profiles showed that the webinars from the Canary Islands (46 participants), Martinique (12) and Azores (65) were mainly attended by relevant researchers and organisations from the CS region. In contrast, participants of the webinars of the Falkland Islands (25), Reunion Island (55) and French Guiana (46) showed a highly heterogeneous profile, mainly from research institutions, NGOs and companies outside the CS area. The results of Saint Martin were presented privately in a stakeholder workshop to complement actions already undertaken by the CS, such as personally handing-over relevant results to the Environment Minister of Sint Maarten (Dutch side of the Island) and different appearances in local newspapers and radio. The seven presentations from the webinars were further posted on a Youtube channel. Project outcomes were further compiled in seven booklets and a special paper collection*[12] consisting of an overview of the CS and a summary of their relevant methods, mapping techniques and statistical analyses.

3.5 Step 5: Implementation

Fig. 10 shows an overview of the level of impact on policy- and decision-making of the different case studies. The results show a varying degree of impact of the case studies, whereby impact varies from people's awareness and understanding of the ES assessment to the uptake of results in new policy and finance mechanisms.

Case study	Increasing level of impact				
	People aware of, understand and discuss ES	Stakeholders focus on ES and articulate different positions	Alternative choices based on ES mapping and assessment	Plans and policies consider ES mapping and assessment	New policy and finance mechanism established
The Azores	●				
The Canary Islands	●				
Saint Martin (1) Simpson Bay Lagoon	●	●	●		●
Saint Martin (2) The whole island	●				
Martinique	●				
French Guiana	●	●			
The Falkland Islands	●				
Reunion Island	●				

Figure 10.

Level of impact on policies and decisions of MAES process in the case studies. Adapted from Geneletti et al. (2020).

Examples of successful implementation of ES mapping and assessment in different policy- and decision-making contexts can be found amongst the analysed case studies. The CS of French Guiana, in collaboration with the work of the ECOSEO project, led to an ES assessment, where results helped to understand the ES supply capacity of ecosystems (Sieber et al. 2021) and are to be included in the creation of a new water management plan. For the Simpson Bay Lagoon on Saint Martin, Duijndam et al. (2020) presented two scenarios, being the construction of a sewage treatment plant and mangrove restoration, that illustrate the economic importance of restoring the ecological integrity of the Lagoon and which show that effective environmental management could be a profitable alternative to grey infrastructure that can benefit the Islands' economy, society and environment.

3.6 Identification of challenges and bottlenecks for successful MAES implementation in the EU Overseas

The resources declared as priorities were assessed by a sample of 443 answers (Fig. 11), highlighting the different foci of the territories. In Reunion Island, the Canary Islands and

French Guiana, the combination of computer equipment (computers and software), technical expertise and access to geospatial data was stated to be of highest priority. The resources declared as priorities in the other regions were the financial resources associated with computer equipment in the South Atlantic, technical expertise in Saint Martin and user networking and training in the Azores. In both Reunion Island and French Guiana, the identified priority pack was constituted by ensuring financial resources, setting-up a network of users and training and granting access to geospatial data.

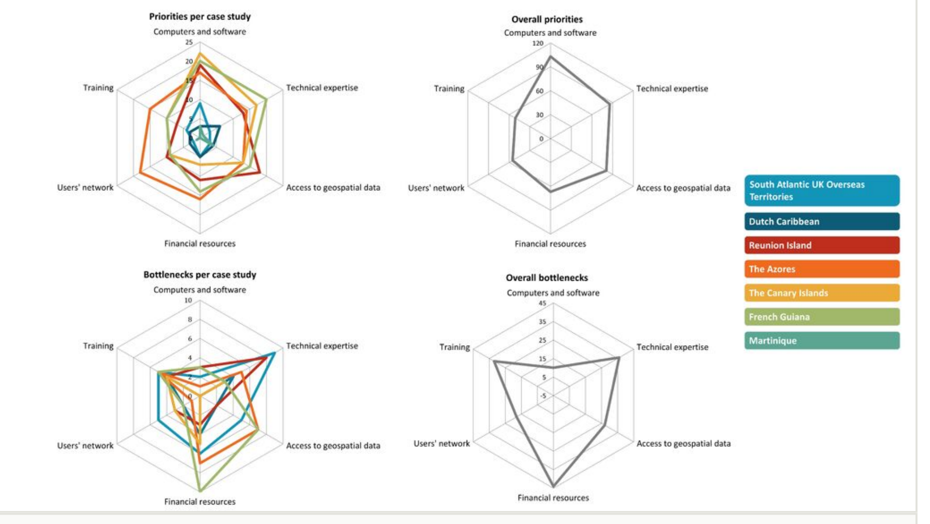


Figure 11.

Resources considered as priorities and bottlenecks in EU Overseas (top: n = 443 and bottom n = 167, respectively).

Moreover, the resources whose absence or scarcity were declared as a bottleneck by a sample of 167 answers (Fig. 11) were the technical expertise in the Falkland Islands, Saint Martin and Reunion Island; access to geospatial data in the Azores and French Guiana; financial resources in most territories; and training in the Canary Islands and Reunion Island.

4. Discussion - lessons learned, challenges and bottlenecks

4.1 Seamless coverage of both land and sea ecosystems needed to provide information for policies

The assessment of case studies showed a high potential long-term benefit for the ES concept to provide information for policy- and decision-making. Each CS targeted about three policy domains on average. In contrast, an overview of EU case studies showed an average of almost four relevant policy domains per CS (Geneletti et al. 2020).

As most of the case studies addressed marine and coastal policy domains, indicating that there is still a large potential for the ES concept to address other policy domains, such as urban planning, public health or forestry. Integrating the concept of ES to multiple policy domains is particularly relevant in the face of future climate change, as many of the studied areas are particularly vulnerable (Petit and Prudent 2008).

Hereby, the eight CS served as an indication of the main policy- and decision-making challenges for the EU Overseas territories. The majority of the case studies focused on the policy domain of *Nature and Biodiversity Conservation* (88%), reflecting trends in the EU mainland (Geneletti et al. 2020) and also important EU-funded initiatives in this domain, namely LIFE projects (Benedicto Royuela et al. 2019).

Unlike in the EU mainland, the second most relevant policy domain was *Marine and Maritime Policy* (75%). This strong interest in policy questions related to marine and coastal environments can be explained with the European Strategies, such as the Water Framework Directive*[4], the EU Biodiversity Strategy 2030 (European Commission 2020), the European Green Deal (European Commission 2019b) or the Marine Strategy Framework Directive*[5] strengthening the understanding and management of the marine environment. This context fosters a need for EU Overseas and Small Islands Developing States (SIDS) to manage marine ecosystems and maritime activities, across three spatial scales: the local scale (coastal and watersheds), meso-scale (exclusive economic zone) and large scale (oceanic basin, transboundary issues and Areas Beyond National Jurisdictions). Spatially-explicit knowledge on the distribution of benthic and pelagic ecosystems, their ecological condition and their provision of ES, such as carbon sequestration or ecological connectivity and nursery functions for fisheries, require massive data collection efforts and methodological development. Islands, especially in the EU, still face a large potential for enhanced mapping and assessment of coastal and marine ES (Liquete et al. 2013, Sieber et al. 2018). Guidance from the EC still focuses largely on terrestrial ecosystems (European Commission 2019a), highlighting the need for a seamless mapping of terrestrial- and aquatic ecosystems of the Member States.

Taking into account the lower availability of data in the marine domain, the approaches developed and implemented in the CS have special relevance, contributing to addressing the data gaps in these environments. For instance, the Canary Islands CS is one of the first attempts to produce a spatially-explicit ES assessment of *C. nodosa meadows*, a seagrass species playing a crucial role in the maintenance of habitats and nurseries of commercially interesting fish species (Espino et al. 2015, Casas et al. 2021), but also for carbon sequestration (Bañolas et al. 2020). Therefore, the relevant results aid in creating conservation and marine spatial planning initiatives for this fundamental habitat in the Canarian Archipelago. The CS of Reunion Island provided a first map of marine water masses surrounding Reunion Island, thus providing the evidence needed to guide future conservation zoning efforts and more largely maritime spatial plans (Roberson et al. 2017).

4.2 Improved stakeholder participation through networks

The importance of active stakeholder networks for the implementation of the ES concept has been widely discussed throughout the literature on ES in the EU (Weibel et al. 2018, Burkhard et al. 2018b, Palomo et al. 2018). Based on their recommendations and lessons learned, the CS aimed to involve local stakeholders from science, policy, practice and society early on in their design and after the completion of the studies. For the implementation of MAES, the presence of key or leading stakeholders in the environmental domain is seen as key to successful MAES implementation on a regional level, as both studies by Rosenthal et al. (2014) and Geneletti et al. (2020) show. For the EU Overseas, the majority of leading regional stakeholders had strong ties or affiliations with EU mainland institutions. Through this link, familiarity with the ES concept was established. At the same time, this might indicate that, in the EU Overseas, capacities for EU MAES need to be strengthened at a local level to achieve a sustainable anchorage of the ES framework and its effectiveness to support local decision-making in the long term. In this sense, the MOVE-ON project*[9] is working on it, setting the ground to advance MAES in Europe's Overseas.

In many case studies, the inclusion of all relevant stakeholders proved challenging. Moreover, the inclusion of indigenous perceptions often remained limited. The language barrier, as described by Amano et al. (2016), could be one explanation for this. Overcoming language barriers could be one potential way of better inclusion in the future - as workshops, surveys and relevant EU guidance documents were either in English, Spanish, Portuguese or French, thus leaving out a large part of the population, including non-French, indigenous or native people, such as in the French ORs. Next to language, wording and conceptualisation of ecosystem services are important (further described in section 4.4) and allowing for a broad spectrum of terminologies to capture the various benefits from nature enabling the inclusion of native and indigenous views, knowledge and perceptions on the ES topic. Other explanations for this could be, for example, the aggravation of power imbalances and representation issues that can hamper the inclusion of other stakeholders from the civil society.

MOVE investigations and development of stakeholders' participation tools and methods in Reunion Island and Azores showed that a time-phased spatial planning sequence, articulating GIS-based input data and an online interactive spatially-explicit Decision Support Tool (DST) - namely SeaSketch - are a relevant way to implement future ES policies with stakeholders in EU Overseas.

4.3 Mapping and Assessment: a sequential and gradual approach is advised to implement MAES

The identification of relevant ES proved challenging and two trends can be observed: one that focused on providing an overview of a wide range of ES, while the second focused on a single ecosystem type or a few of them at a higher level of attention. The identification of ecosystem types for the ES assessments was often based on spatial information, in the form of Land Use/Land Cover (LULC) data. For a suitable mapping exercise on islands, however, small scale maps with a high level of detail on land use and ecosystem types are needed (Gil et al. 2017, Sieber et al. 2021). For the EU, such LULC data is provided by, for example, CORINE, with high-resolution data for urban areas available by the Copernicus Land Monitoring Service "Urban Atlas"*[7]. For the Overseas case studies, mainly islands, EU-wide LULC data are limited to Macaronesia and the Canaries and parts of the French ORs (European Environment Agency 2019). Where CORINE data are available for the EU Overseas, the spatial resolution is comparatively low and the level of thematic detail and ecosystem specificities is limited, as the case studies of the Azores and French Guiana show (Sieber et al. 2021). Land uses often take place in fragmented landscapes that CORINE is not able to capture sufficiently. Therefore, when the mapping of ecosystems proves challenging, the mapping of their services becomes highly difficult.

With limited experience of MAES in many ORs and OCTs, the nomenclature came as a first bottleneck for some of the assessed case studies. Working with the updated CICES 5.1 nomenclature (Haines-Young and Potschin-Young 2018) proved to be difficult due to its high level of detail and rather theoretical nature. In fact, most CS used more diffuse ES categorisations (Casas et al. 2021, Sieber et al. 2021) or worked with existing nomenclatures of Natural Capital (Bayley et al. 2021) or TEEB (Schmiedel et al. 2020, Duijndam et al. 2020).

As many ORs and OCTs are still in the beginning phase of their MAES implementation, it is not surprising that CS applied different Tiers of complexity. Where there was little experience with the MAES concept (Sieber et al. 2018), simple Tier 1 methodologies were applied, coupled with awareness-raising approaches (Trégarot and Failler 2021). One example of this is the application of the ES matrix method using expert scoring in French Guiana. With a broad body of data and ES studies already present, CS regions, such as the Azores or Saint Martin, applied more complex, higher-tiered modelling or scenario-development approaches. A large potential still remains unused: citizen science and participatory GIS methods (PGIS) that could address the lack of adequate data and obtain valuable knowledge in areas with data scarcity (Palomo et al. 2018). The use of online interactive spatially-explicit Decision Support Tools (DST), as demonstrated in the CS of Reunion Island and Azores, offers promising capacities to collect and capitalise on knowledge and preferences of both experts and citizens to support the development and implementation of ES policies. The Martinique CS also showed that ES follow geographical ecological gradients, highlighting the importance of using multivariate approaches and ecosystem functional modelling to link ecosystem condition to pressures and ES.

For some island territories, the knowledge gap on coastal and marine ES assessment methods becomes apparent. With limited references available on EU-wide reports (Maes et al. 2020), guidance on mapping and assessment of coastal and marine ecosystems is limited, yet growing.

4.4 Dissemination and communication

Existing literature outlines many pitfalls related to the dissemination and communication of scientific outcomes. For the MOVE project, a considerable amount of work was dedicated to operating the public dissemination strategies, such as the webinars that became an integral part of the project due to the impossibility to organise physical meetings under the worldwide COVID-19 pandemic prevailing during the last two years of MOVE. However, one important factor to note is that language differences reduced the participation of local stakeholders in some of the webinars (Martinique, Reunion Island and French Guiana). Such language barriers often occur, especially with English as the dominant scientific working language (Amano et al. 2016). Not surprisingly, regions facing this constraint may face difficulties as translation and adaptation of scientific terminologies will be needed to interact with audiences and disseminate relevant MAES results in the official or local languages. Despite this setback, the majority of CS applied extended communication strategies throughout the project process. Stakeholders were included in the identification of relevant networks, in the selection of assessed ES and methodological approaches and the results were publicly presented.

The MOVE Electronic forum*[11] provided answers and guidance and sought to bring together citizens, practitioners, academics and policy-makers to share views and experiences about the use, relevance and priorities for MAES in EU Overseas. However, the electronic forum-based dissemination and communication strategy also had the lowest levels of participation from external stakeholders and researchers. This could be related to the fact that an electronic forum is a time-consuming strategy that focuses on following online discussions that limit interaction, which is why more proactive strategies, such as the webinars, were prioritised.

Another challenge is linked to the communication of the ES framework. For example, some discussions that emerged during the diverse strategies pointed out the lack of knowledge related to ES or the difficulty to approach advocacy using the term both conceptually and scientifically. To overcome this challenge, access to knowledge and information needs to be facilitated. In particular, research institutions and universities may potentially provide access to expertise to overcome this identified barrier. This is in line with other studies that have emphasised the importance of bottom-up, stakeholder-driven and polycentric approaches to ES knowledge dissemination (Barnaud and Antona 2014, Lautenbach et al. 2019, Grygoruk and Rannow 2017).

4.5 Anchor MAES in Overseas policy- and decision-making

Despite the large potential of the ES concept in policy- and decision-making, the analysis of the eight CS showed a limited level of impact on implementation. This can be attributed to the novelty of the concept in many ORs and OCTs (Sieber et al. 2018). The majority obtained a raised awareness and understanding of the ES concept amongst stakeholders in their territory. Such stakeholder inclusion and capacity building is an imperative first step to anchor the ES concept locally and sets the foundation for any future impact on policy-making (Posner et al. 2016). Only in Saint Martin and French Guiana, the CS contributed directly (Duijndam et al. 2020) or indirectly (Sieber et al. 2021) to the inclusion of ES in plans and policies or the formulation of new policy or finance mechanisms in the EU Overseas. Despite this, the eight CS showcased how MAES can be effectively applied at a local level. Methodologically, novel approaches were developed in the coastal and marine realms (Casas et al. 2021), as well as on the applicability of input LULC datasets and their effects on modelling terrestrial ES, as the Azorean CS shows (Sieber et al. 2021).

Whilst Geneletti et al. (2020) concluded that downscaling the EU objectives to the national level, hence integrating national priorities, would be a good strategy to use MAES for addressing national challenges, this might not be sufficient to meet OR specificities. Many National Ecosystem Assessments only include their ORs peripherally and the EU wide ecosystem assessment remains silent on ORs and OCTs (Maes et al. 2020). As ecosystems and governance contexts in the majority of EU Overseas differ from EU mainland (Burkhard et al. 2018b), downscaling EU objectives to national strategies might not be sufficient to address Member States interests and needs. Rather, a bottom-up approach is needed, reflecting local and territorial specificities and needs (Trégarot and Failler 2021). Therefore, the effectiveness and applicability of the ES concept should be highlighted, for example, through initiatives such as EU BEST or the MOVE-ON pilot project. In the meantime, complementary approaches should be encouraged to highlight the importance of ecosystems, such as ecosystem risk assesment approaches. For the Overseas considered in this article, a Red List of Ecosystems (RLE) feasibility study, based on the IUCN framework, was implemented (MOVE project 2021), highlighting the potential of such ecosystem risk assessment approach for ecosystems conservation, protection and sustainable management in the EU Overseas. The study identified the state of the knowledge on ecosystem state, information and data needs, as well as the major barriers to conduct RLE assessments in EU ORs and OCTs, promoting those for conservation and ecosystem management purposes. By assessing the state of their ecosystems, using scientifically robust and globally recognised tools, such as RLE or ecosystem condition assessments, the EU ORs and OCTs can advance in their efforts for evidence-based conservation, prioritising and mainstreaming informed environment policies.

Literature suggests that ES studies often face difficulties with the provision of adequate information needed by decision-makers to make instrumental decisions, mainly because the formats used in scientific literature do not meet all criteria for use in decision-making (Klein et al. 2015, Wright et al. 2017). Therefore, it is necessary to include practitioners and end-users early in the MAES implementation process, bridging the gap between science and policy communities (Weichselgartner and Kasperson 2010, Palomo et al. 2018).

4.6 Challenges and bottlenecks for successful MAES implementation in the EU Overseas

According to the priorities and bottlenecks identified by stakeholders from all the EU Overseas considered in this study (Fig. 11), the availability of computers and software, technical expertise and access to geospatial data were the highest priorities. The availability of these resources was expected to speed up the MAES process in the CS regions, but also as a broader trend, or precondition, for the implementation of MAES in other ORs and OCTs. The more global bottlenecks identified were technical expertise, financial resources and training (Fig. 11), whose absence was expected to be a major limitation to the implementation of MAES even if there were other available resources (e.g. a region may have computers and software, but not the technical experience to implement MAES or the financing to hire a person or, failing that, train people responsible for implementing it). In contrast to this, at EU level, major bottlenecks centred around the availability of data and maps, skills and background of technical staff and technical difficulties (Palomo et al. 2018).

Whilst these bottlenecks had been thoroughly addressed throughout the EU, they still need to be addressed in most of the EU Overseas. This is not surprising, as local regulations and environmental strategies are decoupled from national environmental laws and strategies (Bettencourt and Imminga-Berend 2015), high turnover in technical and governmental staff due to short legislative periods and the remoteness of many EU Overseas often reduces the visibility of such issues (Montero-Hidalgo et al. 2021). Only by filling these gaps in resources and human capacities in the respective territories, MAES could have the potential to become an integral part of natural resources management and safeguard a sustainable supply of ES for the EU Overseas populations. In this context of low data availability, scarce resources and skills, it is extremely difficult to convince policy-makers to consider environmental issues and ES as a priority. Even when it is available, ES knowledge (and data) rarely serves as an “impartial arbiter” between policy options (Saarikoski et al. 2018) as ES remains a concept that requires learning through close interactions amongst researchers, practitioners and stakeholders. In this sense, the MOVE project faced technical expertise and training limitations promoting workshops, several webinars and the MOVE Electronic forum mentioned in sections 3.4 and 4.4 of this article and mobilised European funds to overcome the lack of financial resources in order to implement MAES.

5. Conclusions

The eight CS, developed under the MOVE project, aimed to shorten the difference in progress between MAES implementation in the EU mainland and the EU Overseas. The comparative analysis allowed first insights on the MAES implementation for policy- and decision-making, highlighting opportunities, challenges and bottlenecks.

While downscaling the EU objectives from the Biodiversity Strategy to 2020 to the national level works comparably well for the EU member states, the ORs and OCTs specificities imply special adaptation of the strategies. Often, they remain overlooked in national and EU-wide efforts to map and assess ES. Overseas specificities need to be acknowledged in national strategies and territorial environmental planning. Our assessment highlights a strong need for increased guidance on MAES in the coastal and marine realms. As many of the EU Overseas are (small) islands, they heavily depend on their coastal waters and important ecosystems and are keen to map and assess their surrounding marine ecosystems. ORs with limited experience of the ES concept focused on awareness-raising and showcasing the potential of the concept, as an important first step. Even if constant flows of communication proved to be key, the importance of overcoming the language barrier needs to be stressed as a key opportunity to better include the culturally-diverse population in the EU ORs and OCTs.

The CS contributed to raising awareness of the special role of OCTs and ORs in biodiversity conservation and the supply of multiple ES. It also helped to accelerate the implementation of the 2020 Biodiversity Strategy’s Action 5 in all EU Member States, including OCTs, ORs and marine areas, further supporting the implementation of EU Directives and international commitments related to biodiversity and climate change. The future steps that are needed to highlight the effectiveness of the ES concept for the advancement of MAES in EU Overseas are being addressed by the follow-up MOVE-ON pilot project ("From case studies to anchor projects - setting the ground to advance MAES in Europe's Overseas"; 2019-2023), that aims to provide a tangible contribution from EU Overseas to the MAES initiative.

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Grant title

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Endnotes

*1 https://ec.europa.eu/environment/nature/biodiversity/best/index_en.htm

*2 https://esmeralda-project.eu/

*3 https://moveproject.eu/

*4 Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for community action in the field of water policy (Water Framework Directive https://ec.europa.eu/environment/water/water-framework/index_en.html)

*5 Directive 2008/56/EC of the European Parliament and of the Council establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32008L0056)

*6 http://www.maes-explorer.eu/

*7 https://land.copernicus.eu/local/urban-atlas

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