



# Report on ecosystem services mapping and assessment methods in ORs and OCTs

March 2021

**Citation:** MOVE-ON project (2021), European Commission Directorate General Environment Grant Agreement no. 07.027735/2019/808239/SUB/ENV.D2. Deliverable 2.2.a – Report on ecosystem services mapping and assessment methods in ORs and OCTs.

## Coordinated by:



## Partners:



## Supported by:



This project has received funding from the European Union represented by European Commission Directorate General Environment under grant agreement N° 07.027735/2019/SI2.808239/SUB/ENV.D2. This document only reflects the views of its authors. The Commission is not responsible for any use that may be made of the information it contains.

<b>Project Acronym</b>	<b>MOVE-ON</b>
<b>Project Title</b>	<b>From case studies to anchor projects - setting the ground to advance MAES in Europe's overseas.</b>
<b>Grant Agreement n°</b>	07.027735/2019/808239/SUB/ENV.D2
<b>Start of the project</b>	May 2020
<b>Duration</b>	36 months
<b>Project coordinator</b>	Regional Fund for Science and Technology, Regional Government of the Azores (Portugal)
<b>Website</b>	<a href="http://www.moveon-project.eu">www.moveon-project.eu</a>

<b>Deliverable title</b>	<b>Report on ecosystem services mapping and assessment methods in ORs and OCTs</b>
<b>Deliverable n°</b>	<b>2.2.a</b>
<b>Activity title</b>	Activity 2 - Method development and implementation support
<b>Task title</b>	Task 2.2 - Identification of mapping and assessment methods for ecosystem services in Overseas Territories
<b>Task Leader(s)</b>	URJC and LUH
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<b>Due date of deliverable</b>	29/02/2021
<b>Dissemination level</b>	Internal

## Summary

This document describes the development of a questionnaire to assess the methodological support including suitable methods to guide the MOVE-ON partners during their Anchor Projects' implementation. The questionnaire template were co-created by MOVE-ON partners during a participatory workshop held in October 2020 and then filled by the Anchor Projects' leaders. The resulting questionnaire allow to select an individual portfolio of suitable methods to reach the individual targets for each Anchor Project. The answers will be useful to advise each Anchor Project on a multi-tiered flexible ES mapping methodology according to their situation.

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## List of abbreviations

BISE	Biodiversity Information System
CICES	Common International Classification of Ecosystem Services
ES	Ecosystem Service
ESMERALDA	Enhancing ecoSystem sERvices mApping for poLicy and Decision mAking
EU	European Union
IUCN	International Union for Conservation of Nature
MAES	Mapping and Assessment of Ecosystems and their Services
MOVE	Mapping and Assessing the State of Ecosystems and their Services in the Outermost Regions and Overseas Countries and Territories: Establishing links and pooling resources
MOVE-ON	Mapping and Assessing the State of Ecosystems and their Services in the Outermost Regions and Overseas Countries and Territories: From Case Studies to Anchor Projects - Setting the ground to advance MAES in Europe's overseas
(M)PA	(Marine) Protected Area
OCT	Overseas Countries and Territories
OR	Outermost Region

## 1. INTRODUCTION

Action 5 of the 2<sup>nd</sup> target of the European Union's (EU) 2020 Biodiversity Strategy urged EU Member States to map and assess the state of ecosystems and their services (MAES) in their national territory. Biodiversity, ecosystems and their services remain central in the EU Biodiversity Strategy for 2030, with even more ambitious targets. Europe's Outermost Regions (ORs) and Overseas Countries and Territories (OCTs) are spread all around the globe and have exceptionally high biodiversity and related multiple values. These territories host more than 70% of all EU biodiversity and include 20% of the world's coral reefs and lagoons. They encompass most diverse ecosystems on often very small scales, from coral reefs and mangroves, tropical rainforests, mountain ecosystems to polar - and subpolar seas, which provide multiple relevant ecosystem services from local to global scale (Petit and Prudent 2008).

The MOVE pilot project (GA. No.07.027735/2018/776517/SUB/ENV.D2) intended to facilitate MAES and to support regional policies in the EU ORs and OCTs. The work developed highlighted the steps forward in the implementation of MAES in these territories and there is the need to move on with MAES.

The MOVE-ON pilot project ("From case studies to Anchor Projects setting the ground to advance MAES in Europe's overseas") aims to advance MAES and related methodologies' implementation in European ORs and OCTs. The project also intends to create and strengthen the scientific and technical MAES communities in the territories, taking a bottom-up approach that has been initiated in the MOVE project and demonstrating the benefits of assessments of ecosystems, their conditions and services to support decision-making. The core goal of MOVE-ON is to contribute to local, EU and international policies and goals. At the same time, MOVE-ON aims to develop good practice guidelines and policy recommendations for improving the health status of ecosystems tailored for overseas regions' specificities and needs, pooling resources while involving and empowering local actors. It complements and expands the activities of the MOVE project, strengthening links and capitalizing the on-going work to further test and implement MAES in different regions underpinned by four Anchor Projects in French Guiana, Macaronesia, Reunion Island and South Atlantic.

Each Anchor Project differs in its current state of MAES's implementation and needs. Therefore, it is necessary to gather information concerning: the overall aim of the study, geographical information available, ecosystem types and ES already identified, ES indicators known, and methods employed. All of these, to guide Anchor Regions through the MAES, and choose the combination of methods that fits each Anchor Project adequately.

This report presents the template to assess the methodological needs for all MOVE-ON Anchor Regions in regards to achieve the EU Biodiversity Strategy's

Target 2, specifically the Action 5 targets for mapping and assessment of ecosystems and their services. For the assessment of methodological needs, a questionnaire was developed (see Table 2) and presented to Anchor project leaders.

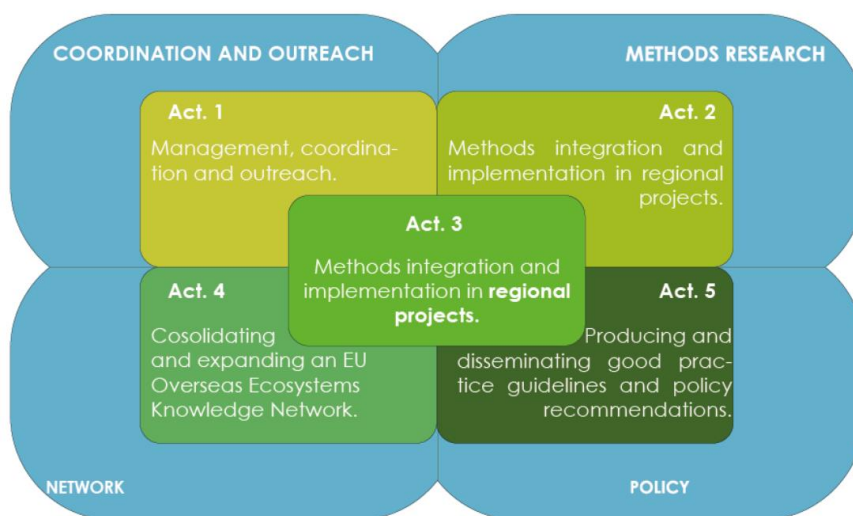
### **1.1 Overview of MOVE-ON Activity 2 “Method development and implementation support” and Activity 3 “Methods Integration and Implementation in Regional Projects”**

The general objective of the MOVE-ON Activity 2 is to identify, develop and support the implementation of suitable methods, relevant to the MAES advance in EU ORs and OCTs, considering specific needs and data availability. The activity gathers relevant MAES methodologies and the assessment of ecological reference conditions of marine ecosystems in overseas territories to develop conceptual models of ecosystem services provision, in a context of climate change and anthropogenic pressures.

The activity will be carried out by considering existing data and knowledge as well as gathering information on the needs and expectations of the relevant stakeholders in the ORs and OCTs. A range of different approaches for mapping and assessing ES will be considered (e.g. cross-disciplinary integration of biophysical, social, and economic mapping and assessment approaches). These methods will take account of different levels of detail and complexity through a tiered approach that can be applied according to the purpose of the respective ES study, data and resources availability and specific needs. The work will therefore exploit expert- and land cover- based methods, existing ES indicator data and more complex process-based ES models. Such tiered solutions will allow the Anchor Projects (to be implemented in Activity 3) to work with different levels of available information (or poor information availability in case of data absence), and in different contexts. Innovative tools such as an online method explorer, in relation to the MAES Methods Explorer<sup>1</sup> created under the ESMERALDA EU Projects, will be created, linked or further developed during the project. The aim is to jointly develop and test these methods and tools as a result of the applications provided by the Anchor Project partners, that include relevant experts, networks and stakeholders from across the overseas territories.

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<sup>1</sup> <http://database.esmeralda-project.eu/home>



**Figure 1-** MOVE-ON project structure.

**Table 1-** Overview of the MOVE-ON Anchor Regions, their themes, relevance to the MAES process, spatial scale and stakeholder involvement (Source: MOVE-ON 2019).

<b>Activity 3 – Methods Integration and Implementation in Regional Projects</b>					
3.1	Coordination of regional Anchor Projects				
	<b>Anchor Project</b>	<b>Theme</b>	<b>MAES relevance</b>	<b>Scale</b>	<b>Stakeholder involvement</b>
3.2	French Guiana	Development of sustainable ecosystem services management plans	Ecosystem services supply, use and management assessments and applications	Local Municipality	Municipality representatives, Town council, Local scientists from CIRAD or ONF
3.3	Macaronesia	Marine habitat mapping and RLE classification	Marine ecosystem condition assessment and mapping	Regional	
3.4	Réunion Island	Assessing ecosystems' functionality and services of a bio-corridor		Regional	
3.5	South Atlantic	Making MAES outputs meaningfully available for Policy and decision-makers	Implementation of ES mapping and assessment outcomes	Regional	Various stakeholders at different levels, Policy makers



## 2. METHODS AND MATERIALS FOR STOCKTAKING OF ANCHOR REGIONS' STATUS

### 2.1 Specific methodological needs of the Anchor Projects

The needs and methodological requirements of the Anchor Projects will be collected in a questionnaire based on the operational framework for integrated MAES. The mentioned framework that is proposed in this study is modified from Burkhard et al. (2018) and it comprises 31 questions organized in 8 consecutive steps (Fig. 2).

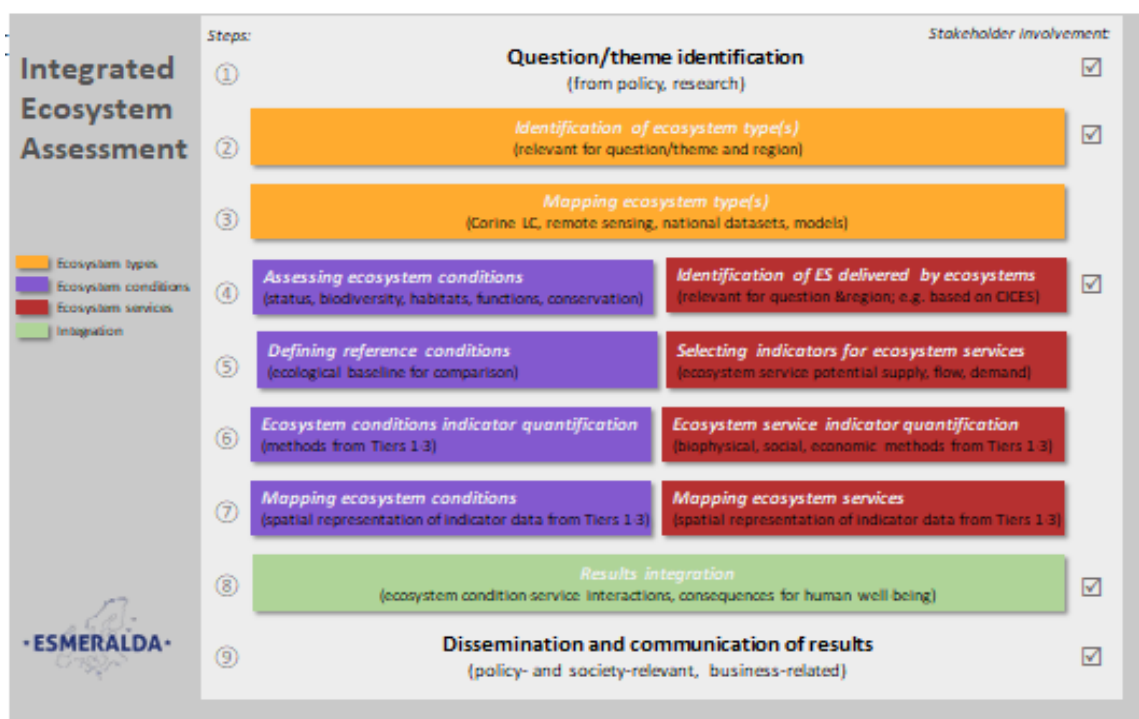


Figure 2 - Identification of steps for integrated ecosystem assessments based on Burkhard et al. (2018).

The steps, as shown in Figure 2, include **Step 1**: Question and theme identification; **Step 2**: Identification of ecosystem types; **Step 3**: Mapping of ecosystem types; **Step 4**: Defining ecosystem condition and identification of ES delivered by ecosystems; **Step 5**: Selecting indicators for ecosystem condition and ES; **Step 6**: Ecosystem condition and ES indicator quantification; **Step 7**: Mapping ecosystem condition and ES; and **Step 8**, the integration of results. These steps are specified in 31 questions (Table 2).

Answers to these questions will be collected by Tasks 2.2 team, from the Anchor Region leaders, for their respective territory. Answers will be analysed and as a

result, each Anchor Project will have a proposed pool of methods for ecosystem condition and services, which will be shown in the deliverable 2.2.c.

The integration of the different results will be carried out in close co-operation with Activity 3 in order to test the identified links in real situations.

The questionnaire was developed using the online platform of Google Forms and each question can either be answered as open question, dropdown list or tick-box (Table 2).

**Table 2** - Questionnaire to identify the MOVE-ON Anchor Regions needs for methodological support.

1) Theme identification	
Open question	<p>What is the overall aim of the Anchor Region Study?</p> <p>Is there a policy question driving the Anchor Region study, if yes, which? <sup>1</sup></p> <p><input type="checkbox"/> Is there a business question driving the Anchor Region study, if yes, which? <sup>2</sup></p> <p><input type="checkbox"/> Is there a social question driving the Anchor Region study, if yes, which? <sup>3</sup></p> <p>Which are the main socioeconomic problems of the Anchor Region?</p> <p>How can the Anchor Region Study assist the OR/OCT in assessing and reviewing policy priorities to be set for ecosystem management?</p> <p><i><sup>1</sup>Policy questions are questions which are raised by policymakers at different levels of governance and public decision-making. Typical examples are national or regional ministries or agencies, municipalities or supra-national institutions such as the EU (e.g. How will ministries that use or influence natural capital (transport, energy, economy) uptake MAES information/scientific information in order to improve sectorial policies?).</i></p> <p><i><sup>2</sup>Business questions are formulated by the private sector at different economic scales. Examples include individual farmers, small and medium-sized enterprises, multinationals, but also associations that represent the private sector or their interests (e.g. What is the economic value of bird watching and what is its contribution to tourism management?).</i></p> <p><i><sup>3</sup>Societal questions are raised by individual citizens or organisations that represent civil society such as non-governmental organisations. These types of questions are closely interlinked with policy questions (e.g. How to facilitate education for citizens so more people are convinced of the importance of green for society?)</i></p>
2) Identification of ecosystem types	
List of selectable Ecosystem types	<p>What are the main types of ecosystems for the assessment in the Anchor Region? (Ecosystem types = MAES level 1)</p> <ul style="list-style-type: none"> <li>• Terrestrial</li> <li>• Fresh water</li> <li>• Marine</li> </ul>

What are the main subcategories of ecosystem for the assessment in the Anchor Region? (Ecosystem types = MAES level 2)

- Urban
- Cropland
- Grassland
- Woodland and forest
- Heathland and shrub
- Sparsely vegetated land
- Wetlands
- Rivers and lakes
- Marine inlets and transitional waters
- Coastal
- Shelf
- Open ocean

What are the main subcategories of ecosystem for the assessment in the Anchor Region? (Ecosystem types = MAES level 3) Please, specify only if it is necessary.

- Littoral (Tidal zone)
- Infralittoral (fotic zone > 1% light algal dominated)
- Circalittoral (zone beyond the infralittoral dominated by sessile animals)
- Offshore circalittoral (region as sandbanks or muddy habitats-dominated by sessile animals)
- Upper bathyal (depth from 1000 m to 2500 m below sea surface)
- Lower bathyal (depth from 2 500 m to 4000 m below surface)
- Abyssal (depth 4000 m below surface)
- Coastal dunes and sandy shores
- Coastal shingle
- Rock cliffs, ledges and shores including the supralittoral
- Estuaries
- Coastal lagoons
- Surface standing waters
- Surface running waters
- Littoral zone of inland surface waterbodies
- Raised and blanket bogs
- Valley mires, poor fens and transition mires
- Aapa palsa and polygon mires
- Base-rich fens and calcareous spring mires
- Sedge and reed beds, normally without free-standing water
- Inland saline and brackish marshes and reed beds
- Dry grasslands
- Mesic grasslands
- Seasonally wet and wet grasslands
- Alpine and subalpine grasslands
- Inland salt steppes
- Sparsely wooded grasslands

- Tundra
- Arctic, alpine and subalpine scrub
- Temperate and Mediterranean-montane scrub
- Temperate shrub heathland
- Maquis, arborescent matorral and thermo-Mediterranean brushes
- Garrigue
- Spiny Mediterranean heaths (Phrygana, hedgehog-heaths and related coastal cliff vegetation)
- Thermo-Atlantic xerophytic scrub
- Riverine and fen scrubs
- Shrub plantations
- Broadleaved deciduous woodland
- Broadleaved evergreen woodland
- Coniferous woodland
- Mixed deciduous and coniferous woodland
- Lines of trees, small anthropogenic woodlands, recently felled woodland, early -stage woodlands and coppice
- Screes
- Inland cliffs, rock pavements and outcrops
- Snow or ice-dominated habitats
- Miscellaneous inland habitats with very sparse or no vegetation
- Arable land and market gardens
- Cultivated areas of gardens and parks
- Buildings of cities, towns and villages
- Low Density buildings
- Extractive industrial sites
- Transport networks and other constructed hard-surfaced areas
- Highly artificial man-made waters and associated structures
- Waste deposits

### 3) Mapping of ecosystem types

Open questions	Are maps available at regional/territorial scale for habitats or ecosystems? If yes, provide source/link?
Open question	Is metadata available for those maps? If yes, provide source/link?
Open question	What databases were used to create those maps (e.g. CORINE land cover, EUNIS habitats, national database)?

### 4) Identification of ES delivered by ecosystems

Open question	Which ES classification is most used in your work environment? (List of CICES, MA, TEEB, etc.)
Dropdown list	Which specific ES would you like to assess?
	<ol style="list-style-type: none"> <li>1. Provisioning services               <ol style="list-style-type: none"> <li>1.1. Food</li> <li>1.2. Water</li> </ol> </li> </ol>

	<ol style="list-style-type: none"> <li>1.3. Raw Materials</li> <li>1.4. Genetic resources</li> <li>1.5. Medicinal resources</li> <li>1.6. Ornamental resources</li> </ol> <ol style="list-style-type: none"> <li>2. Regulating services             <ol style="list-style-type: none"> <li>2.1. Air quality regulation</li> <li>2.2. Waste treatment (water purification)</li> <li>2.3. Regulation of water flows</li> <li>2.4. Moderation of extreme events</li> <li>2.5. Erosion prevention</li> <li>2.6. Climate regulation</li> <li>2.7. Maintenance of soil fertility</li> <li>2.8. Pollination</li> <li>2.9. Biological control</li> <li>2.10. Maintenance of life cycles of migratory species (incl. nursery service)</li> <li>2.11. Maintenance of genetic diversity (especially in gene pool protection)</li> </ol> </li> </ol> <ol style="list-style-type: none"> <li>3. Cultural services             <ol style="list-style-type: none"> <li>3.1. Spiritual experience</li> <li>3.2. Aesthetic information</li> <li>3.3. Inspiration for culture, art and design</li> <li>3.4. Recreation and tourism</li> <li>3.5. Information for cognitive development</li> </ol> </li> </ol>
Dropdown list	<p>On which scale would you like to implement the assessment?</p> <ul style="list-style-type: none"> <li>• Local</li> <li>• Regional</li> <li>• National</li> </ul>

5) Selecting indicators for ES	
Open question	Are indicators/indicator data available to assess those ES that you selected? If yes, provide source/link?
Yes/No	Would you use those indicators to assess the potential of ecosystems to provide a sustainable flow of ES in Anchor Region?
Yes/No	Would you use those indicators to assess the demand of that ES in Anchor Region?
Yes/No	Would you use those indicators to assess the actual use of that ES in Anchor Region?

6) Identification of methods for ES quantification	
Yes/No	Do you know any biophysical methods to quantify ES supply, use or demand in physical units (such as ha, kg, m)?
Multiple choice	<p>If yes, which one would you like to use?</p> <ul style="list-style-type: none"> <li>• Conceptual model</li> </ul>

	<ul style="list-style-type: none"> <li>• Ecological Connectivity models (to include methods/software such as Zonation, MSPA, MatrixGreen, TerrSet (former IDRISI), FunCon, etc.)</li> <li>• Field Observations</li> <li>• Integrated modelling framework</li> <li>• Macro-ecological models (includes habitat models)</li> <li>• Phenomenological models</li> <li>• Process-based models (includes: landscape function models)</li> <li>• Remote sensing and earth observation derivatives (NDVI, land cover, surface temperature)</li> <li>• Remote sensing and earth observations</li> <li>• Spatial proxy methods</li> <li>• State and transition model</li> <li>• Statistical models</li> <li>• Surveys and questionnaires</li> <li>• Trait-based models</li> <li>• Use of statistical and socio-economic data</li> </ul>
Open question	Could you explain the reason why you select the above methods?
Yes/No	Do you know any economic methods to quantify ES supply, use or demand in economic units (such as \$, €)?
Multiple choice	<p>If yes, which would you like to apply?</p> <ul style="list-style-type: none"> <li>• Choice modelling (choice experiment, discrete choice modelling)</li> <li>• Contingent valuation</li> <li>• Corporate Ecosystem Service Review</li> <li>• Cost-Benefit Analysis (CBA)</li> <li>• Cost-Effectiveness Analysis (CEA)</li> <li>• Damage cost avoided</li> <li>• Defensive expenditure</li> <li>• Ecosystem Service Accounting</li> <li>• Ecosystem service assessment</li> <li>• Group / participatory valuation</li> <li>• Hedonic pricing</li> <li>• Market price</li> <li>• Net factor income (residual value method)</li> <li>• Opportunity cost</li> <li>• Production function</li> <li>• Public pricing</li> <li>• Replacement cost (Alternative cost method)</li> <li>• Restoration cost</li> <li>• Social Cost of Carbon</li> <li>• Travel cost</li> <li>• Value transfer (benefit transfer)</li> </ul>
Open question	Could you explain the reason why you select the above methods?

Yes/No	Do you know to apply any socio-cultural methods (Participatory GIS, preference assessment, photo elicitation...) to quantify ES supply, use or demand in non-economic units (such as persons, preferences)?
Multiple choice	<p>If yes, which would you like to apply?</p> <ul style="list-style-type: none"> <li>• Deliberative assessment</li> <li>• Geo-tagged photo-series analysis</li> <li>• Participatory GIS</li> <li>• Participatory scenario planning</li> <li>• Photo-elicitation surveys</li> <li>• Preference assessment</li> <li>• Q-methodology</li> <li>• Time-use assessment</li> </ul>
Open question	Could you explain the reason why you select the above methods?

7) Mapping ES	
Open question	<p>Are any maps available for ES in the Anchor Region? If yes, provide source/link?</p> <p>Is metadata available for those maps? If yes, provide source/link?</p> <p>What methods were used to create those maps?</p>

## 2.4 Co-creation process

On October 1<sup>st</sup>, 2020, the MOVE-ON co-creation workshop took place (13:30 – 15:00 CET, online), jointly organized by Tasks 2.2 and 3.1 leaders. During this online Workshop, all Anchor Region leaders (WWF, ABAS, SAERI, NEXA), as well as MOVE-ON project partners (URJC, LUH, UNITN and FRCT) were present. The aim of the workshop was to jointly discuss and create the adjusted MAES scoreboard of Task 3.1, to assess the preconditions and *status quo* of current MAES implementation (Task 3.1). Further, the questionnaire to identify needs for methodological support (template Task 2.2), was presented to the Anchor Project leaders.

During the workshop, Ina Sieber (LUH) introduced the aim of the workshop, Benjamin Burkhard (LUH) presented the MAES scoreboard and Fernando Santos-Martin (URJC) presented the first version of the questionnaire to identify the MOVE-ON Anchor Regions needs for methodological support. Brief performances about the Anchor projects objectives, methods and implementation status from each Anchor Regions were held [Clément Villien [WWF], French Guiana; Fran Otero (ABAS), Macaronesia; Cathleen Cybèle (NEXA), La Réunion; and Tara Pelembe (SAERI), South Atlantic]. Thereafter, discussion and first adaptations on the questionnaire, took place.

Key messages included the applicability of the questionnaire to both ORs and OCTs and their regions specificities.

### 3. IMPLEMENTATION

The implementation of task 2.2 will be carried out in 3 phases:

- a) Sending the questionnaire presented in this Deliverable 2.2.a to Anchor Project leaders;
- b) Receipt of responses that will be presented in Deliverable 2.2.b;
- c) Analysis of the responses and proposal of methods for ecosystem services mapping and assessment which can deliver the most robust and applicable results for each Anchor Project. The mentioned analysis and the set of methods will be presented in Deliverable 2.2.c.

The integration of the different results will be carried out in close co-operation with Activity 3 in order to test the identified links in real situations. Besides, there will be a close collaboration with MOVE-ON Task 2.1 - *Coordination of regional Anchor Projects*, which will support and monitor Anchor Projects implementation. The following main workshops or meetings are scheduled:

- **Workshop Template co-creation:**  
October 2020 - online; All Anchor Regions partners; to present, discuss and adapt the guiding questionnaire.
- **Strategic planning meeting:**  
October 2020 – online; all Anchor Regions partners and Tasks 2.1, 2.2 and 2.3 leaders; to come up with a suitable methodological approach for each of the Anchor Regions.
- **Anchor region update meetings:**  
February 4<sup>th</sup> 2021 – 1<sup>st</sup> Anchor Region Update Meeting (Macaronesia, La Réunion, South Atlantic and French Guiana) to provide guidance and assistance for different aspects of MAES implementation.
- **Progress and update meetings:**  
Every two/three months – online; All Anchor Regions or individual Anchor Project partners; To identify progress, good practices, challenges and difficulties.



#### 4. DISSEMINATION AND COMMUNICATION

The results of Task 2.2 will be shown in the deliverable D.2.2 - *Report on ecosystem services mapping and assessment methods in ORs and OCTs* (due date M36, April 2023), which will be presented in 3 sections:

- a) The present Deliverable 2.2.a which show the final version of questionnaire sent to Anchor Project Leaders to collect methodological needs of Anchor Project's implementation;
- b) Deliverable 2.2.b (due date M26, June 2022) where will be exposed every response received;
- c) Deliverable 2.2.c (due date M36, April 2023) where will be presented the analysis of the responses and a proposal of methods for ecosystem services mapping and assessment that can deliver the most robust and applicable results for each Anchor Project.

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