



Ecosystem service mapping and assessment gaps in EU member states and recommendations to overcome them

Deliverable D2.2

(Overview of gaps and recommendations to overcome them)

Ecosystem Services Ecosystem service mapping and assessment gaps in EU member states and recommendations to overcome the

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Preface

The objective of ESMERALDA Work Package 2 is to develop and facilitate a stakeholder process throughout the project and to create a European network to facilitate a dialogue among relevant communities from science, policy, society and practice. To achieve this, the sub-objectives are:

- To identify relevant stakeholders from the scientific and user communities, as well as national and international funding bodies and to develop a stakeholder engagement plan (MS7, MS13);
- **To identify and evaluate what is required in EU member states and in different sectors in order to achieve the EU 2020 targets (MS12, D2.2);**
- To create a functional collaboration network for the support of project activities, process of dialogue and knowledge co-creation (MS10);
- To develop both country- and case study-specific profiles based on needs and opportunities (MS8, MS9);
- To cluster all member states by level of readiness for implementation of mapping and assessment activities in terms of availability of data, tools and personnel with appropriate knowledge and expertise (MS11, D2.1);
- To assess the practical means and provide guidelines to support EU member states in implementation (D2.3); and,
- To provide continuous support to responsible authorities in the EU member states and ensure the continuation of the network beyond ESMERALDA (D2.4, D2.5).

The aim of this Deliverable 2.2 report is to present what are the gaps in achieving the EU Biodiversity Strategy's Action 5 targets for mapping and assessment of ecosystems and their services in the EU member states. This is followed by recommendations for how the hurdles could be overcome.

Summary

The Horizon 2020 ESMERALDA project was initiated to ensure assistance to all EU member states in mapping and assessment of ecosystem services taking into account their different levels of implementation as well as their prerequisites and challenges in regard to reach the targets set in the Biodiversity Strategy's Target 2 Action 5. ESMERALDA project's Deliverable 2.1 report¹ presented the status of each member state in the ecosystem service mapping and assessment activity by clustering member states into three groups based on their level of progress. The status was determined by the developed country fact sheets (Milestones 8 and 9). Stakeholders' (i.e. EU countries' official MAES contacts or nominated representatives of them) deeper knowledge of problems and gaps in the activity as well as their own ideas for possible solutions were gathered in the ESMERALDA stakeholder Workshop in Riga, Latvia, 13-16 October, 2015.

This Deliverable 2.2 report ends the first phase of ESMERALDA. It first presents the status of EU countries in ES mapping and assessment together with perceived gaps based on the country fact sheets (Chapter 2) and the stakeholder Workshop in Riga, Latvia (Chapter 3). After that it provides a set of recommendations and solutions based on different information streams to ensure a better implementation of Action 5, in particular in those countries, which are still at the start of the process (Chapter 4). The report concludes in Chapter 4 with a proposal for the next steps to make progress with mapping and assessment work.

¹ The public report can be downloaded from here: <http://esmeralda-project.eu/documents/1/>

1. Introduction

The EU Biodiversity strategy to 2020 was adopted by the European Commission in 2011. It aims to halt the loss of biodiversity and ecosystem services in the EU and to help to stop global biodiversity loss by 2020. It reflects the commitments taken by the EU in 2010, within the international Convention on Biological Diversity. The strategy sets out 6 targets and 20 actions. Target 2 complements conservation by maintaining and enhancing ecosystems and their services through the inclusion of green infrastructure in spatial planning and by restoring at least 15 % of degraded ecosystems.

Action 5 under Target 2 calls on EU member states to map and assess the state of ecosystems and their services (MAES²) in their national territory by 2014, with the assistance of the European Commission. They must also assess the economic value of such services, and promote the integration of these values into accounting and reporting systems at EU and national level by 2020. ESMERALDA provides dedicated support to the member states to achieve the ambitions of Action 5. To do this, ESMERALDA was designed to first take stock of the level of implementation of MAES-related activities in the member states, so that in a later phase more targeted support can be provided.

All EU member states are now actively involved in mapping and assessing the state of ecosystems and their services in their national territory. However, differences in policy response to the ambitions set forward in the Biodiversity Strategy, lack of sufficient resources and research capacity, different levels of stakeholder engagement and problems related to data availability have resulted in different implementation levels of Action 5 across the EU member states. In the last year (during most of 2015), we have analysed the status of implementation of Action 5 in the EU. Our analysis was based on two different sources of information.

Firstly, we developed factsheets for every country of the EU building on the outcomes of the MESEU project (a service contract funded by the Directorate General for Environment of the European Commission) and more than 30 other documents. Member states had the possibility to update the factsheets based on the state of play. The factsheets contain a wealth of information about how countries are concretising Action 5. They report on the policy process, the relevant actors and executive agencies, the problems encountered, the data needs, the research capacity, and the actual results and outcomes. These factsheets constitute an essential database for ESMERALDA and are crucial pieces of information to understand how ESMERALDA can help countries in completing the work. The factsheets are available through the project website but they are also published on BISE³, the European Commission's official gateway to information concerning the EU Biodiversity Strategy.

The factsheets were helpful in clustering the EU countries based on their status of mapping and assessment implementation. The clusters are described in ESMERALDA Deliverable D2.1 (Kopperoinen et al. 2015) and they are the basis for a better identification of member state prerequisites and needs in mapping and assessment work to decide on suitable supporting actions.

Dividing countries in clusters was needed to facilitate discussions in a meeting with the different member states' representatives. A stakeholder Workshop organised in Riga in October 2015 gave an additional opportunity to enrich the picture obtained from the country fact sheets. Members of the EU working group MAES (which oversees the implementation of Action 5) as well as project partners

² <http://biodiversity.europa.eu/maes>

³ http://biodiversity.europa.eu/maes/maes_countries

were able to adjust the country fact sheets, provide new updates and start discussing solutions to remove barriers and obstacles to the full implementation of MAES at country scale.

2. Level of progress in mapping and assessment of ecosystem services based on the country fact sheets

To learn about the status of EU member states in mapping ecosystem services, the country fact sheets produced in the ESMERALDA project were analysed. In addition, case study fact sheets from respective countries as well as the minutes and the report of the ESMERALDA Workshop in Riga, Latvia, 13-16 October 2015, were used as complementary material. All the material was analysed using a qualitative content analysis.

At first, thematic categories were created indicating the scientific progress in ES mapping and assessment, progress in policy implementation and stakeholder involvement as well as problems related to data, funding or human resources (see Annex 1). The country fact sheets were then systematically analysed in terms of these categories and the results were recorded into an analysis table. After this, the analysis table was turned into a score sheet in which countries were given points for different elements indicating progress in ES mapping and assessment, policy implementation or existence of good prerequisites in terms of data and financial and human resources (see ESMERALDA Deliverable 2.1; Kopperoinen et al. 2015). Belgium was analysed separately for Flanders and Wallonia. This is because the Flemish government has just finished a regional ecosystem assessment which covers half of the country (and 65 % of the population of Belgium). The regional assessment is the first assessment in Europe which started after the establishment of the working group MAES. It used the MAES typologies and an adapted conceptual framework and can thus be considered as the first MAES-type assessment in the EU. Therefore, we considered it useful to report separately on Belgium.

The highest score was received by Belgium / Flanders and UK (24 points each) and the lowest by Cyprus and Slovenia (0 points each). The scores are presented in Figure 1.

To see whether there are differences in scientific progress and progress in the policy process related to ES mapping and assessment in the member states, the questions used to score the member states were regrouped into two groups:

- (1) questions surveying the progress made on aspects related to implementation of policy and networking with stakeholders and
- (2) questions which surveyed the progress made on research in terms of mapping and assessment.

For clarity, let's consider, for instance, the position of Poland. Questions for Poland about the policy implementation and stakeholder involvement in the MAES initiative resulted six times in a positive answer (yes) (for details see Annex 2). As for research (i.e. status of mapping and assessment), Poland received eight positive answers. With this position, Poland – as well as Hungary and Italy - represents the EU median.

The resulting position of each EU member state is presented in Figure 2. The maximum score on the policy and stakeholder axis is 12; the maximum score on the research axis is 15.

Countries in the upper right corner in Figure 2 have implemented MAES or have made substantial progress over the last two years. Countries in the lower left corner have yet to implement MAES. Countries in the middle of the point cloud are in the process of implementation.

Figure 2 clearly shows that both processes - policy and research - go hand in hand. There are no countries in the upper left or lower right corner. Research and policy are mutually dependent on each other to achieve progress.

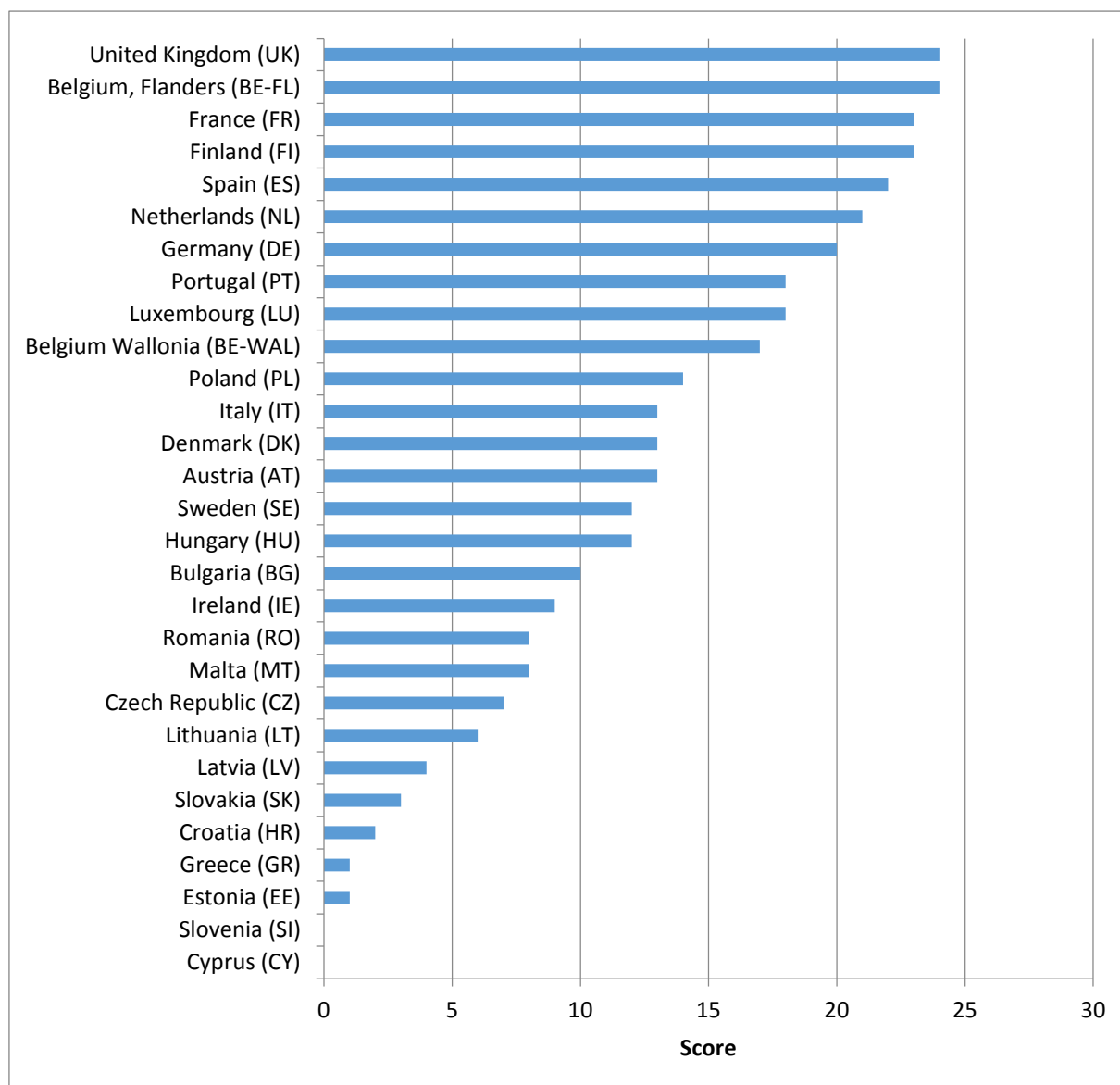


Figure 1. Scores given to EU countries based on their level of progress both in policy implementation and stakeholder involvement and in science related to mapping and assessment of ES (updated version of scores shown in ESMERALDA D2.1 report) (see also Annex 2).

Clearly, both the scores of each country (Figure 1) and cross-tabulation of them (Figure 2) are snapshots of the situation how it was assessed at the end of 2015. However, we can use them as a baseline to measure progress of the MAES process in the next years. Member states' representatives can update progress at the occasion of the biannual MAES working group meetings. These updates can be published on BISE and can be used by the project to keep track of the progress made (see also Milestone 31: Meetings with relevant Stakeholders, e.g. DG ENV, EEA), and to discuss inter-

operability of ESMERALDA outputs into OpenNESS / OPERAs Common Platform⁴ and BISE (September 2015, January 2016, January 2017 and August 2017).

The assessment of the progress made in the different countries can also be used to give country-specific advice. There are several possible options to make further progress on MAES. The options listed in this report are not stand-alone solutions to start or proceed with a MAES-type of ecosystem assessment at the national scale but can be combined (cf. Table 1).

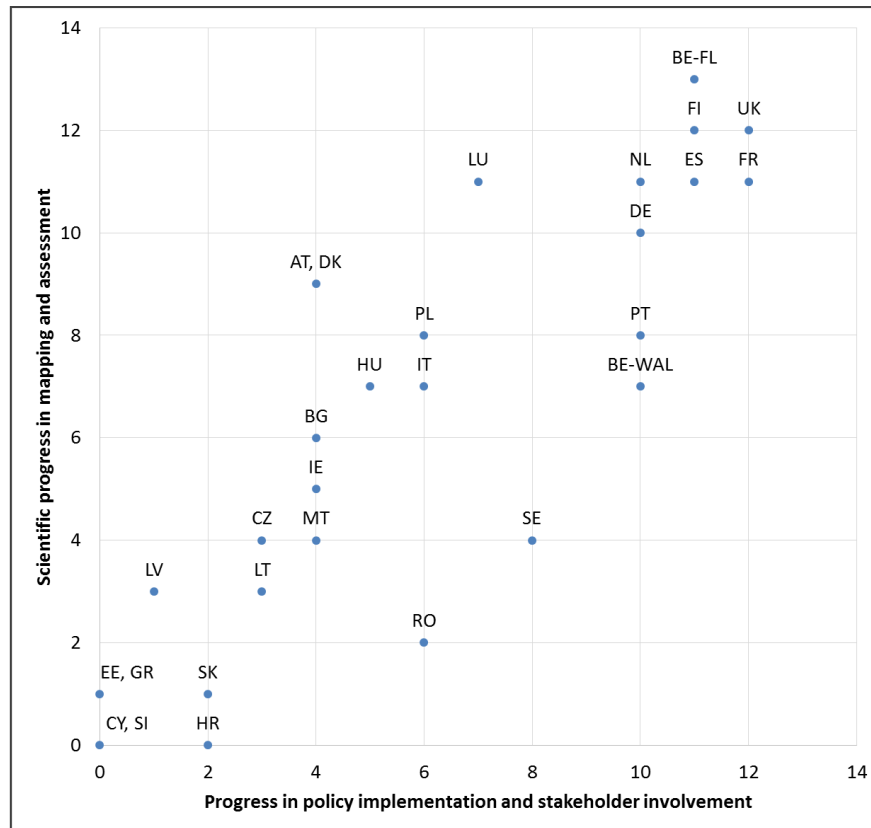


Figure 2. Assessment of EU member states based on progress related to implementation of policy and networking of stakeholders and progress made on research in terms of mapping and assessment.

3. Gap analysis based on the stakeholder Workshop in Riga, Latvia

Workshops have an important role in ESMERALDA. The ESMERALDA Workshop 1 in Riga, Latvia, 13-16 October 2015, was the first in a series of Workshops to enhance project collaboration with stakeholders⁵. The topic of this Workshop was “ESMERALDA stakeholder Workshop on ecosystem service mapping and assessment in EU member states at national level - Identified gaps and possible solutions”. The aim of the Workshop was to deepen the knowledge of gaps in reaching the targets set in the Biodiversity Strategy Action 5, as well as the strengths that member states have in the field. Another aim was to find solutions that can be developed in the frame of ESMERALDA to

⁴ <http://oppla.eu/>

⁵ Stakeholders in the ESMERALDA context are persons that are involved in mapping and assessment of ecosystems and their services. They can be representatives from policy, science, society, business or practice and producers or users of ecosystem service mapping and assessment-related products.

support member states. Finally, the Workshop also had an intension to start the establishment of country-wise stakeholder support groups for ecosystem service mapping and assessment activities.

Workshop 1 was arranged in Latvia as agreed in the ESMERALDA project's Description of Action (DoA). The Finnish Environment Institute SYKE was in charge of the programme and outcomes of the Workshop and the Baltic Environmental Forum BEF was responsible for the practical arrangements.

The ESMERALDA Horizon 2020 project is a Support and Coordination Action (SCA). To build on the knowledge from the MAES network, it was decided that the invited stakeholders should preferably be official MAES contacts. In some cases such contacts were not available, but other people having relevant experience in ecosystem service mapping and assessment were selected and they were asked to get a nomination to represent the official contacts. For keeping the Workshop reasonably small and fruitful for discussion, yet still having representation from all member states, it was agreed to invite primarily only one stakeholder per country.

73 people from 29 different countries participated (see participants list in Annex 3; Figure 3).

3.1. Method of collecting and analysing the stakeholder knowledge

In the stakeholder Workshop in Riga, most of the work was carried out in break-out group sessions. This was to engage participants in a more lively and free discussion than it usually would take place in a bigger group. There were three parallel break-out groups (Groups A, B and C), which had a similar list of topics to be discussed. These groups were formed based on the pre-clustering of member states based on their initial status in MAES-related activities at national level (ESMERALDA Milestone 11).



Figure 3. Group photo on Workshop day 1 (Riga, Latvia, 2015). (Photo copyright: Iliyana Kuzmova, Pensoft)

The EU member states were first divided into 1) those in an initial phase of activities, 2) those where activities are on-going but support is still needed and 3) advanced. After this, the member states in different phases were blended and distributed evenly in the three Groups A, B and C, to enhance knowledge exchange between countries in different stages of progress. To stimulate the network development, participants from the same member state – both stakeholders and ESMERALDA consortium members - were directed into the same groups. This was something several participants found fruitful: a rare opportunity to also interact and engage with colleagues and stakeholders from their own country.

In Groups A, B and C, participants were further placed around tables in clusters consisting of 1-4 countries depending on the number of participants from each country (Figure 4). The principle behind this was to give each person an opportunity to speak: in small groups, everyone really has the chance to say something, not only those having good English language skills or those being more extroverted. This approach proved to be successful.

Pairs of ESMERALDA Executive Board members acted as facilitators of the break-out groups.

The resulting three break-out groups were as follows:

Group A

Facilitators: Benjamin Burkhard, Marion Potschin

Country representatives from

Austria, Belgium, Denmark, Estonia, Germany, Greece, Latvia, the Netherlands, Poland, Switzerland

Group B

Facilitators: Joachim Maes, Pavel Stoev

Country representatives from

Bulgaria, Croatia, France, Hungary, Luxembourg, Malta, Portugal, Slovenia, UK

Group C

Facilitators: Fernando Santos Martin, Davide Geneletti

Country representatives from

Czech Republic, Cyprus, Finland, Ireland, Italy, Lithuania, Romania, Slovakia, Spain, Sweden

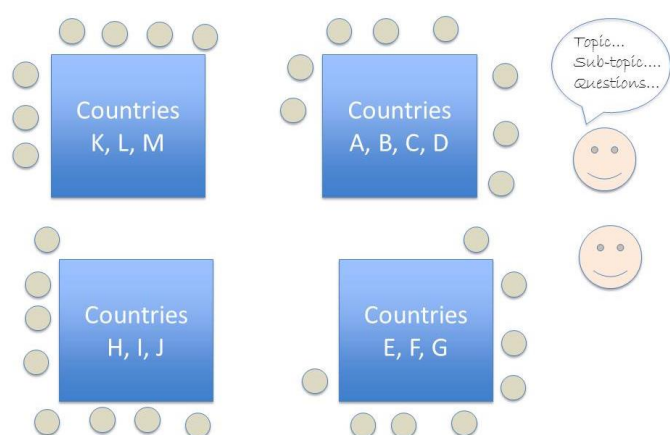


Figure 4. Working style in a break-out group.

Talking heads: facilitators.

Blue squares: tables.

Grey circles: participants.

The break-out sessions started with a short introduction to the topic of the session followed by helpful questions given by the facilitators (Figure 4). Each topic was further divided into three sub-

topics, which were discussed one at a time. Each sub-topic was first discussed in the sub-groups around the tables for about 10-15 minutes, after which the discussion highlights were presented for the whole group and discussed together for 15-20 minutes.

In this work, the facilitators had an important role in stimulating the discussions and creating a common understanding and further dissemination of the outcomes. Each break-out group had a note-taker who collected the highlights from the common discussion. In addition, the hand-written notes of each table were collected and written in electronic format afterwards. The key guiding question of all sessions in day 1 was “What hinders the implementation of MAES in your country?” The facilitators were always coming back to this question in case the discussion went too much aside.

For the ESMERALDA Deliverable 2.2, the protocols, flipchart papers and other notes from the Riga Workshop were analysed using a qualitative content analysis (Hsieh and Shannon 2005). The workflow was the following:

1. An Excel table containing the Riga Workshop break-out session topics as headlines in columns and country groups as headlines in sub-columns was developed.
2. All written material from the Workshop was coded in the table under the proper topic and country group. (Note: if, for example, a stakeholder involvement problem had been brought up during a session allocated to methodological gap discussion, it was coded under the stakeholder involvement topic).
3. After all workshop material was coded, it was analysed and classified under emerging key themes standing out from the discussions.
4. Summaries of the analysis results were written.

3.2. Problems and gaps brought up by the EU member state representatives

The first breakout groups were organised in two subsequent sessions, for which the following six questions were identified as being relevant for implementing MAES in the EU member states:

Session 1: Policy, stakeholders, process

- How is the overall engagement of the national authorities in the MAES process?
- What other stakeholders are involved in the MAES assessment?
- What (capacity, resources) would be needed to carry out a national ecosystem assessment that will be align with Action 5 of the BD strategy?

Session 2: Methods, data and indicators

- What are the most important gaps for biophysical mapping and assessment of ecosystems and their services?
- How can social mapping and assessment methods be used or integrated in MAES?
- What are the obstacles to go from biophysical to economic mapping and assessment?

They were discussed subsequently within the different breakout sessions. Key findings are presented in the following paragraphs.

3.2.1. Engagement of national authorities in the MAES process

Summary

The main gaps in national engagement in the MAES process emphasized during discussions included specifically: (1) there was an identified lack of engagement of authorities from different levels and sectors and a need for harmonization of different policies, (2) lack of coordination was recognized even at national level, (3) the EU BD strategy was seen as not binding enough and not understood as

something important and urgent, (4) need for more resources was also pointed out, and (5) communication issues were identified mainly because of fuzziness of the ES concept and data problems.

Moreover, the usefulness of maps was seen as not clearly communicated to the governments and the reaction was reported to be sceptic there and leading to reluctance in getting engaged in MAES. In terms of communication, the data-related problems were identified as well, because, for example, available CORINE Land Cover (CLC) data was perceived as not detailed enough for local needs. Also the different perceptions of the ES concept played an important role in communication problems and caused confusion especially related to the needed data.

Detailed comments

Lack of engagement of different level/sector authorities, need for harmonisation of different policies

- Lack of policy support and political will from national governments.
- Lack of feeling ownership of MAES process by national authorities.
- Lack of engagement of all the national authorities potentially connected to MAES process, for example, agricultural ministry.
- At the moment there is a gap in the dissemination of MAES deliverables, because the regional and local authorities are not involved.
- There is interest in central governments, but they are in different stages of the engagement cycle.
- Highly dependent on the political structure of the country; for instance, the process can be top-down (e.g. delegation by the ministry to a scientific society). The next step would be to involve the regional levels.
- Lack of harmonization of different sectors/policies. The same few people have to work for different initiatives (MAES, CAP, ...). It would be possible to share data and methods, as many initiatives use the same data (e.g. public goods and ecosystem services).
- The need and usefulness is acknowledged at the bottom level, but there is lack of a political mandate.
- Gaps in the connection of governmental and research departments.
- It is useful to start with engagement at the highest level to get a showcase of champions.
- More involvement of the national institutions is needed.

Lack of national coordination

- There is no finance and no overall coordination.
- There are many activities going on, but national coordination is lacking.
- Guidelines are needed.
- EU strategy is not binding enough, no strict requirements, in countries with limited resources governments tends to be very pragmatic.
- The deadline 2020 is too near. The general timeframe was too short, the objectives were set but the methods and data were not ready.
- The Biodiversity strategy is not understood as important nor as urgent.
- Process tends to be volunteer-driven, there is need for more resources.
- Lack of resources to involve stakeholders.
- There are two ways to let country jump: governmental directions or understanding that it is beneficial for certain stakeholder groups. Because governmental directions are lacking at the moment, we need to raise awareness and get economists and ecologists talk to each other.

Communication issues

- Usefulness of maps is not clearly communicated to the government. Therefore they are very sceptic and do not easily invest.
- Fuzziness of the concept is an important issue: people have different perceptions of the ES concept. The fuzziness is particularly difficult when considering needed data.

Other

- Reorganisation of organisations and subsequent change of tasks of involved people hinders implementation.

3.2.2. Stakeholder involvement in the MAES process

Summary

The main gaps and issues identified during the discussions on stakeholder involvement were: (1) A confusion regarding who is responsible for MAES in the country and the lack of feeling ownership of MAES. Despite (2) the need to involve stakeholders across sectors and levels, there was (3) scarce stakeholder participation in many countries. If there was stakeholder participation, (4) conflicts between stakeholders were reported and moreover, (5) stakeholders did not seem to have any interest in the process, because of (6) sectoral division and gaps in interaction.

Furthermore, it was seen that the involvement of different stakeholders was challenging because of their willingness to cooperate changed over time. In addition, there had been some critical conflicts between local and national stakeholders. On the other hand, there were several cases reported with quite successful involvement of stakeholders, for example in Ireland, Sweden and Finland in Natural capital forum, IPBES and TEEB.

Detailed comments

Responsibility

- Confusion regarding who is responsible for MAES.
- Scarce stakeholder participation. More stakeholders should be identified.
- Some potential stakeholders do not see any opportunity to be involved.
- Stakeholders might not have interest in the MAES process.
- The concept of ES has no clear "client".

Engagement of different levels and sectors in MAES

- There is a need to involve stakeholders across sectors and levels.
- It is challenging to reach municipal level.
- Case studies should involve all relevant stakeholders from different levels and not be too selective.
- So far the process has been too top down; regional authorities need be involved.
- Regional and municipal representatives might not have any knowledge of the MAES process.
- Sectoral division can cause gaps in interaction.
- Division between environment and agriculture at the European level.
- Sectoral division between scientists.
- Stakeholders should be involved in modelling and also to every step of MAES.

Conflicts

- Involvement of all levels from local to national can create a conflict.
- Stakeholders might agree on the process in the beginning but overtime they begin to disagree on relevant issues. That can cause a critical divide between stakeholders, which impedes the work.

Communication

- Stakeholder groups have problems with communicating their needs.
- Sectoral division causes gaps in interaction.

3.2.3. Capacity and resources

Summary

The gaps in capacity and resources to carry out MAES in a country can be crystallized in two main groups: (1) financial and (2) human. Financial problems can simply be a complete lack of funding or funding that is not sustainable. In some cases, most of the ES mapping and assessment work is mainly done on a voluntary basis. Lack of time can also be a limitation but usually the human gaps relate to a lack of expertise, brain drain (experts leaving to other countries) and/or a lack of interdisciplinarity. There is a need to integrate experts from different fields (especially sociologists and economists). Especially small countries can face capacity issues deriving from a limited pool of financial and human resources.

Detailed comments

Financial

- Commitment and foundation need economic support through funding.
- Funding is not sustainable at the moment.
- Funding and expertise gaps are of essential nature. Small countries have a capacity issue – a limited pool of resources.
- Most of the work is currently mainly done on voluntary basis but there is a limit to voluntary action without funding.
- In some countries funding outside the country may be relevant.
- ES have been framed under sustainable development rather than biodiversity in one country to unlock a budget.
- Working time for MAES is needed in addition to financial support.

Human

- An interdisciplinary approach should be adopted from the beginning. Should have a common understanding that MAES implementation is a slow process.
- More human resources are needed.
- Lack of human capacity is an issue given the richness of biodiversity in some countries. Also the capacity for ES is limited given the novelty of the topic.
- Expertise leakage is an issue in some of the newer accession countries.
- Lack of good GIS experts.
- Lack of appropriate education in spatial data analysis and interdisciplinary research.
- Expertise is needed in regard to

- Tools, especially GIS (complex models needs to be explained properly and understand) and participatory methods (social science, people perceptions),
- Citizen science,
- Involving economist to give financial value to ES.
- Need for trainings and help desk.
- Integrating experts from different fields to work with ES, also sociologists and economists.
- Need for more capacity in communicating the ideas.
- Fear of forcing the use of ES concept too much in communication. Especially concepts of regulating and supporting ES and cultural ES are complex. Also the concept of socio-economic assessment has proven to be difficult.
- It is challenging to integrate social and economic assessments to the biophysical one.
- The MAES process should be conceived as dynamic and flexible.

Coordination, especially related to data accessibility

- Functional structure of the management - now there is lack of integration and coordination.
- We need clear goals for what we should do.
- We need to know clearly ourselves what kind of information we really need and for whom.
 - What ecosystem services should we map?
 - How many?
 - Which indicators?
 - Which are the most important?
 - How to prioritize them?
- Knowledge of end-users should be included in mapping and assessment.
- Coordination is needed in bringing all data together.
- Much of the information is not digitalized and analysed, should be done in a coordinated way.
- Data is not always accessible.
- Authorities need to recognize spatial data requirements.
- Guidelines are needed.
- Good data and good understanding of the limitations are important.
- National coordination and bottom-up approaches are equally important, these need to be balanced.
- It is crucial to specify to whom the MAES data is for.
- Getting additional data and harmonization / standardization of existing datasets.
- Data and methodologies for cultural ES assessment are needed.
- Need to find a common language about scientific concepts.
- Aim should be an integrated perspective.
- MAES should not concentrate solely on mapping because it is not useful alone.

3.2.4. Biophysical mapping

Summary

The main gaps for biophysical mapping during the discussions were seen to relate to (1) data-related issues, (2) lack of marine areas mapping, (3) methodological confusion connected with models, indicators and different scales, (4) institutional issues, and (5) the need to deal with ecosystem condition information.

The data gaps can be divided into CORINE Land Cover (CLC)-related and others. CLC was seen as quite a good start or base for the mapping, but not suitable for more detailed scales (regional, local).

Availability of detailed data varied a lot among member states. Some of them had a wealth of data, others had problems in accessing the data (poor access due to e.g. payments or security reasons) or did not have any data at all for some sectors. A common experience was that institutions had not been interested in national ES mapping because the national level had been perceived to be too general and not concrete enough. Moreover, indicators and used methods should be decided together with stakeholders in each country and not by the EU at a central level. To enable this, the concept of ES needs to be made comprehensible and the benefits of mapping and assessing ES clear. It can be difficult to choose a suitable model for mapping and assessment as well as suitable assessment unit. Moreover, the separation of abiotic and biotic environment was seen as a big problem in the assessment and mapping.

Defining and assessing ecosystem condition was generally seen challenging. There are gaps especially in marine ES mapping, which is not done in most of the countries.

In addition to gaps, it was also brought up that a lot of data already exists for translation of biophysical maps to ES. Belgium (Flanders) has produced a land use map (in 10 m x 10 m pixel size), which has been used to map physical suitability, use and demand related to ES. In the Netherlands, a land cover and land use map has been produced by combining agricultural and residential maps. Portugal stands for a good example of mapping ecosystem conditions using the MAES approach. Sweden provides some good examples of marine systems mapping and assessments. In Italy, CLC data has been integrated with National Potential of Vegetation data. As a result, 91 ecosystems were identified and mapping and assessment of ecosystems have been completed.

Detailed comments

Data issues – CORINE Land Cover, other sources

- Data resolution is an issue when addressing local issues; CORINE Land Cover data is not enough for local needs.
- CLC is too coarse, not clear which other data should be used; CLC does not match to local patterns.
- CLC 2012 is available, but not used for mapping (-> forest compartment data with high resolution/every five years); CORINE data links to vegetation types but not ecosystems.
- Lack of common data in inland waters and marine habitats. TAPIS/ATIP/GEOPORTAL must be used instead (Latvia).
- Available data is not necessary usable.
- EUNIS is useful in mapping ES, but there are difficulties in using it.
- Gaps in ES data, data accessibility and management; indicators are missing.
- A lack of data for baseline assessment and mapping.
- Lithuania – data is a major gap, need for detailed data.
- Slovakia – data gaps, different data holders and access to data are challenging because of needed licenses.
- Sweden – data sharing is an issue for security reasons.
- Ireland – data holder charge for the data, even ministry has to pay.
- Romania - basic CLC is used. Still in the process of identifying gaps. All available data has not been identified.
- Spain - CLC level 3 is used. The challenge is what to do with the available results. The next step is to actually implement the ES concept (synergies, trade-offs, bundles) because otherwise it is giving new names to old approaches.
- Issues with data availability and costs; Cyprus – limited access to data.

Institutional issues

- Ministries might not be interested in something general (= national level mapping), they do not see a concrete purpose for that.
- It is a challenge to make changes in management of areas outside already protected areas based on the results of MAES.
- Indicator selection and selection of methods should be driven by a proper stakeholder process not by EU at central level.
- Reorganization of organizations and subsequent change of tasks of involved people is problematic.
- Mainstreaming of ES mapping on regional level; regions should identify their priority ES.

General methodological confusion/issues

- There are so many problems in relation to ES that it is hard to explain.
- No clear understanding of what is an ecosystem service.
- Availability of many different models – how to choose the right model? What is suitable? What is valid? Models are not user friendly.
- Lack of models linked to specific ES. Lack of models to support ES mapping; if available the models are too complex and data and capacity demanding.
- Lack of models linked to different ES – different interpretation of what to map, not only final ES.
- Lack of assessment tools.
- How to transfer data from coarse sources to information which is needed?
- Clarification of terminology and methodology.
- Unclear what indicators to choose, which indicator for different ecosystem types.
- How to map potential and flow?
- How to consider abiotic environment? How to separate biotic and abiotic?
- There is a need to refine MAES typology for different countries.
- Difficulty to map some services (supporting, regulating).

Ecosystem condition

- Ecosystem condition is challenging to assess and define: measure specific to each service or aggregated measure for the whole ecosystem? How to handle it?
- Ambiguity of concept of condition.

Language/translation issues

- Ecosystem services and benefits – in some countries difficult to translate correctly.

Scale-related methodological issues

- ES framework is not useful at regional scale, because of insufficient data.
- Methods of mapping differ per region/institution. There are transferability and compatibility issues.
- Issue of assessment unit identified, suggestion to make it place-based.
- What should we map? Spatial and temporal scale.
- Scaling from local to national level impeded by the lack of baseline data.

- Spatial link is difficult to set – e.g. groundwater areas: mapping the actual supply or the areas where the water is actually used?

Marine areas

- A critical gap in mapping marine ES.
- Different data and quality of marine data (versus terrestrial), there are technical questions about how to map.

3.2.5. Social mapping

Summary

First of all, an understanding what “social mapping” actually is seemed to be lacking among most of the stakeholders. In ESMERALDA, social ES mapping is seen as a method for mapping supply, demand and multiple dimensions of ES harnessing different experts’ and stakeholders’ (including scientists, citizens, decision-makers and managers) knowledge and values. Results advance the knowledge about differences in perceptions of the spatial distribution of ES based on stakeholder groups (see also ESMERALDA DoA and Deliverable 4.3).

In social mapping, especially the category of cultural ecosystem services was seen as being difficult to map. However, there was evidence on successful applications across the Workshop participants, which proved that this is not an impossible task. Nevertheless there are relevant concerns related to decreasing data uncertainty on one hand and increasing policy impact of social mapping and interpretation of cultural ecosystem services on the other. Although in some countries mapping and assessment of cultural ecosystem services is not considered as highly relevant at the moment, findings from social mapping can be used for advocating (environmental) objectives in the decision-making arena or as supporting arguments for other ecosystem services. The meanings, values and perceptions that stakeholders or survey respondents make from cultural ecosystem services change over time and may or may not be place- specific. Another methodological obstacle is the transfer of findings across scales - from local to national level. Additional analytical problem arises from trying to draw a clear line between the flow and demand for this category of ecosystem services.

Detailed comments

Data

- The classification of ES can contribute to confusion in communication with stakeholders or survey respondents,
- Most studies that have been done focused on gathering and evaluating social values and perceptions combined the findings with statistical data.
- Difficulties and mismatch often exist between mapping of ES demand and flow
- Data accuracy – perceptions may alter with changing environment and over time, dependent on method chosen for collecting (need to avoid bias). Often the social data available has not been collected to assess ES.
- The data used for the demand side recalls that the suitability of indicators need to be reconsidered.

Methods

- Participatory GIS mapping at urban and regional level.
- Other participatory methods used: games (at local level), scenarios, links to engagement in activities, social mapping (greater relevance when spatialized).

- Need to avoid the mismatch when designing methodological frameworks for ES supply & flow & demand and need to consider transfer between different levels (local – national).
- Need to create research designs with high policy impact (for example for biodiversity conservation, sustainable tourism), to advocate environmental objectives in the eyes of policy-/decision-makers.
- Other approaches to mapping and assessment of social values of ES at national level may be costly.
- The transferability (scaling up) of findings from local case studies to national level is unclear.

Other

- In many countries, social mapping is not in focus at the moment, rather other domains of ES which are more relevant at the moment or because it is often linked with the cultural ES which are fuzzy as such for many.
- Problematic implementation of policies: inevitable trade-offs between access of ES use and conservation.
- Quality and sustainable ES use issues have to be incorporated as part of the message to policy-/decision makers.

3.2.6. Economic mapping

Summary

A greater integration of economic sciences into ecosystem service research as well as into the MAES process would be very much needed in order to make the process of knowledge transfer into practice and policy making more credible. To address sustainability issues and linkages in the socio-ecological systems, trade-off analyses need to be made and non-economic indicators / values need to be considered as well. In cases where there are ethical concerns about nature and ecosystem services, aspects of social wellbeing could be considered for assessment. Because economic mapping of ES had been carried out only in few countries, the Workshop participants had very little experience on it and therefore the discussions in break-out groups remained very short.

Detailed comments

Data

- Lack of capacity and tools.
- Economic data has to be reorganized into spatially explicit data.

Methods

- There are methodological gaps; more economists need to be involved in MAES processes.
- There are different methods to calculate economic value, which give different values. Therefore when values are compared, the method used needs to be considered.
- To overcome uncertainties, research design and implementation can become quite costly, and still face the confrontation by mainstream economists, or decision-makers who may misunderstand the usefulness of approaches to ES valuation.
- The process of valuation must be credible and replicable like the GDP assessment.
- Biophysical mapping could be linked to subsidies mapping.

Scale

- Sustainability could be a purpose for economic valuation of ES at national level.
- ES supply and use may not be well aligned.

Other

- Concerns whether valuing nature economically is ethical.
- Valuing as a tool for mainstreaming.
- The reasoning for valuing ES is questionable. How about considering more the aspects of social well-being?
- Economic valuation can be useful in some situations, for example to support decision-makers when there are changes in land use. Trade-off analyses need to be made and non-economic indicators / values need to be considered as well.
- There should be a clear division of market value and non-market value.

4. Recommendations and solutions**4.1. Solutions based on the outcomes of the Workshop**

After discussing the problems and gaps in mapping and assessment of ES and MAES implementation, the last break-out session was dedicated to gathering ideas of solutions how to overcome them and consequently producing recommendations. The discussions were grouped into the four topics: 1) Justification (of the MAES process), 2) Communication, 3) Education and capacity building and 4) Technical support. The groups also got a memo as a reminder of the problems that surfaced the previous days. In the following, syntheses of solutions relating to different themes are given.

4.1.1. Justification*Summary*

Presented recommendations for justification of the ES mapping and assessment work can be summarized as follows: (1) using understandable and appealing examples (or case studies, best practice cases), (2) interpreting research results also in terms of societal problems or benefits (not only economic problems / benefits), and (3) seeing communication also as a possible solution to problems. The last implies better communication of the benefits and involvement of “opinion leaders” and (famous) influential people. An important point is also to channel information, research findings and ecological arguments into networks of key actors to the MAES process (e.g. as members of steering committees of national MAES implementation) and integrate their perceptions. Another opportunity would be to create a more competitive environment among the EU member states on the progress with MAES and support benchmarking initiatives.

*Detailed comments***Legal arguments, EU policy**

- The European Commission is quite engaged, but it should put more pressure on national authorities (contact them more than once and assess development). The Commission should also address other than environmental ministries.
- ESMERALDA should work on convincing the European Commission to provide Directives or better regulations for MAES implementation. The suggestions should be made more legally binding through the Ministries of Environment and regional development.
- Coming EU policies should be anticipated and the importance of ES shown in regard to them.

- Down-scaling the EU objectives to the national level, hence integrating national priorities is a good strategy.
- More base work is needed to increase the understanding of the need for mapping and assessment of ecosystem services and how it helps countries to improve their sustainability.
- Two options to make the “nature” of MAES: either as “a stick” or “a carrot”.

Competition between countries

- Make countries compete by benchmarking of EU member states progress - “you don’t want to be the last”.

Ecological arguments

- Remind about the carrying capacity of ecosystems and the link between ecosystems and ecosystem services.

Problem-based solutions – communicate benefits and solutions

- Present problem-based solutions, which are easier to explain.
- MAES products should meet the following agendas: (1) relevance for growth agenda, (2) solve outstanding social problems, and (3) be environmentally and socially competitive.
- Money talks. Put the ES loss into economic context or create economical valuation of ES. Use cost-effectiveness as a good argument for implementing MAES as a way to find solutions to social problems.
- Express the loss of ES in monetary terms.
- If we manage to link ES to nature conservation and through that to long-term problems in social situation – such as poverty – it makes the explanation easier.
- Make contrasting examples like how much money it takes to restore services and contrast that in what difference it makes if we could give the same sum to work against poverty.
- Take measures to make one good mapping exercise instead of many smaller diverse mapping and assessment projects. It is more cost-efficient.
- Or have a national initiative and use local case studies. This could be a good strategy if resources are limited.
- Demonstrate added values and compare options, e.g. grey vs green solutions.
- Communicate long-term benefits.
- Focus on agro-ecosystems, because benefits are evident.
- In urban ecosystems, connect MAES with public health issues.
- Use MAES deliverable for addressing national challenges (saliency of MAES).
- Present that MAES is an opportunity to show what is valuable in a spatially explicit way, highlighting trade-offs. Demonstrate the need of MAES and explain the benefits and advantages of it.

Using examples

- Demonstrate the benefits of MAES. What advantages can be derived from its application. Provide good case study examples of application.
- Present smaller case studies and use them as arguments.
- Make appealing case studies on impact assessment with and without ES.
- Communicate benefits and solutions (esp. economic benefits and solutions for social problems).

Contacting the right people, getting into the system, personal connections

- Find high level influential people and approach them with understandable examples.
- Reach the decision-makers and high-level stakeholders and raise their awareness on the necessity and utility of MAES.
- Make government contacts or connect with those you know to have good government contacts.
- It is important to do what it takes to get “into the system”.
- Communicate at different levels of public administration, talk and insist and use personal relationships as channels.

Involving actors to the process

- Involve also other than environmental ministries into the steering committees or in the evaluation. Commitment needs starting high up throughout, e.g. involving the ministry early.
- Include different actors in the steering committees of MAES projects at different levels.
- Prioritize regional and local authorities.
- Integrate stakeholders’ viewpoints in the process.
- Focus the assessment on the users' needs.
- Communicate benefits of MAES to stakeholders by using their own language and concepts (appealing to their interests).
- Raise awareness in society.
- Engage opinion leaders, famous influential people.

4.1.2. Communication

Summary

For communicating the often very complex ES research findings and conclusions it is recommended to select an adequate level of information complexity and an appropriate language for the respective target group. Besides media, organizing events (accompanied by excursions, for example) supported by key actors and ambassadors, could be used to provoke discussion, since successful transfer of knowledge involves interaction of people. There is enough evidence in literature on the positive effects of stakeholder participation in the actual performance of policies. A successful communication strategy should be based on using understandable examples, practical cases or success stories of solutions to problems and they should be shared also via social media. Communication of responsibility should be addressed also to actors from the business sector.

Detailed comments

Examples, success stories, excursions

- Use success stories to communicate how mapping and assessment of ES can make a difference.
- Invite high level stakeholders and decision-makers to informal occasions or excursions where it is possible to more visibly show off what ES really means.
- Find and disseminate best practices of sustainable use of ecosystems and ES.
- Make a set of slides with European case studies.

Start from easy language and terms

- It is not easy to explain the whole concept of ES; choose some easily understandable services and start with them. Make use of ecosystem service cascade model: use an example of a local ES and present what ecosystem structures and processes create that ES and what valuable benefits that service can provide.

- Use the language of the actual end-users of ES (e.g. in case of farmers the numeral values for different land use types).
- Maybe use nature-based solutions as an alternative term to ES when suitable.
- Use national language in the outcome.
- Target messages to specific audiences; given complexity of ES it can be quite challenging.

Use of popular and social media

- Use social media, newspapers and films with famous actors as channels for raising awareness and influencing the politicians.
- Use live TV shows (e.g. X factor) to reach the general public.
- Arrange an ecosystem service concert, e.g. involving known musicians, a festival or other public event.
- Use social media, e.g. ES fun club on Facebook.
- Make use of national press.
- Use national language in the outcome.

Other communication tools: ambassadors, use of maps, high level event

- Involve ambassadors - champions - who help deliver the message.
- Map the ecosystem condition as a mean for communication.
- Organize a high level event, link to international setting to gain prestige, and invite top-level speakers also from abroad.
- Organize meetings.
- Maps themselves could be provocative and stimulate discussion.
- Make use of MAES reports (methodologies, frameworks).

Approaching large masses, different groups, from the bottom to up

- Raise awareness broadly involving large masses.
- Broadcast messages from many directions.
- Approach both sides: decision-makers (talking about the votes) and local people as well.
- Organize autumn festivals.
- Communicate first at the bottom and educate the whole society.
- Communicate in an attractive way and in simple language, starting at the schools and kindergartens.
- Talk to stakeholders at different levels.
- Explain ES at different administrative levels.

Involving end-users, being interactive, making people feel that the voice is heard

- Steps for awareness-raising: inform (education), involve, get familiar with the concept.
- Connect the tool with the end-user.
- Engage all sectors from the very beginning of MAES: supervising board, partnerships, media, citizen science.
- Convince sectors that they are experts in the field and make them feel they are listened to.
- Involve different authorities.

- Build a network of stakeholders as soon as possible because it provides legacy and ability. The network can be built at different levels.
- Use translators for stakeholders at different levels.
- Ensure appropriate participatory structures and processes.
- Create a stakeholder plan for mapping ES (like in Sweden).
- Carry out the work with stakeholder groups (like TEEB scoping study in Finland, IPBES panel in Sweden, or Ireland Natural capital forum, which engaged journalists, academics and scientists).
- Look how the stakeholder engagement has been implemented and learn from the experience.

Addressing business

- Address industries, use networks for this, e.g. Leaders for Nature.
- Make big companies to see the values of actions worth taking.

Using communication experts

- Use trained professionals in communication for awareness-raising.
- Involve sociologists and use social behavioural methods for awareness-raising of ES to make social influence (e.g. the effect in reduction of energy consumption when individuals are informed that the neighbour does better than they themselves and also spends less money by switching off the light).
- Create a new clear communication strategy of MAES, among DGs and Members states.

Communicating benefits, problems and solutions

- Express ES in terms of problems and solutions.
- Arrange campaigns for demonstrating added values of ES and compare options in favour of the green solutions.
- Explain that the champions have lower costs and can have long-term benefits.
- Give examples of how MAES can help specific groups (e.g. farmers use better their land, decision-makers resolve policy conflicts, cities can have better quality of life).

Responsibility

- Remind national authorities on their responsibility.
- Send mapping and assessment reminders to all ministers.

4.1.3. Capacity building

Summary

As it was already mentioned before, in order to build capacity for ecosystem service mapping and assessment and achieve consistent and impactful results it is necessary to integrate knowledge from different disciplines (including especially economic sciences) and support transdisciplinary research efforts. It would be highly appreciated if ecosystem services were to become a part of curricula in schools and university programs, or even provided to officials in a form of workshops or seminars, guidance materials, handbooks or other useful online learning tools and resources.

Detailed comments

Funding

- Provide vital funding for MAES work through EU funds and governmental funding.

Training, education, need of skilled people (training for students and officials)

- Capacity building needs to be institutionalized, not just be a responsibility of individuals. Find 'champions' for support.
- Standardize capacity building.
- Get ES assessment and mapping into university curricula.
- Arrange summer schools, not only for students but also for teachers.
- Meet the need for knowledge, find the right kind of technical people.
- Integrate ES topic into school curricula, e.g. school exercises about assessing local ES condition.
- Develop materials for secondary schools, for teaching about ecosystems and biology. To enable this, arrange presentations and seminars for teachers.
- Arrange university courses and master programs about ecosystems, involve students into projects.
- Arrange qualification courses for the employees in public administration.
- Identify specific needs of training.
- Develop educational programs at universities.

Guidance, handbooks/manuals, FAQs, online resources

- Establish helpdesks at EU and national level (e.g. a farmer can call and ask about ES provided by his field).
- There is a great demand for a handbook on mapping and assessment of ecosystem services. Develop handbooks and manuals for particular topics, e.g. ecological, biophysical and economic mapping with regional specifications taking into account the differences of ecosystems.
 - NOT guidelines that are too general BUT instead clear and specific handbooks and manuals.
 - NOT guidelines BUT guidance about what models to use for what services.
- Develop online resources (FAQs, Wiki).
- Develop learning platforms for practitioners.
- Provide guidance on technical practices.
 - Guidance on how to combine the content of ES with the technical part (applying the theory into practice).

Workshops, seminars

- Arrange national workshops on how to make the right justifications at national level.
- Arrange seminars with local communities about how ES assessments are used in practice.
- Arrange practical workshops with funding (e.g. TRAIN), involving policy-makers (very few are both scientist and policy-makers).

Integration of knowledge, transdisciplinarity

- Help economists and ecologists learn to speak common language, then build capacity of the decision-makers.

- Integrate the economists' and the ecologists' knowledge. Improve the education capacity and give guidance how to get the two topics together.
- Use an interdisciplinary approach and make a real integration of knowledge.
- Think the future stages of MAES, (i.e. accounting), hence communicate to newly-involved scientific communities (statisticians) in their own language. Go beyond the biophysical aspects.
- Focus better in real interaction in synthesis activities.

Examples, learning from others, knowledge exchange

- Show real example studies with benefits where ES were mapped or assessed, monitor the development of these projects (ex post evaluation).
- Mobility of researchers between countries, to foster exchange of data, knowledge and experience.
- Learn from others.
- Start a community of practitioners.

4.1.4. Technical support

Summary

Recommendations for technical support can be generally divided into four main themes: (1) data-related recommendations, (2) institutional recommendations including emphasis on resources and guidance, (3) methodological and research recommendations, and finally (4) mapping and scale-related recommendations.

Some of the suggestions mentioned again the need for assessing ecosystems' capacity to provide ecosystem services and suggested using an EU-wide database (combination of EU and member state datasets). When applicable, it was also recommended to use open source data as much as possible. A helpdesk serving as a sort of knowledge hub with frequently asked questions and frequently provided answers, and a list of available tools and methodologies should be created. Methodological suggestions were mainly about creating standards with which the state of the ecosystem services could be compared between member states. The standards should consist of clear delineation of scale, detail and type of ES for mapping. Similar recommendations were made about further research, which should be more focused on clear concepts and reliable data. Lastly, it was seen important to use multi-scale approaches with production functions and linking biophysical assessments to economic values. The maps should have appropriate compatible data and source, which both need to be tested at the regional level.

Detailed comments

Data related recommendations

- Data should be kept with its source; recalculate it if necessary.
- Use data and indicators from other policies to increase their ownership.
- EU-wide database could be used for covering the capacity (combination of EU and member state datasets).
- Identify and use case-specific real data, use open source data, ensure data availability.

Institutional recommendations, resources, guidance

- Enhance INSPIRE coordination.
- Make new produced geo-services available also for BISE.

- Provide technical guidance to administrative work.
- Provide a list of available tools and methodologies – a knowledge hub.
- Provide a helpdesk with frequently asked questions and frequently provided answers.

Methodological and research recommendations

- Develop specific models (“just feed the data and results will be spitted out”).
- Carry out more research with clear concepts and reliable data.
- Specify standards (scale, detail level, type of ES).
- Explicit spatial and temporal trade-offs between ES.
- Standardize to allow member state comparison.
- Do research on social perception of ES.

Mapping recommendations, scale issues

- Provide maps with compatible data and data sources.
- Upscale data or map at national scale (test at regional scale).
- Use multi-scale approaches: use of production functions links biophysical assessment to economic value.
- Define a minimum set of ES to be mapped and assessed.

4.2. Country-specific recommendations for enhancing MAES in EU member states

For the most advanced group, there is in principle not so much that ESMERALDA can do at the moment. However, even though these ‘front-runners’ may be more advanced than many other countries, they still might have a lot to do to reach the MAES targets in whole. Therefore, front-runner does not stand for completed action. Front-runner countries can substantially benefit from collaboration with other countries via ESMERALDA and can also learn new methods, ways of networking as well as policy implementation options from others.

Still, a special challenge is to make the knowledge, data and experiences of front-runners available (in English) so that they can be used by other member states.

Several countries in the middle of the MAES implementation have mobilised resources for MAES-related activities and are thus expected to make progress in 2016 and 2017. In addition, Norway is committed under its membership of the European Economic Area to support financially the implementation of MAES in several central and eastern European countries. ESMERALDA can help here with research and networking activities.

The beginner countries in the MAES implementation should be supported by dedicated projects and financing where possible.

Table 2 presents the countries in more detail. For every country, we list the score for the implementation level in that country, as well as each country’s strengths in implementation and some recommendations for the next steps. The outlook is based on an assessment of the country fact sheets as well as on updates of project partners on project-based financing or inclusion of MAES in the government’s working program.

Table 2. Implementation level, strengths and recommendations related to the MAES process in EU member states based on ESMERALDA project's WP2 results. (Disclaimer: the statements here are based on ESMERALDA findings and do not necessarily represent national MAES authorities' nor European Commission's opinions).

	Score for implementation level	Strengths	Recommendations
Belgium, Flanders (BE-FL)	24	Nature reporting is a legal requirement in Flanders. Several projects in both parts of the country are planned. Wallonia prepares a dedicated data system.	Make additional efforts in mainstreaming and awareness-raising in regional governments.
Belgium Wallonia (BE-WAL)	17		
United Kingdom (UK)	24	UK-National Ecosystem Assessment has triggered substantial interest. UK is leading operationalising ES through natural capital accounting.	Increase the level of ambition for nation-wide mapping and assessment of ecosystem conditions.
Finland (FI)	23	Active research community and relatively wide interest in policy in regional and municipal level. Some budget allocated to start a national MAES in 2016. Establishment of a national network is under consideration.	Make the national government actively involved in MAES and ESMERALDA to see the whole scope of actions and possibilities in mapping and assessment of ES.
France (FR)	23	EFESE - French National Assessment of Ecosystems and Ecosystem Services is available.	Make additional efforts in networking activity, in which the ESMERALDA research partner could take the lead.
Spain (ES)	22	Spain is almost at the end of the ecosystem assessment cycle.	Spain could focus on the application of MAES/NEA with restoration priorities and natural capital accounting.
Netherlands (NL)	21	Substantial scientific and technical expertise for mapping and assessment as well as data sharing (Project Atlas on Natural Capital). Co-leading the current MAES urban pilot.	Increase the level of ambition for nation-wide mapping and assessment of ecosystem condition.
Germany (DE)	20	An active national MAES community of practice has started during 2015. Several dedicated research projects on different scales. Experience from TEEB-DE.	Adapt the high ambition level and expectations. Make additional efforts to coordinate and mainstream different actions.
Luxembourg (LU)	18	Active research community and government engagement in MAES.	Increase outreach of the results and enhance engagement of other policy departments. Integrate Luxembourg in ESMERALDA.

Portugal (PT)	18	A MAES-compliant regional assessment for Alentejo covering 1/3 of the country is available and will be used as an example for a national assessment, which is being prepared. A dedicated MAES workshop on 11/12/2015 convened relevant actors and discussed next steps. High capacity to implement MAES.	Portugal could take the lead in ongoing discussions and research on ecosystem conditions and ecosystem services.
Poland (PL)	14	High engagement of research.	The Polish scientific community should be endorsed by the ESMERALDA project.
Austria (AT)	13	Clear political positioning toward ES analysis and mapping (content-wise, administrative and structural).	Streamline existing ES-approaches and experts on the national scale in Austria (possible via a Workshop). Provide sufficient financial support for coordinated implementation of MAES in Austria.
Denmark (DK)	13	Active research community.	Make additional efforts in networking activities and in mainstreaming and awareness-raising in regional government. Showcase the value of MAES implementation for more practical applications (e.g. nature-based solutions).
Italy (IT)	13	Strong knowledge base on ecosystems, biodiversity, nature conservation and ecosystem conditions, which could be activated for MAES.	Make additional efforts in networking activity since many initiatives at regional level are not or insufficiently feeding into the national MAES process.
Hungary (HU)	12	Much progress can be expected because of increased government funding for MAES.	Hungary could serve as an example on how to use detailed habitat mapping for ecosystem and ecosystem services mapping and assessment (and provide links to the value of the Habitats Directive for ecosystem services).
Sweden (SE)	12	Engaged policy and research community.	Coordinate better all the different research activities at a national scale to increase the visibility of Sweden in the European MAES process.
Bulgaria (BG)	10	Active research community. European Economic Area projects on implementing MAES are going-on.	Make additional efforts in mainstreaming and awareness-raising on governmental level. Enhance knowledge and methods capacities.
Ireland (IE)	9	A first project on mapping and assessment is in progress. Active network on natural capital accounting.	Integrate Ireland in the ESMERALDA project.

Malta (MT)	8	High engagement of policy and research despite limited resources.	Malta should be invited to a potential BEST meeting with overseas territories. Malta could take the opportunity of the 2017 presidency to put MAES and urban green infrastructure / nature-based solutions on the agenda.
Romania (RO)	8	Active research community. Substantial funding for implementing MAES through Norway and the European economic area.	Increase the level of aspiration for nation-wide mapping and assessment of ecosystems and ecosystem services (making optimal use of available research budget). The country could serve as an example for application of earth observation methods for ES mapping.
Czech Republic (CZ)	7	Active research community and capacity is available.	A new step at government level should be taken to endorse the research community, which has made significant progress. Research could raise its visibility (e.g., ESP regional Conference 2018).
Lithuania (LT)	6	A national survey related to some cultural and provisioning ES has been carried out. ES mapping process has started.	Integrate better in the MAES process at EU level. Integrate Lithuania in ESMERALDA. Make use of ESMERALDA support e.g. in justification of MAES implementation.
Latvia (LV)	4	Active research community and capacity is available.	Make use of ESMERALDA support e.g. in justification of MAES implementation.
Slovakia (SK)	3	Policy interest and active research community.	Slovakia could use the opportunity of the approaching presidency of the Council of the EU to enhance MAES in the country. Integrate Slovakia in ESMERALDA.
Croatia (HR)	2	With almost 37% of the country covered by Natura 2000, the country can contribute in relevant ways to ongoing discussions on how to reconcile conservation approaches with approaches based on ecosystem services.	Integrate better in the MAES process at EU level. Potential candidate for a common regional assessment with Slovenia, Greece and other Balkan states. Integrate Croatia in ESMERALDA.
Estonia (EE)	1	Engagement of research community in mapping and assessment. Funding for national TEEB will enhance mapping and assessment of ES. Research on linking ecosystem condition with ES.	Enhance mutual understanding via active discussion and collaboration between the researchers and national government representatives. Integrate Estonia in ESMERALDA.
Greece (GR)	1	A nation-wide multi-criteria methodological approach on cultural landscapes in the Natura 2000 sites of Greece is being implemented and based on this, indicators for mapping and assessment of	Integrate better in the MAES process at EU level. Potential candidate for a common regional assessment with Slovenia and other Balkan states. Integrate Greece in ESMERALDA.

		cultural services delivered by agro-ecosystems will be completed in 2016. Mapping and assessment of ES delivered by freshwater ecosystems will also be completed in 2016.	
Cyprus (CY)	0	A national ESP network has been created.	Integrate better in the MAES process at EU level. Take advantage of dedicated help from ESMERALDA. Join dedicated workshop on the outermost regions for a tier 1 mapping and assessment exercise based on country-specific policy questions. Integrate Cyprus in ESMERALDA.
Slovenia (SI)	0	With almost 40% of the country covered by Natura 2000 and with the capital as a winner of the Green Capital Award 2016, the country can contribute in relevant ways to ongoing discussions on how to reconcile conservation approaches with approaches based on ecosystem services.	Integrate better in the MAES process at EU level. Potential candidate for a common regional assessment with Croatia, Greece and other Balkan states. Integrate Slovenia in ESMERALDA.

4.3. The next steps in starting and improving the MAES process

There are no quick medicines to improve the implementation level of MAES in the EU member states. The proposed solutions are providing the base when planning the tailored and flexible ESMERALDA coordination and support activities. Some well-tried recommendations are presented below to boost the MAES process in all countries. The beginner countries will especially benefit from taking account of them but any country can improve its progress by applying these suggestions.

1. **Join forces.** Some countries are really at the start of the MAES process for various reasons. They could consider joining efforts. Baltic countries could consider a regional Baltic MAES assessment; also countries in the Balkan including Greece, Slovenia and Croatia could collaborate on MAES. A recent workshop organised by the Joint Research Centre (January 2016) learned that there is interest from non-EU countries such as Serbia, Montenegro, and Bosnia and Herzegovina to join a common regional assessment. Smaller countries, but in particular islands like Cyprus and Malta, could benefit from the ongoing BEST initiative on biodiversity and ecosystem services in the overseas territories. There are concrete plans to organise a meeting dedicated to MAES in overseas territories in which Cyprus and Malta should be invited.
2. **Meet and map.** Based on experience, it takes two workshops to initiate MAES activities in countries, which deliver rapid progress. This statement may be overly naive: it is indeed easier said than done. Yet, the MAES process at EU level but also in many countries starts with a policy and stakeholder meeting, which seeks for common ground, and concludes on a list of key policy questions. Such a workshop can be followed by a workshop where

researchers demonstrate and convince policy and decision-makers that a national MAES is feasible and beneficial to their policies. A participatory tier 1 mapping of ecosystem services based on land cover and land use is often a stimulating experience for workshop participants for both research and policy. ESMERALDA is based on this approach as it goes through a stakeholder phase followed by a mapping and assessment phase. These workshops, which do require an initial investment of the research community, should be followed by a commitment of government or by external funding in order to continue MAES activities. Several examples, for example at EU level but also in Germany or Ireland, have shown that this approach can work. Much information is already available, for instance the two MAES reports, which set a conceptual framework and a common assessment framework. The Joint Research Centre, the European Environment Agency and the ESMERALDA project will support start-up countries.

3. **Network.** A more formal cooperation at national or regional scale (whatever works best) among research institutes and other stakeholders on MAES or more in general on ecosystem services or natural capital should be considered. As a solution to all kinds of problems, networking seems a key; it is perhaps expensive in terms of personal time and commitment, but it does increase the legitimacy or the ownership of the MAES process. National networks on MAES, on ecosystem services, or on natural capital exist in different countries. A network in the context of MAES should aim to meet at least annually. It helps if annual meetings are organised in the capital or nearby the civil administration, which is responsible for biodiversity. It strongly facilitates their participation. ESMERALDA supports creation of national networks through its partner FSD and the Ecosystem Service Partnership (ESP). The project has expertise with several types of networking activities to exchange ideas, opinions and best practices.

The first supporting actions that the ESMERALDA project can take for the benefit of member states in the MAES implementation have been decided based on the wishes and suggestions made by country representatives in the ESMERALDA stakeholder Workshop in Riga. They are listed below:

1) **Solutions for justification of MAES at national level**

ESMERALDA experts can be invited to visit member states to promote MAES in case the country representatives feel they need support in it.

ESMERALDA has identified the key stakeholders of ES mapping and assessment activity in each member state. These people are considered to form the initial support group members of the activity in each country. ESMERALDA will help in establishing formal support groups or national networks of ES mapping and assessment activity, including policy, practice and science (ESMERALDA Milestone 13). The support groups will help in communicating the supporting actions to a wider group of key stakeholders and provide a community of practice for sharing knowledge between different sectors and levels.

Justification of ES mapping and assessment activity is also supported by providing “good ES practice” examples with the ESMERALDA case studies.

2) **Solutions for communication**

ESMERALDA partners can act as intermediates or brokerages between EU member states and the European Commission. The project is also helping member states by offering linkages with related projects (especially MESEU, TRAIN, OpenNESS, OPERAs), as well as with international networks and initiatives (e.g. ESP, IPBES, MEA, TEEB).

Immediate help is provided by the developed ESMERALDA Glossary (Deliverable 1.4), which clarifies the ES concept.

3) Solutions for capacity building

ESMERALDA and its related research community is in process of writing a “Mapping ecosystem services” open access handbook, which is to be published in 2016. In addition, ESMERALDA will produce and distribute training material, teach ecosystem services (especially project partners from Academia), and participate in arranging workshops and summer schools. In specific cases also training courses might be provided, which might be open on-line courses due to resource limitations of the project. Moreover, ESMERALDA can help in curriculum development.

4) Solutions for technical support

ESMERALDA will make information, data and maps available via common, open source platforms (e.g. via EU BISE, ESP-VT⁶, OPPLA). For the actual ES mapping and assessment, ESMERALDA will provide guidelines and guidance (e.g. available models, data needs, indicators, scale-issues, ES selection) depending on what is applicable in MAES. In regard to ES classification, ESMERALDA can provide first-hand expertise in CICES⁷ and its application (Milestone 19).

5. Acknowledgements

We acknowledge all EU member state MAES contacts, their nominated representatives and all those involved in mapping and assessment of ecosystem services in different European countries who have contributed to this Deliverable 2.2. by spending their time and offering their valuable knowledge to the work.

All ESMERALDA partners are acknowledged for their work in identifying the member states' key contacts in ES mapping and assessment and working together with them to update the status reports (country fact sheets). Many ESMERALDA project members as well as researchers outside the project have produced the case study fact sheets, which provide detailed knowledge about actual completed ES mapping and assessment studies. Their input is highly appreciated.

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⁶ <http://esp-mapping.net>

⁷ <http://cices.eu/>

Annex 1. Questions used to analyse the ESMERALDA country fact sheets to assess the status of EU member states in MAES implementation.

1) Status of MAES work

- Is MAES currently implemented in the country?
- Is there any policy in place for operationalizing the outputs of MAES (for nature-based solutions, for GI implementation, etc.)?
- Is a national MAES report available?

2) Status of networking and stakeholder involvement

- Does a national platform facilitating ES work and bringing together stakeholders exist? A platform can be, for example, a specific website, an ES association, a working group or regular events, seminars or workshops?
- Is central administration (for example, ministries, state institutes) involved in the ES work?
- Are governmental institutes involved (for example, an environment agency, a nature agency or research institutes under the ministry)?
- Are regional administration and officials actively involved?
- Are scientific organisations, such as universities or research institutes, actively involved?
- Are non-governmental organisations involved?
- Are business, companies or industry involved?
- Are local communities involved?

3) Resources available

- Are financial resources for ES mapping and assessment activities sufficient?
- Are human resources sufficient? Are there any problems in relation to lacking personnel with appropriate expertise or brain drain?

4) Status of national assessment work

- Have any of the following assessment methods been used at national scale (literature, expert judgment, statistic information, maps and models, workshops / interviews, economic valuation, conceptual thinking / models)?
- Has a selection been made of ecosystems to be included in the mapping and assessment?
- Is there a prioritization of ES to be included in a national assessment or has a classification been selected for the assessment (for example, CICES)?
- Is there a national indicator framework ready and published for mapping, assessment or accounting?
- Has underlying data been identified for such a framework?
- Have EU Directive reporting indicators and data (or biodiversity / ecosystem data) been proposed or used to measure the condition of ecosystems?

5) Status of mapping

- Are maps available at national scale for some ecosystem services?
- Are maps available at national scale for habitats or ecosystems?

6) Status of data

- Is there a national clearing house with data on MAES available? (With a clearing house it is meant that there is a website dedicated to MAES related activities (such as the <http://www.biodiversity.fi/en/home> or the Dutch atlas of natural capital).)
- Is data available, updated and sufficient for ES mapping and assessment?
- Is data compatible (for example, different databases and statistical sources)?

- Is data streamlined, harmonized and used consistently (for example, no big regional differences, similar precision etc.)?

7) Are there case studies available that could serve as examples (upscaling) for a national assessment?

8) Is a nation-wide mapping and assessment project planned for 2016 or beyond?

Annex 2. Scores given to EU countries based on their level of progress both in policy implementation and stakeholder involvement and in science related to mapping and assessment of ES

(an updated version of score table; see the previous version in ESMERALDA D2.1 report) (see also Annex 1).

Questions / EU countries	AT	BE- FL	BE- WAL	BG	CY	CZ	DE	DK	EE	ES	FI	FR	GR	HR	HU	IE	IT	LT	LU	LV	MT	NL	PL	PT	RO	SE	SI	SK	UK
Is MAES currently implemented in the country?	1	1	1	1	0	1	1	1	0	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1	1	1	0	1	1
Is there any policy in place for operationalizing the outputs of MAES (for nature-based solutions, for GI implementation, etc.)?	0	0	1	0	0	0	0	0	0	1		1	0		0	0	1			0	0	0	1	1		1	0	0	1
Are executive (research) institutes involved (typically the environment agency, or nature agency, or research institutes from the ministry)?	1	1	1	1	0	0	1	0		1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1
Does a national platform facilitating ES work and bringing together stakeholders exist (incl. seminars, workshops, websites etc.)?		1	1		0	0	1	0	0	1	1	1	0			1	0		0	0	0	1	1	1		0	0		1
Is central administration (e.g., ministries, state institutes) involved in the ES work?	1	1	1	1	0	0	1	0	0	1	1	1	0		1	1	1	1	1	0	1	1	1	1	1	1	0		1
Are regional administration and officials actively involved?		1	1			0	1	0		1	1	1					1						1		1				1
Are scientific organisations, such as universities or research institutes, actively involved?	1	1	1	1		1	1	1	0	1	1	1			1		1		1		1	1	1	1	1	1			1
Are NGOs involved?		1	1			0	1	0		1	1	1										1		1					1
Are business, companies or industry involved?		1	1			0		0		1	1	1							1			1		1					1
Are local communities involved?		1	1			0	1	0		1	1	1										1		1					1
No Financial resources needed		1	0	0	0	0	1	1		0	1	1	0		0	0			1			1		0	1	1			1
No Human resources needed		1	0		0	1	1	1		1	1	1	0		1	0			1			1		0	1	1			1
Are there case studies available that could serve as examples (upscaling) for a national assessment?	1	1	1	1	0	1	1	1	1	1	1	1	0		1	0	1	1	1	1	1	1	1	1	1	1	0	1	1
Has a selection been made of ecosystems (ES) to be included in the mapping and assessment?	1	1	1	1	0	0	1	1		1	1	1		0	0	1	1	1	1		1	1	1	1		1	0	0	1

Is there a prioritization of ES to be included in a national assessment or has a classification been selected for the assessment (e.g., CICES)?	1	1	1	1	0	0	1	1		1	1	1		0	0	1	1	1	1		0	1	1	1		1	0	0	1
Is there a national indicator framework ready and published for mapping, assessment or accounting (e.g. the Finnish or German national ES indicators)?	1	1	0	0	0	0	1	1		1	1	1		0	0	0	0		1		0	1	1	1		0	0	0	1
Have underlying data been identified for such a framework?	1	1	0	0	0	0	1	0		1	1	1		0	1	0			1		0	1	1	1		0	0	0	1
Are EU Directive reporting indicators & data (or biodiversity/ecosystem data) proposed or used to measure the condition of ecosystems?	1	1	0	0	0	0	1	0				1		0	1		1		1		1	0	0	1		0	0	0	0
Have any of the following assessment methods been used at national scale (literature, expert judgment, statistic information, maps and models, workshops/interviews, economic valuation, conceptual thinking/models)?	1	1	1	1		1	1			1	1	1							1			1		1					1
Are maps available at national scale for habitats or ecosystems?	1	1	0	1	0	1		1		1	1	0		0	1	1	1	0	1		0	1	1	0	0	0	0	0	1
Are maps available at national scale for some ES?	0	1	0	0	0	1	1	1		1	1	1		0	0	0	0	0	1		0	1	0	0	0	0	0	0	1
Is a national MAES ecosystem assessment report available?	0	1	0	0	0	0		0		1	1	0		0	0	0	0	0	1		0	0	0	0	0	0	0	0	0
Is there a national clearing house with data on MAES available	0	1	1	0	0	0		0		1	0	0		0	0	0	0	0	0		0	1	0	0	0	0	0	0	1
Is a nation-wide mapping and assessment project planned for 2016 or beyond?													1			1	1			1			1		1				
No problems in data availability	1	1	1	1			1	1		1	1	1			1	1	1		1	1	1	1	1	1		1			1
No problems in data compatibility		1	1				1	1			1	1			1	0	0		0	0	0	1		0					1
No need for data streamlining		0	0	0			0	1			1	1			1	0	0		0		0	0	0	0		0			1
SUM	13	24	17	10	0	7	20	13	1	22	23	23	1	2	12	9	13	6	18	4	8	21	14	18	8	12	0	3	24
Status of implementation related to policy and stakeholders	4	11	10	4	0	3	10	4	0	11	11	12	0	2	5	4	6	3	7	1	4	10	6	10	6	8	0	2	12
Status of implementation related to science	9	13	7	6	0	4	10	9	1	11	12	11	1	0	7	5	7	3	11	3	4	11	8	8	2	4	0	1	12

Annex 3. Participants of Workshop 1.



ESMERALDA stakeholder workshop on ecosystem service mapping and assessment in EU member states at national level

- Identified gaps and possible solutions-

October 13-16, 2015, Riga, Latvia

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