



Monitoring and Evaluation of Spatially Managed Areas

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Final Activity Report S & T results

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SUMMARY

This report summarizes the main S & T results of the MESMA project (2009-2013). For each work package, we have provided information on the main products, we described the key findings and lessons learned, how MESMA researchers worked together and which results were obtained. We also list all the scientific outcomes of the project.

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MESMA project set-up

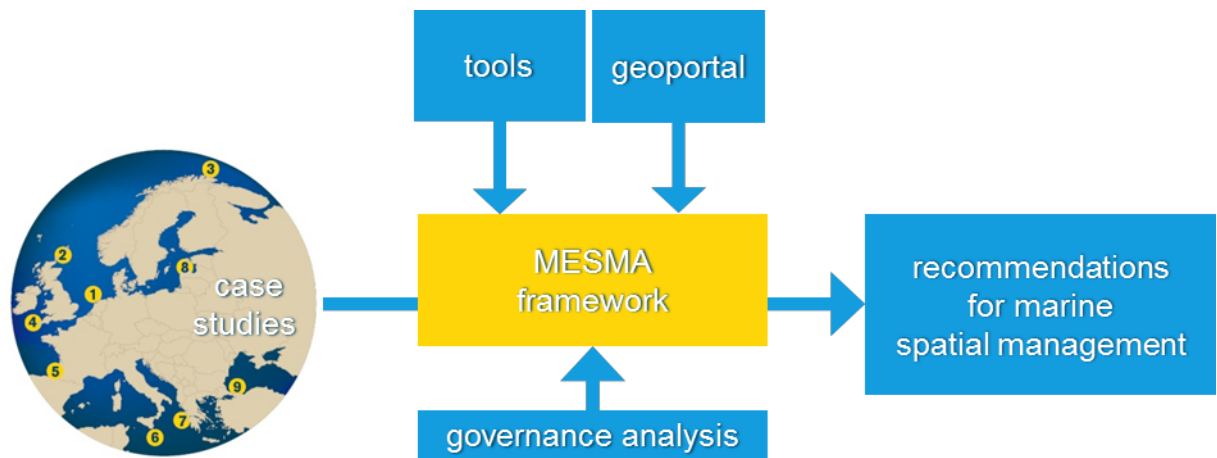


Figure 1. The MESMA Framework for the monitoring and evaluation spatially marine managed areas (SMAs) is the central part of the MESMA project. The governance analysis is run in parallel and feeds into the framework. A selection of tools help to perform the analysis and the geoportal stores all datasets used in the case studies. The MESMA case studies served to test the framework. A run through the MESMA framework will result in a set of recommendations for the marine spatial management under study.

KEY OUTPUTS FROM THE MESMA PROJECT

1	The MESMA Framework . The MESMA framework is a step-wise approach to the evaluation and monitoring of spatially managed marine areas. The framework -published in Marine Policy- provides guidance on the selection, mapping, and assessment of ecosystem components and human pressures. It also addresses the evaluation of management effectiveness and potential adaptations to management. Moreover, it provides advice on the use of spatially explicit tools for practical tasks like the assessment of cumulative impacts of human pressures or pressure-state relationships.
2	A governance analysis that can be performed in parallel to the Analytical Framework and feeds into the different steps of the framework.
3	MESMA Spatial Data Infrastructure (SDI) . The MESMA SDI consists of a set of interconnected web services and two main components: the Metadata catalogue and the Geoportal . The metadata catalogue is powered by Geonetwork, using the INSPIRE compliant MESMA Metadata Profile (MMP), It contains over 900 metadata records pertaining to datasets that are relevant to the MESMA case studies, and provides a shared vision of the collective data holdings relevant to the MESMA objectives. The MESMA Geoportal is a richly featured web-mapping system that offers three main functions: data discovery (through browsing and search), visualisation, and access (download). Through this users can browse and (in some cases) download geospatial datasets that are classified in accordance with INSPIRE.
4	MESMA tools collection . Over 70 tools that can be used in combination with the MESMA framework have been collected during the MESMA project. Case studies have worked with tools and provided feedback on tool use and an evaluation. The tools can be accessed per framework step, or per category. In addition several tools were either modified or developed as prototypes during the MESMA project.
5	MESMA Case study reports . The MESMA analytical framework and governance analyses were tested in 9 different case studies. The case study reports contain all information collected.
6	MESMA Central Exchange (http://www.mesmaexchange.eu/), is the main access hub which provides structured access and guidance for end-users to navigate all the MESMA web services and associated information, methods and results.
7	Peer reviewed publications on (1) Ecosystem Based Marine Management, (2) on the MESMA framework (analytical framework, governance framework), (3) the results of the application of the framework in MESMA Case studies, (4) on Governance issues, such as the emerging policy landscape for marine spatial planning in Europe, and some others and (4) on newly developed tools (uncertainty analysis).
8	MESMA Final Conference (Lisbon, 2013) in which all MESMA findings were presented and put into the wider context.
9	A network of practitioners via LinkedIn. http://www.linkedin.com/groups?viewMembers=&gid=2751965&sik=1381840721196

WORK PACKAGE 1: COMPILATION AND ANALYSIS OF EXISTING INFORMATION

The first task in the MESMA project was to compile and analyse existing information on the concepts, objectives and policy frameworks related to the implementation of spatial management areas. This work formed the basis for the development of the MESMA Framework (see next chapter). We identified the relevant policy objectives and parameters linked to the success or failure of the different spatially managed areas (SMA) regimes. We found that practical implementation of ecosystem-based marine spatial management (EB-MSM) faces a number of challenges such as major science and knowledge gaps, constraints in policies and legislation, institutional fragmentation, and difficulties in coupling environmental safety and sustainable use of resources with stakeholder's needs and expectations.

The relative value of seabed biotopes, evaluated on the basis of goods and services, is an important starting point for the spatial management of marine areas. In MESMA, we compiled different types of European seabed biotopes and their related goods, services, sensitivity issues, and conservation status, the latter referring to management and protection tools which currently apply for these biotopes at European or international level. Many of the assessed biotopes appeared to be quite vulnerable to many human activities and have been facing substantial deterioration, with fishing activities, especially by benthic trawls, and marine pollution constituting the main threats.

Products

- Three scientific articles related to ecosystem based management, monitoring and seabed biotopes:
 - Ecosystem-based management: a review of concepts, policies, approaches, and critical issues (Katsanevakis et al. 2011)
 - Monitoring marine populations and communities: methods dealing with imperfect detectability (Katsanevakis et al. 2012).
 - Assessment of goods and services, vulnerability, and conservation status of European seabed biotopes: a stepping stone towards ecosystem based marine spatial management (Salomidi et al. 2011)
- A Review Document on the Management of Marine Areas with particular regard on Concepts, Objectives, Frameworks and Tools to Implement, Monitor, and Evaluate Spatially Managed Areas (PDF).
- A Catalogue of European seabed biotopes that describes the goods and services of 67 biotopes at EUNIS-4 level (including Black Sea), and 27 sub-biotopes at EUNIS levels 5 and 6 ([PDF](#)).

Key findings and lessons learned

- Ecosystem-based marine spatial management (EB-MSM) is a promising multidisciplinary approach to achieve a sustainable use of the marine environment.
- Early stakeholder engagement in the management process, rather than final consultation, is a distinctive feature of EB-MSM.
- Marine Spatial Planning (MSP), Ocean Zoning (OZ), Marine Protected Area (MPA) networks, and socioeconomic valuation techniques are among the most important tools for Ecosystem-based marine spatial management (EB-MSM).
- Any EB-MSM framework must be flexible and able to incorporate changes.
- Through EB-MSM, the assessment of the impacts of human activities and their spatial reallocation to achieve ecological, economic, and social objectives appears to be the only effective way towards sustainable development.

WORK PACKAGE 2: FRAMEWORK FOR MONITORING AND EVALUATION OF SPATIALLY MANAGED MARINE AREAS

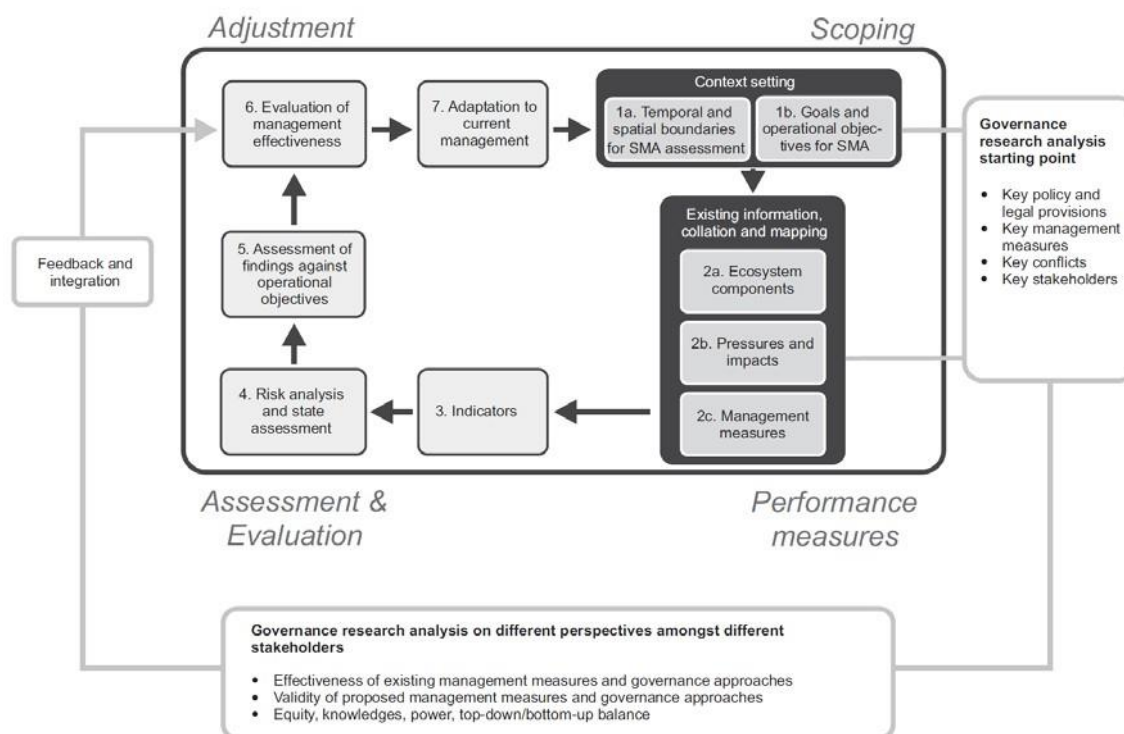


Figure 2. MESMA Framework, consisting of the MESMA Analytical Framework (inner scheme) and Governance analysis (Stelzenmüller et al. 2012).

The MESMA Framework is the central part of the MESMA project. The framework, which represents the outcome of an iterative process, provides guidance on the selection, mapping and assessment of ecosystem components and human pressures, the evaluation of management effectiveness and potential adaptations to management, in order to monitor and evaluate spatially managed marine areas (SMAs) in a systematic way. The suggested stepwise process is based on existing concepts of adaptive management and considers a number of practical examples. To support the implementation of an ecosystem based marine spatial management approach, the framework considers interactions between ecosystem components, management sectors, institutions and key actors, as well as the cumulative impacts of human activities. The framework was tested by the MESMA case studies and their feedback was used to further refine the protocol.

Products

- MESMA Analytical Framework (Stelzenmüller et al. 2013).
- MESMA Protocol for the Application of the Generic Framework – Paper manual (protocol) and electronic manual or ‘e-manual’ that guide the user through the steps of the framework.

Key findings and lessons learned

- The MESMA framework and its guidance provide systematic and structured scientific guidance on how to monitor and evaluate a spatially managed area (SMA). The tools and methods suggested are directly applicable to SMAs with an overarching marine spatial plan, a partial plan or plan in preparation and SMAs with one or more (often sectoral) management plans and initiatives (but no overarching spatial plan).
- The MESMA framework consists of seven key steps. The steps involve the (1) definition of desired outcomes and management objectives, (2) mapping of relevant ecosystem components and human activities (pressures), (3) identification of performance indicators, (4) monitoring and risk analysis, (5) assessment of findings in relation to objectives, (6) evaluation of current management and (7) recommendations for adaptation.
- Nine case studies tested the protocol and their feedback was subsequently used to refine the protocol based on their experiences.
- Some case studies worked closely to the framework structure, whilst others adapted the framework to suit their individual needs. The framework can, therefore, be used as guidance to a lesser or greater degree depending on the requirements of the user, data and expertise available and desired aim or outcome.
- The most common factors identified as driving the need for this type of assessment are the European Marine Strategy Framework Directive (MSFD), Water Framework Directive (WFD), Habitats Directive and/or other regional incentives.
- The MESMA analytical framework is data driven and the robustness of the assessment therefore relies on:
 - The quality and quantity of input data;
 - Assessor expertise – a number of steps require use of expert judgement for completion (particularly where data are lacking) and this can introduce a degree of subjectivity into the assessment.
- International cooperation is of key importance to tackle cross-boundary issues.
- SMART objectives and indicators are important for the successful monitoring and evaluating of spatially managed marine areas (SMAs).
- Case study researchers testing the MESMA framework reported better management of data and better communication between organisations and stakeholders (with the generation of new links) as a result of undertaking the analysis.
- The framework provides a mechanism to communicate specific findings and recommendations to policy and decision makers.

WORK PACKAGE 3: MESMA CASE STUDIES



- 1) Southern North Sea
- 2) Pentland Firth & Orkney Waters
- 3) Barents Sea & Lofoten area
- 4) Celtic Sea
- 5) Basque country continental shelf (SE Bay of Biscay)
- 6) Strait of Sicily
- 7) Inner Ionian Archipelago & adjacent gulfs
- 8) Baltic Sea
- 9) Black Sea

MESMA's main aims included the production of a generic framework that can help in the monitoring and evaluation of spatially managed areas (see previous chapter) and the construction of a governance analysis framework (see chapter on work package 6), both to be applied in European Marine Waters. These conceptual tools needed to be tested for their applicability in the real world. The "real world" consisted of 9 case studies, distributed over the European marine regions, and reflecting the complexity of the marine spatial planning process in Europe. To test the applicability of the developed tools outside Europe, two non-European case studies were selected as well. Case studies applied the prototypes of the MESMA Framework analysis and governance analysis and through a structured process, provided the feedback needed for improvement. During the testing, tools were compiled and tested (see next chapter) and spatial data were delivered to the MESMA Geonetwork. As such, the MESMA case studies were considered the laboratories in the heart of MESMA.

Key findings

As MESMA Case Studies were delivering input and data to other MESMA WPs, the main findings with regard to the analytical framework are reported in the sections in the previous chapter on work package 2 (WP2). Key findings for the governance analysis are reported in the chapter on work package 6 (WP6). Therefore, we limit ourselves to a rather technical description of the lessons learned from a case study perspective.

- The MESMA generic framework and MESMA governance analysis framework are applicable to the real world.
- Data needed to conduct the MESMA generic framework analysis are often incomplete or fully lacking.
- Tools developed by MESMA actually help to produce the data and or maps needed to perform an analysis of the effectiveness of marine spatial plans.

WORK PACKAGE 4: DEVELOPMENT AND EVALUATION OF MANAGEMENT TOOLS

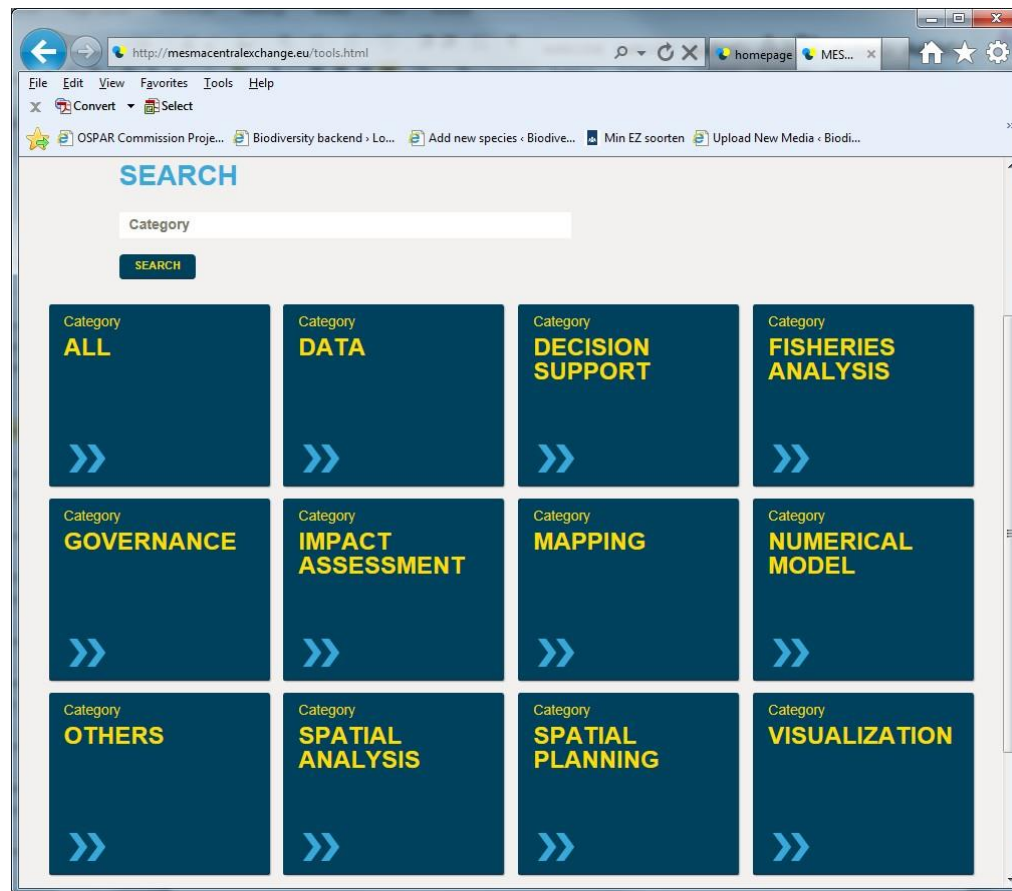


Figure 3. An overview of the tools is available at www.mesmaexchange.eu/tools.html

MESMA collected and described over 70 tools such as models, databases and decision support tools that are relevant for the monitoring and evaluation of spatially managed areas. The tools are linked to the MESMA Framework steps or can be explored by category. This inventory of tools can be found on the MESMA central exchange (www.mesmaexchange.eu/). It also includes a brief description of MSP-specific conceptual tools and guidelines.

Products

- MESMA tool inventory (<https://publicwiki.deltares.nl/display/MESMA/Home>)
- Online tool database (<http://www.mesmaexchange.eu/>)
- Web-based tool related to the MESMA framework (<http://mesma.ucc.ie/manual/>)
- Uncertainty methodology (Stelzenmuller et al., 2013)
- Testing of tools within the case studies
- An Inventory of Tools for Marine Spatial Management ([PDF](#))
- Tests of set of management tools ([PDF](#))
- Selected set of management tools and recommendations for improvements ([PDF](#))

WORK PACKAGE 5: DATA STANDARDS AND INFRASTRUCTURE FOR THE MONITORING AND EVALUATION OF SPATIALLY MANAGED MARINE AREAS

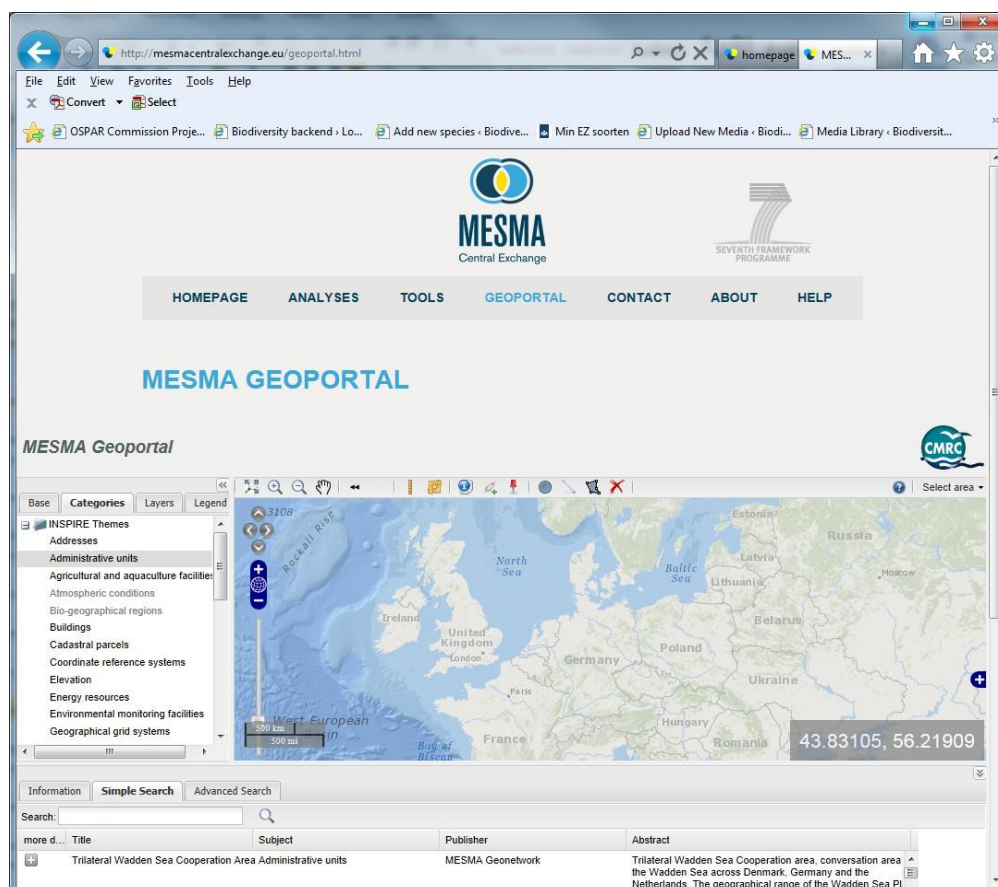


Figure 4. The Geoportals is available at <http://www.mesmacentralexchange.eu/geoportal.html>

Reliable monitoring and evaluation of spatially managed areas requires the use of reliable geospatial information covering a broad range of themes at a variety of temporal and spatial scales and with varying resolution depending on the level of detail being considered. Typically available data are fragmented, dispersed, and often poorly documented. MESMA has applied best available practice in the development of a project wide spatial data infrastructure (SDI) which is compliant with EU (INSPIRE) and international standards. By this means all project participants now have the knowledge and facilities to fully document and effectively share (internally and externally) both their own (and other available) geospatial data. As core components in the MESMA central exchange the Geoportal, distributed geodatabase and associated metadatabase are also the prime mechanism for disseminating selected thematic layers to a wider audience.

Products

- The MESMA GeoNetwork catalogue: <http://mesma.ucc.ie/geonetwork>.
- The MESMA Geoportal: <http://www.mesmaexchange.eu/geoportal.html>
- A Guide to MetadataTools, Data Access Portal and Data Inventory (PDF) in which it is described how MESMA deals with spatial data, how such data is described with metadata and how data can be found on a geoportal.
- A Data model and ontologies.
- An Interconnected Geographic Database

Key findings

- Developed and documented an INSPIRE and ISO compliant metadata catalogue using the MESMA metadata profile (MMP)
- Developed the distributed INSPIRE categorised geodatabase containing thematic layers relevant to the MESMA case studies and identified monitoring issues.
- Adapted and documented a common data model to accommodate relevant geospatial data to a very fine level of granularity. Documented the extent to which many key datasets are subject to restrictions on use and hence are not publicly available for general use.

WORK PACKAGE 6: GOVERNANCE

The emerging policy landscape for marine spatial planning in Europe was analysed and this revealed some significant synergies and tensions amongst different EC policies that are affecting MSP initiatives in member states in a variety of ways. In order to explore such MSP initiatives, a MESMA governance analysis framework was developed, which provides a systematic and structured approach to analysing governance issues in marine spatial planning. This was applied 13 MSP case studies which represent a variety of contexts, scales, objectives and issues. The findings of these case studies reveal that the realities of MSP are very different to the concept of MSP.

Products

- A Typology of conflicts in MESMA case studies (PDF)
- Selection of approaches for addressing conflicts in MESMA case studies (PDF)
- A Tool box of incentives for the governance of spatially managed marine areas (PDF)

Key findings

- The emerging policy landscape for marine spatial planning in Europe' (Qiu and Jones, 2013) discusses some of the synergies and tensions amongst different EC policies that affect MSP;
- The MESMA governance analysis framework and the related thematic issues provide a systematic and structured approach to analysing governance issues in MSP case studies;
- The 13 MSP case studies represent a variety of contexts, scales, objectives and issues;
- The findings of these case studies reveal that the realities of MSP amongst the case studies are very different to the concepts of MSP.
- The MESMA governance analysis framework and the related thematic issues can be used to analyse governance issues in other MSP case studies.