SEVENTH FRAMEWORK PROGRAMME

Monitoring and Evaluation of Spatially Managed Areas

Deliverable 2.3
Protocol for Application of Generic Framework

Due date of deliverable: month 36 (November 2012)
Actual submission date: month 36 (November 2012)

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Grant Agreement number:	226661
Project acronym:	MESMA
Project title:	Monitoring and Evaluation of Spatially Managed Areas
Funding Scheme:	Collaborative project
Project coordination:	IMARES, IJmuiden, the Netherlands
Project website:	www.mesma.org

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The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 226661

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The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 226661

Acknowledgements

This work is part of ongoing research within the EU FP7 Project 'Monitoring and Evaluation of Spatially Managed Areas'. We would like to thank all those involved in the MESMA Project, particularly the MESMA Case Studies, for providing feedback on the use of the generic framework, which has guided the evolution of this document. We would also like to thank MESMA Advisory Board members Tundi Agardy, Eugene Nixon and Jake Rice for steering the work.

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INTRODUCTION

This document forms the Deliverable 2.3 of the EU FP7 Project 'Monitoring and Evaluation of Spatially Managed Areas' (MESMA). It is an updated version of the original MESMA Deliverable 2.2, which contains a protocol for the application of a generic framework for monitoring and evaluation of Spatially Managed Areas (SMAs). Please note the procedure detailed within this document will hereafter be referred to as the 'protocol' and the document itself will be referred to as the 'manual'.

This document aims to provide the wider scientific community and management bodies with a structured approach (or protocol) to guide the user through monitoring and evaluation of a spatially managed area(s). The protocol should be read in conjunction with the 'Generic framework for monitoring and evaluation of Spatially Managed Areas' (Deliverable D2.1, commonly referred to as the 'generic framework'), which provides a best practice guide for the monitoring and evaluation of Spatially Managed Areas (SMAs), in seven distinctive and clearly outlined steps. The steps include:

1) Setting the context;
2) Collation of existing information and mapping;
3) Setting of targets;
4) Risk analysis and state assessment;
5) Assessment of findings against operational objectives;
6) Evaluation of the effectiveness of management measures;
7) Adaptation of the current management regime based on the outcome of the assessments.

For further details please refer to the generic framework (D2.1) and to D2.4 (Stelzenmüller et al. 2013. Monitoring and evaluation of spatially managed areas: A generic framework for implementation of ecosystem based marine management and its application. Marine Policy (37): 149-164). This is a scientific publication providing all the relevant cross references for the suggested methods and approaches suggested here.

Although the protocol has been developed as a generic tool for use by a range of people involved in evaluating SMAs, the first version of the manual was specifically tailored (in certain areas) for use by the case studies involved in MESMA. It was designed as an aid to the case studies applying and testing the framework. Feedback on the performance of the framework and protocol has since prompted three iterations of the manual, resulting in the production of the present document (D2.3).

MESMA has two streams of work – the generic framework and the governance research analysis. Links have been identified between the two streams; these links are indicated in the respective framework steps, but please note the MESMA generic framework and protocol do not accommodate a comprehensive governance analysis. Governance issues should be analysed through the **Governance Analytical Structure**. Further guidance on governance research has been developed and is available in a separate document entitled 'Guidelines for MESMA WP6 Governance Research'. This governance research essentially aims to address the following questions:

1) What are the governance approaches and incentives being adopted in a given existing initiative with spatial elements, and how effective are the incentives and governance approaches in that particular context in achieving a particular priority objective?
2) What are the potential incentives and governance approaches that could be implemented to improve effectiveness in achieving the specific objective of an existing initiative and addressing related conflicts?

3) How do wider issues, such as top-down/bottom-up balance, inter-sectoral integration and power, cross-border issues, justice and different levels of knowledge, affect the effectiveness of existing initiatives?

This 'two stream' approach will provide a clear way forward for combining the MESMA framework and governance research to your case in an integrated and coherent manner. As a result, a reference to the governance analysis may feature in the text for each framework step and this may be accompanied by a reference to specific actions that will largely be carried out under the governance analysis. Further details on the governance analysis and on how the two streams of work are linked (from a governance perspective) can be found in the document 'Guidelines for MESMA WP6 Governance Research'.

Appendix 1 of this document shows a visualisation of the linkages between the two streams of work. It should be noted that in order to link and integrate the evaluation of your SMA and the governance analysis, both of the following conditions should be met:

1. Both streams of work are about analysing an existing initiative. Such an initiative may be an implemented integrated marine spatial plan or part of the integrated plan; or if there is no integrated marine spatial plan in place, an existing initiative with spatial elements which may be linked or offer valuable lessons to the future development of an integrated marine spatial plan.
2. It is recommended that the generic framework and governance analysis should focus on the same priority objective for at least one run of the generic framework, but please be aware that where the governance analysis focuses on only one priority objective, the generic framework can (and should) be used iteratively to assess multiple objectives.

The practical implementation of the framework is also linked to specific tools and data handling standards which have been developed and subsequently included in the overall MESMA Toolbox (Deliverable 4.5). Please consult the MESMA Toolbox for a set of practical tools comprising technical and conceptual tools that may be used for specific steps in the protocol.

MANUAL USER GUIDE

It is the purpose of this manual to guide the user through the application of the generic framework to the plans and/or initiatives that exist for the marine area under evaluation. If a spatial management plan exists for that area, the framework can help to monitor and evaluate the effectiveness of the plan in achieving management objectives. If there is no spatial management plan in place, the framework can help to identify issues to be taken into account as part of the planning process (Figure 2). The framework is part of an integrated toolbox, comprising technical tools, metadata and a structured approach to analysing governance; together these guide the user through evaluation of an existing or proposed management plan.

The MESMA framework comprises a series of steps that can be completed to a greater or lesser extent and used to present the outcomes of the assessment. This manual aims to provide clear and user friendly instructions on how to complete each step and when to proceed to the next step. It includes specific actions that it is suggested you undertake for successful completion of the evaluation.

Whilst this document may be entitled 'protocol', it does not attempt to describe the 'official', 'only' or 'correct' method of evaluating or monitoring an SMA. It simply provides guidance on how this could be done and suggests tools that may be used in the process. It may be used to a greater or lesser extent to monitor and evaluate a plan or initiative and should therefore be considered as guidance. The framework will not necessarily complement all cases. It is best suited to both the evaluation of a single, integrated spatial management plan (in other words a single, overarching plan that integrates management of multiple activities) and the scoping for an on-going planning process, but it can also be used to evaluate other integrated management initiatives with spatial elements.

Below is some guidance for using the manual:

1. The framework is a tool that can be used iteratively to test different combinations of objectives or different SMA expansions for cases where the framework is used for scoping for spatial management.
2. To begin the assessment, establish the scope of your study. This will help you identify what you wish to achieve from applying the MESMA framework to your SMA i.e. identify the overarching goal or desired outcome.
3. Please note that although the framework can guide you through the evaluation of an existing management plan, it can also be used for scoping of issues or as a checklist. Thus, it should be used as **guidance** and is not necessarily prescriptive.
4. All background information used to compile the protocol has been discussed and referenced in the parallel Deliverable 2.1 'Generic Framework for Monitoring and Evaluation of Spatially Managed Areas (SMAs)'. Therefore D2.1 should be referred to for background information. A comprehensive literature review on good practice in implementing ecosystem based spatial management has also been conducted and this has been presented in the MESMA Deliverable 1.3.
5. Throughout the manual, 'Governance Analytical Structure' refers to the governance framework described in the guidance document entitled 'Guidelines for MESMA WP6 Goverance Research'.
6. Under most actions there are tables which will help the user to complete each action, summarise results and collate information for use in subsequent actions. Tables can be amended to reflect the needs of the user. Although it is recognised that certain information may not be readily available/accessible, completed tables will provide the best results; therefore, tables should be populated with as much information as possible.

7. Where an action can not be completed due to lack of information or expertise, this should be noted and fed into step 7 where recommendations for future adaptations can be made.
8. Where limited data may make it difficult to complete every action described in the manual, it may be helpful to compliment desktop data collation with expert and/or stakeholder workshops. These can be used to obtain information that may not be readily available, pool knowledge and expertise and discuss elements of risk and uncertainty associated with an assessment based on limited data.
9. Information collected for use (and tabulated) at an earlier stage in the framework may be required for use in subsequent steps. Final tables or maps for each step should, in particular, be retained, not only for use in step 7 but for comparison of results from subsequent iterations.
10. Data should be catalogued using a metadata format that is compliant with both ISO core (19115, and 19139) and INSPIRE core. For further guidance and a web-based tool to create, share and view metadata records (GeoNetworks), please refer to the MESMA Toolbox and the MESMA Metadata Catalogue (MMC)[1], Deliverable 5.2.
11. All mapping exercises should result in final maps using the coordinate system WGS84 and Mercator projection format. For further details on this please consult the MESMA Toolbox and MESMA Metadata Catalogue.
12. Throughout the application of the framework, uncertainty accumulates within each framework step. To promote a transparent assessment, the outputs should be delivered together with a description and/or quantification of uncertainty. Guidance on the basic characterization of uncertainty within the framework is provided in Appendix 3. Where present, uncertainty should be reported. This is particularly important where a step cannot be completed due to lack of data or where expert judgement has been used as a substitute for data (where data are limited or unavailable).
13. A definition of key terms used in the protocol can be found in the Glossary at the back of this document. This is a condensed and modified list of key terms taken from the overall MESMA glossary.
14. Examples of nine different case studies that have applied the framework can be found in the MESMA Toolbox and Deliverable 3.3.

[1] The MMC uses the MESMA Metadata Profile (MMP) and is implemented using a distributed architecture with local and central nodes on the GeoNetwork.

THE APPLICATION OF THE GENERIC FRAMEWORK (GENERAL)

The rationale of the developed framework is outlined in D2.1, 'Generic Framework for Monitoring and Evaluation of Spatially Managed Areas'. This document compliments the manual and therefore it is essential that it is used in conjunction with the protocol. Whereas the manual describes the preparatory work, sequence of steps and related tasks the user should undertake, the document D2.1 provides further information, explanation and key references to the information included here.

Before starting with the actual assessment, the user should consider and describe the way in which the MESMA framework will be applied. For instance, in some cases a single step may be processed, while in others, the framework may be used to evaluate the process of implementing current spatial management plans. Thus the user should outline how the framework will be used and describe the expected outcomes.

In Figure 1, the practical implementation of each framework step is described, taking into account data availability and the related variation of activities under each task. A number of actions are defined under each step. Guidance has been provided to reflect the data available to the user. Actions are described with clear guidance on the methods and tools to be used, where a conclusion has to be drawn or a map has to be created from GIS based information, expert knowledge and/or qualitative information. Suggested methods and tools for specific analyses are provided in the text of each of the relevant steps.

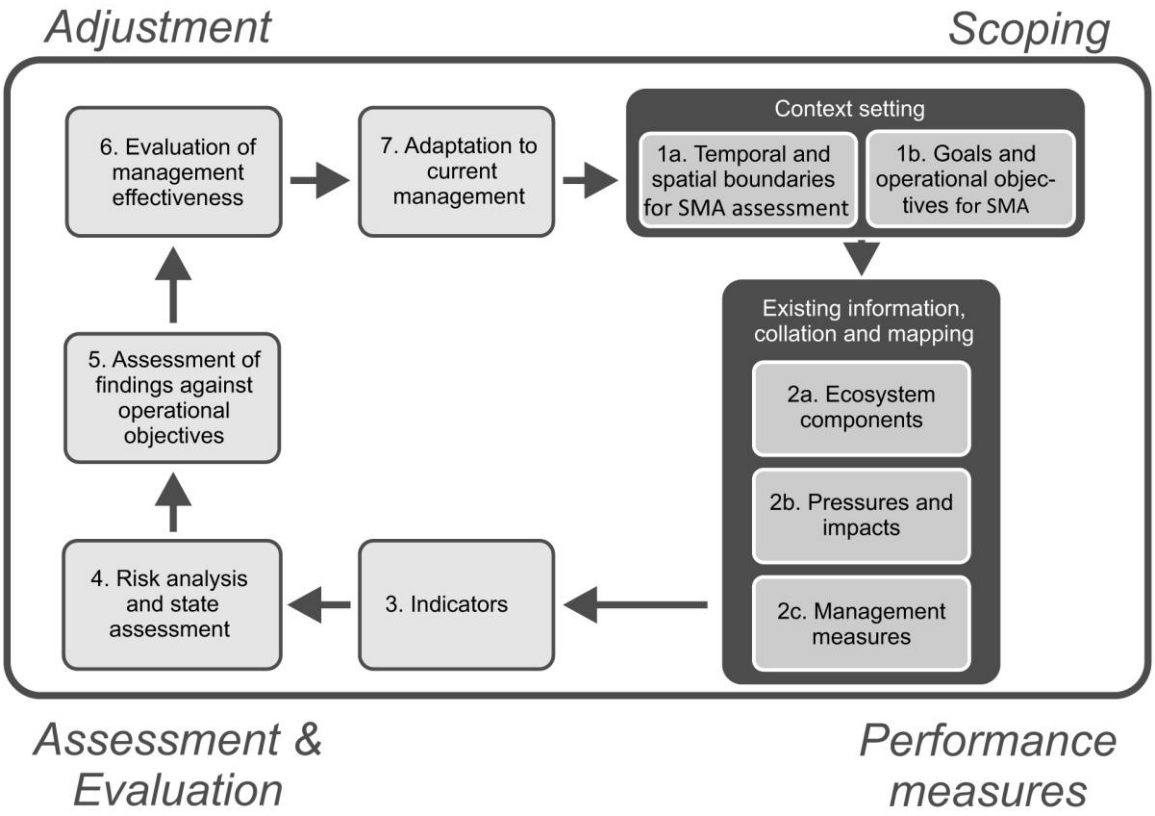


Figure 1. Proposed MESMA framework outlined in detail in D2.1.

WHAT CAN THE MESMA FRAMEWORK DELIVER?

With the help of a few standardised questions, the user can assess how the MESMA framework will be used for their particular case and what the expected outcomes are:

i) Give a brief (150 words) description of the case, highlighting the main issues regarding its spatial management.
ii) Describe the relative position of your case within the scheme in Figure 2 (for a detailed description see D2.1).

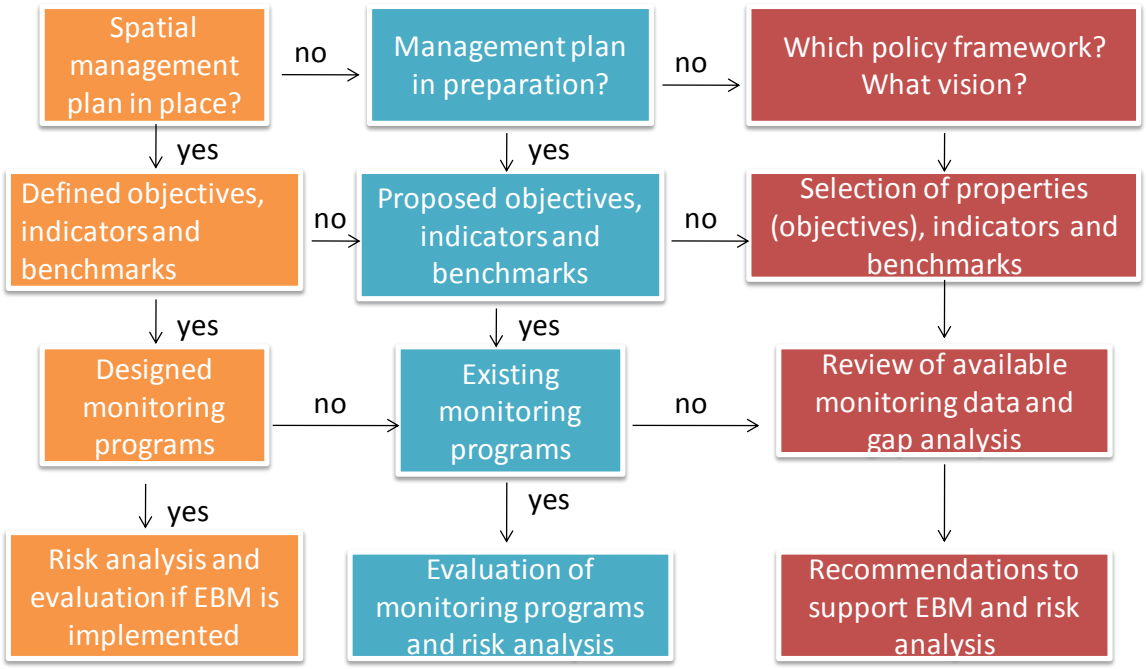


Figure 2. Conceptual flow diagram which relates the maturity of a given spatial management in a SMA together with the available data to expected assessment outcomes.

iii) How will the MESMA framework be used for your case?
iv) What are the expected outcomes of the application of the MESMA framework?

STEP BY STEP GUIDANCE ON THE APPLICATION OF THE GENERIC FRAMEWORK

Step 1 Context setting

The first question in step 1 is designed to allow the user some flexibility in collation of information depending on whether or not they are evaluating a single integrated marine spatial management plan (i.e. one that integrates management of multiple activities). If a single integrated management plan is being evaluated, the user should complete actions 1a.5 and 1b.8 to collate the information on the boundary and objectives of the plan (assuming that this information is readily available).

If there is not one single integrated spatial management plan under evaluation then the user should undertake step 1a (actions 1a.1 to 1a.4) to define the boundary and step 1b (actions 1b.1 to 1b.7) to define the operational objectives. Steps 1a and 1b should be carried out together. Both steps use different pieces of information (from existing sources) to complete subsequent actions, in order to set the context for evaluation throughout the rest of the protocol.

If there are one or a number of spatial management initiatives under evaluation, the user should complete steps 1a (actions 1a.1 to 1a.4) and 1b (actions 1b.1 to 1b.7) to define the SMA boundary and operational objectives. If the boundary and objectives are already defined for any or all of the initiatives, the user should still complete these steps to collate information on other sectors, activities and plans within the area and therefore ensure consideration of all other uses of the SMA. The boundary can then be defined on the basis of all available information.

It is worth noting that this section links to section 1.3 in the Governance Analytical Structure, accepting that from a governance perspective, the boundaries have already been defined by the existing initiative upon which the governance analysis is focused.

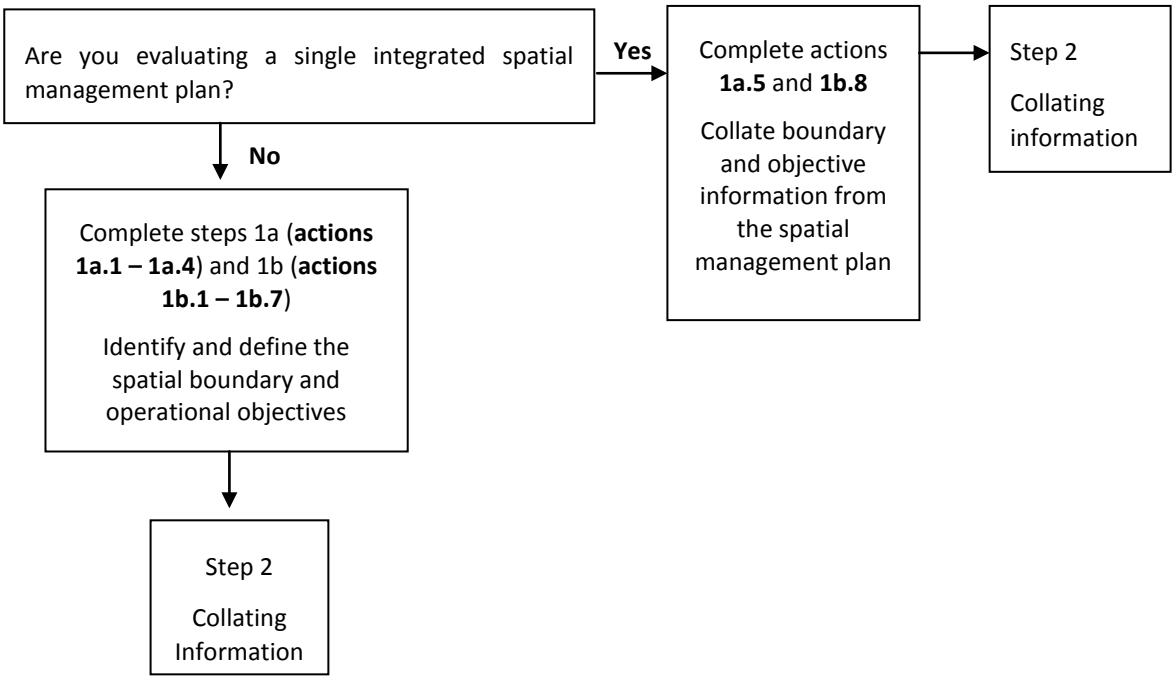


Figure 1.1. Work flow for step 1.

Consult the following bullet points for direction to the appropriate step:

- Single integrated marine spatial management plan available (e.g. Belgium's marine spatial planning initiative or 'Master Plan', or the Management Plan for the Barents Sea) – go to action 1a.5.
- Single integrated marine spatial management plan not available – go to action 1a.1.
- One or more existing management initiative(s) (with spatial elements) – go to step 1a.1.

Step 1a Set spatial and temporal boundaries for SMA assessment

Step 1a should be carried out in conjunction with step 1b; together they should set the context for the physical area involved as well as the overarching aims of the plans for the SMA. Having decided which objective should be the focus of the MESMA framework evaluation, there may be several different spatial boundaries that are specified in the relevant legal and policy documents; these boundaries should be used in the assessment, recognising that the boundaries may themselves be a focus for disputes. In this way, the assessment is based on actual, real policy initiatives and related conflicts, rather than hypothetical scenarios. Conflicting objectives such as conservation objectives and other local and sectoral objectives will also be considered through the governance research analyses, particularly in section 1.3 of the Governance Analytical Structure; although from a Governance perspective, the boundaries will have already been defined by the existing initiative that the governance research is focused on.

Step 1a begins by identifying and mapping existing management plans, sectors and activities which have a spatial boundary and the relevant institutional landscape. This information is then used to finalise the spatial boundaries, using a flow diagram which prioritises boundaries to ensure the best information available is used to inform decisions. For cases where the boundaries are already defined, this step can be used to evaluate the chosen boundaries and to suggest future changes. The output from step 1a is a finalised spatial boundary which, alongside the output from step 1b – a summarized list of policy goals and objectives relevant to the SMA – will feed into step 2 to ensure that all information collated is at the relevant spatial scales.

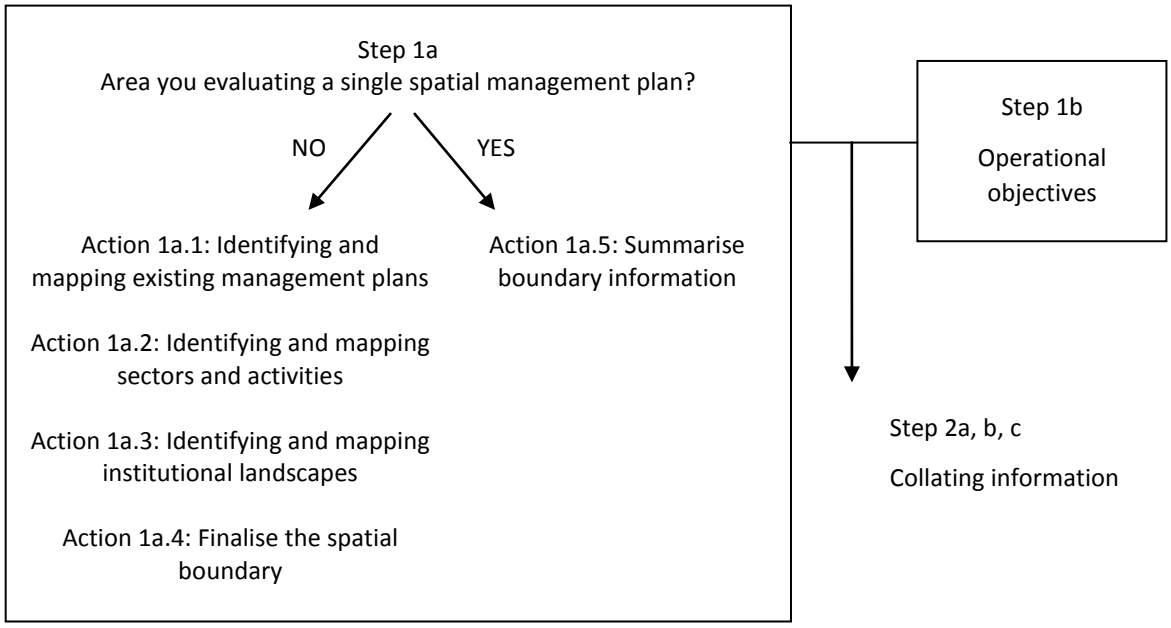


Figure 1a. Work flow for step 1a.

Action 1a.1 Identifying and mapping existing management plans

Identify which management plans or initiatives are applicable to the SMA. Check the management plans or initiatives for their proposed spatial and temporal limits.

The spatial scale of all management plans should be mapped using GIS software. This may be illustrated with a basic polygon of the area under management or may be a more complex map of the separately managed areas. The metadata, i.e. precise information about the GIS data used to produce the maps, could be included in the MESMA Metadata Catalogue. (You may also be able to use some of the records in the MMC to locate data.)

Complete table 1a.1.

Where there are no management plans in place move to action 1a.2.

Table 1a.1. Management plan spatial and temporal limits.

Operational level (local/national etc)	Plan name	Date of implementation	Review cycle (years)	Describe spatial boundary

Action 1a.2 Identifying and mapping sectors and activities

Compile a list of sectors and activities present in your area and indicate whether they are active and if they have a spatial management initiative. This can be achieved by completing columns 1 to 4 of table 1a.2, which was adapted from the MarLIN table of sectors and activities. Please note this is an example of a table that could be used to complete this action and can be further modified to reflect the sectors, drivers and activities relevant to the SMA. For an alternative list of sectors and activities, it may be helpful to refer to the suite of Linkage Tables and associated Guidance produced as part of the 'Options for Delivering Ecosystem-Based Marine Management' (ODEMM) EU FP7 Project, (available at http://www.liv.ac.uk/odemm/data/and http://www.liv.ac.uk/odemm/guidancedocuments/ respectively).

Next, compile GIS layers of the spatial extent of the different sectors (and again you can record and upload information about the metadata to the MESMA Metadata Catalogue). These layers will be used in subsequent steps for estimating cumulative pressures and impacts on ecosystem components.

When completing this step, please refer to the MESMA website, Toolbox and MMC for worked examples (by the MESMA case studies).

For those sectors and activities which have a spatial management initiative, fill in columns 5 to 10 of table 1a.2. If there is little or no information on sectors and activities, omit this section and move on to action 1a.3.

Table 1a.2. Adapted MarLIN table of sectors and activities in your SMA.

1. Sector/Driver	2. Activity	3. Active? (Tick)	4. Spatial management initiative? Y/N	5. Operational level (local, national etc)	6. Spatial extent within region	7. Seasonality	8. Plan name	9. Date of implementation	10. Length of initiative? E.g. 10 year plan
Aquaculture	Fin-fish								
	Macro-algae								
	Predator control								
	Shellfisheries								
Climate change	Current change								
	Sea level change								
	Temperature change								
	Weather pattern change								
Coastal defence	Barrage								
	Beach replenishment								
	Groynes								
	Sea walls/ breakwaters								
Collecting	Bait digging								
	Bird eggs								
	Curios								
	Higher plants								
	Kelp & wrack harvesting								
	Macro-algae								
	Peelers (boulder turning)								
	Shellfish								
Development	Construction phase								
	Artificial reefs								
	Communication cables								
	Culverting lagoons								
	Dock/port facilities								
	Land claim								
	Marinas								
	Oil & gas platforms								
	Urban								
Dredging	Capital dredging								
	Maintenance dredging								
Energy generation	Nuclear power generation								
	Power stations								

	Renewable (wind/tide/wave)								
Extraction	Maerl								
	Rock/ minerals (coastal quarrying)								
	Oil & gas								
	Sand/ gravel (aggregates)								
	Water resources (abstraction)								
Fisheries/ shellfisheries	Benthic trawls (e.g. Scallop dredging)								
	Netting (e.g. Fixed nets)								
	Pelagic trawls								
	Potting/ creeling								
	Suction (hydraulic) dredging								
Recreation	Angling								
	Boating/ yachting								
	Diving/ dive site								
	Public beach								
	Tourist resort								
	Water sports								
Uses	Animal sanctuaries								
	Archaeology								
	Coastal farming								
	Coastal forestry								
	Education/ Interpretation								
	Military								
	Mooring/ beaching/ launching								
	Research								
	Shipping								
Wastes	Fishery & agriculture wastes								
	Industrial effluent discharge								
	Industrial/ urban emissions (air)								
	Inorganic mine and particulate wastes								
	Land/ waterfront runoff								
	Litter and debris								
	Nuclear effluent discharge								
	Sewage discharge								
	Shipping wastes								
	Spoil dumping								
	Thermal discharges (cooling water)								
Other	Removal of substratum								

Action 1a.3 Assessing institutional landscapes

The assessment of the institutional landscape for a given case will compile information on regulatory bodies, national maritime jurisdictions, sectoral legislation, policies etc. This will also be explored through the governance analysis, particularly in section 1.3 of the Governance Analytical Structure.

Where appropriate, compile GIS layers to illustrate any identified boundaries or areas to which any policies or legislation are applicable.

Action 1a.4 Finalise the spatial boundary

Using the information collected in previous steps and the GIS layers available, develop a spatial boundary for your SMA. The decision tree below (Figure 1a.4) provides guidance on how to use your information to define the spatial boundary of your SMA.

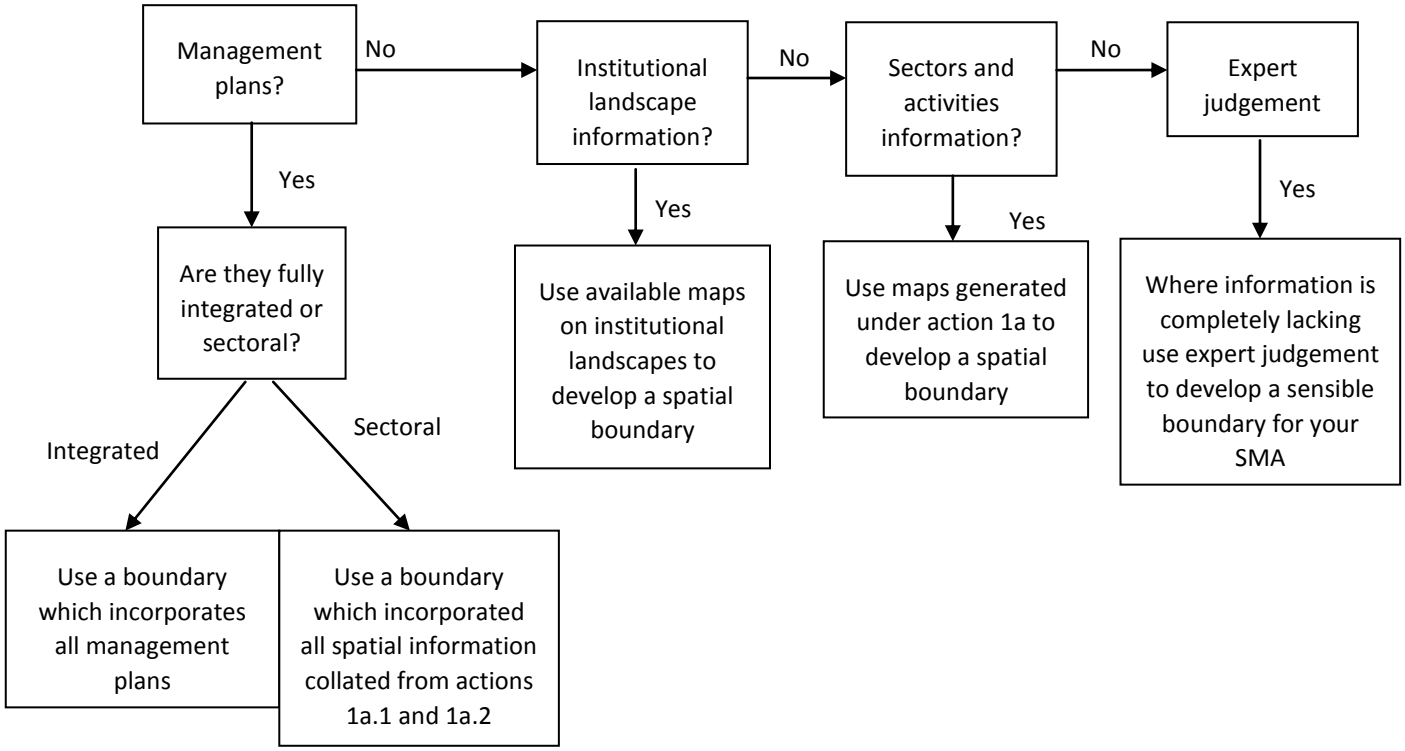


Figure 1a.4. Flow chart to help define the spatial boundary.

Create a GIS layer to display the final SMA spatial boundary. Provide a brief textual description of this boundary and a summary of the reasons for its selection.

Please note that definition of a spatial boundary may require both managerial and technical input, and any final decision is likely to require considerable discussion between assessor (i.e. scientist/technician) and decision-maker or policy lead.

Omit action 1a.5 and progress to step 1b.

Action 1a.5 Summarise boundary information

The protocol has directed you straight to this action if you are evaluating a single spatial management plan (for which boundary information is available). Collate and summarise in table 1a.5, the boundary information for the spatial management plan. The spatial extent of the study should then be mapped using GIS software. This map may take the form of a basic polygon of the area under management or it may be a more complex map of each of the managed areas.

Once this action is complete, progress to action 1b.8.

Table 1a.5.

Name of plan/initiative	Date of implementation	Review cycle (years)	Describe the spatial boundary	Sectors included in the spatial management plan	Sectors not included in management plan but active in the area

Step 1b Goals and operational objectives for the SMA

This step aims to set the context of the SMA by defining the goals and operational objectives. **It is carried out alongside step 1a,** as together they provide details of the physical area as well as the overarching goals and objectives to be evaluated. Step 1b uses similar literature and approach to step 1a. The first actions include identification of the existing or proposed management initiative and collection of objectives which may come from legal obligations. In order to assess operational objectives they should be SMART (Specific, Measurable, Achievable, Realistic and Time-bound). The validity of the goals and objectives and whether they are SMART will be evaluated from a scientific perspective through the MESMA framework, focusing on how well they address the need to contribute to a healthy and functioning ecosystem. An example would be achieving good environmental status as requested in the Marine Strategy Framework Directive.

The output is a list of clearly defined operational objectives for the SMA and a paragraph describing any potential compliance issues with respect to laws in the SMA. The list of goals and operational objectives is then used in step 3 to choose indicators, step 5 to assess if these objectives have been achieved or are likely to be achieved, step 6 to identify reasons why operational objectives were or were not met, and finally in step 7 to identify adaptive management needs. An additional output from step 1b is a list of sectoral interests and stakeholders in the SMA; information gathered in the governance analysis may assist in completion of this step.

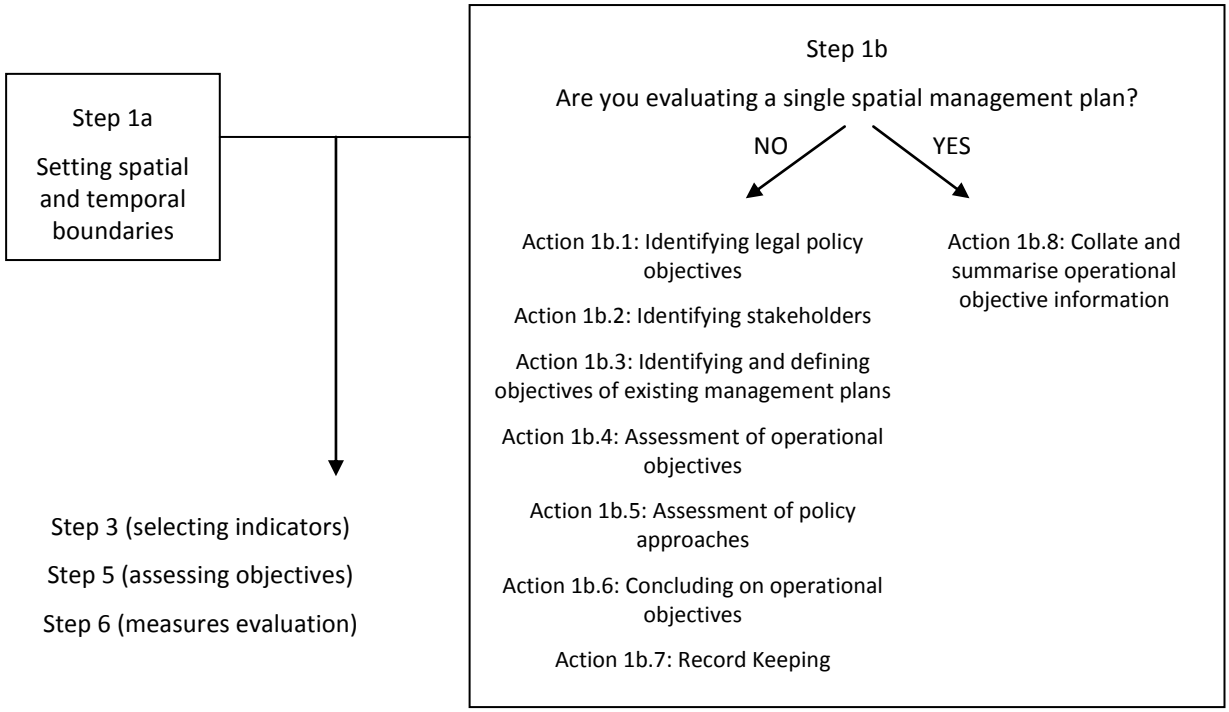


Figure 1b. Work flow for step 1b.

Action 1b.1 Identifying legal policy objectives

Legal obligations are clearly defined and recorded. Using available sources, list the laws, statutes and regulations applicable to the area, including domestic legislation, transposing International and European

obligations and local byelaws. Expert legal opinion should be obtained to ensure that all obligations have been identified and recorded in table 1b.3.

Identify related policy objectives and guidance (that relate to the chosen evaluation focus) and complete table 1b.1 below.

Table 1b.1. Legal policy objectives and guidance.

Operational level (local, national etc)	Statute - title and reference	Implementing department or agency	Key regulations and byelaws - reference	Related policy objectives and guidance - reference	GIS layer file name (if available)

Action 1b.2 Identifying sectoral interests

Identify the relevant sectoral interests and stakeholders in the SMA. Some of the main sectors and the interests amongst their representatives in the area, will be explored through the governance analysis. It may be helpful to refer to action 1a.2 of the MESMA framework and section 1.1 of the Governance Analytical Structure to complete this action.

Stakeholder participation at this stage may also help to identify the main sectoral interests in the SMA, as there may not be a comprehensive list of stakeholders identified through the governance analysis.

Action 1b.3 Identifying and defining objectives of existing management plans

Using the list of management plans under action 1a.1, complete the table below with information regarding their objectives. Categorise objectives into environmental, social, economic or mixed/other objectives. You may wish to draw on information from the governance analysis to complete this action; the balance between ecological and socio-economic objectives will be evaluated through the governance analysis, which draws on institutional settings and the views and perspectives of stakeholders with an interest in the SMA.

Where there are no proposed management plans or management plans in place, move straight to action 1b.4.

Table 1b.3. Objectives of existing management plans.

Plan name*	Plan objectives	Are the objectives ecological (E) / social (S) /economic (Ec) / mixed or other (O)?	Area for which the objective is relevant (whole region / part of the region)	Objective deadline	Conflicts between other management plans / objectives

*Use relevant policy objectives from table 1a.1.

Action 1b.4 Assessment of operational objectives

Operational objectives should be SMART (Specific, Measurable, Achievable, Realistic and Time-bound):

- **Specific –** Objectives should be clearly defined;
- **Measurable –** It should be possible to quantify the objectives;
- **Achievable –** Targets should be achievable in practice;
- **Realistic –** Defined targets should be achievable in the given time frame;
- **Time-bound –** A timeline should establish the deadlines for the fulfillment of defined targets.

Filling out table 1b.4 will show which objectives are not SMART. Where an operational objective is considered not to be SMART, this information should be retained; you may wish to include these as a part of your assessment at a later date or as part of a subsequent iteration. They should also be recorded and presented in the reporting phase during step 7.

Table 1b.4. Assessing operational objectives against SMART criteria.

Operational objective	Specific (yes or no)	Measurable (yes or no)	Achievable (yes or no)	Realistic (yes or no)	Time-bound (yes or no)	Comments on quality of data available (e.g. none / poor / intermediate / good)

Action 1b.5 Assessment of policy approaches

Policy approaches can be top-down (imposed by government), bottom-up (meeting popular demands from end users), or a combination of the two. The balance between these policy approaches will give an indication of how likely end-users will be to follow enforcement laws in the SMA. The discussions through

section 4 of the Governance Analytical Structure are particularly relevant to this; use this information to provide a short written assessment of the policy approaches.

Action 1b.6 Concluding on operational objectives

Using table 1b.4, fill in table 1b.6.1 below to give an overall view of the goals and operational objectives. When filling in the table, if possible, put linked legal obligations, policy goals, operational objectives or management goals on one line. Where a legal obligation, policy goal or operational objective is additional to a management plan or where a management plan does not exist this column will remain empty.

The defined area, time scale and review period may not be equal for different legal obligations, policy and management goals and operational objectives. In this case, use the specifics of the management plan, as this is a SMART tool for management of the Marine Area.

Table 1b.6.1. Goals and operational objectives.

Legal obligations	Policy goals or operational objectives	Management plan goals or operational objectives	Define the area for the objectives (entire SMA area, or just a specific part)	When should the goal be achieved?	How often will the goal be reviewed?

Where possible, all identified operational objectives should be carried forward for assessment using the generic framework. Assessment of all objectives facilitates consideration of different uses of and plans relevant to the SMA. It enables a more comprehensive evaluation and increases the level of confidence the user has in their findings and recommendations for management improvement (which are the outcome of step 7). To continue with the assessment of all your identified objectives, complete table 1b.6.2 to separate operational objectives into three categories - ecological, social, economic and other/mixed – and explain why they are important. Populate each row of the third column with a 'Y', to indicate that each objective will be carried forward for assessment.

If resources are limited, then a prioritization exercise could be undertaken to consider the relative importance of ecological, social, economic and other operational objectives, (depending on the higher level goals of the SMA) and to select one or more objectives for further assessment. (This exercise could be done with the help of stakeholders.) Prioritisation of the most important objectives then provides a focus for further assessment and facilitates easier progression though the remaining steps of the framework. However, this would not be the recommended approach and it should only be selected where there are too few resources to enable assessment of all operational objectives.

To undertake a prioritisation exercise and narrow the scope of your assessment, populate table 1b.6.2 with information about the objectives. Separate the operational objectives in table 1b.6.1 into three categories: ecological, social, economic and other/mixed. List these in table 1b.6.2. Indicate in table 1b.6.2 which objectives will be carried forward for further assessment and which will not. Then state the reason for your conclusions.

Consideration could be given to:

- High-level political goals – what political processes and policies are there in place?

- Other Drivers
  - Environmental, social, political and economic drivers
  - Standards set – for example MSFD targets
  - Stakeholders – who is involved and why?
  - Conflicts between objectives and between stakeholders
- Geography
  - Spatial extent – which objectives have the widest spatial influence?
  - Inshore versus offshore
  - Sub-regional, regional and national differences
  - Trans-boundary issues
- Objective characteristics
  - Status of the objective and trend information – for example, has the objective been met or is it at risk of failing?
  - Does the objective overlap with any other objectives?
  - How many components are covered by one objective?
- Data availability/accessibility

Table 1b.6.2. Prioritisation of operational objectives.

Ecological operational objective	Reasons why important	Focus for assessment? Y/N
Social operational objective	Reasons why important	Focus for assessment? Y/N
Economic operational objective	Reasons why important	Focus for assessment? Y/N
Other/Mixed operational objective	Reasons why important	Focus for assessment? Y/N

Action 1b.7 Record Keeping

Since completion of the actions in step 1b may require a range of specialist expertise, it is possible that a number of different specialists may be involved in completion of the step (particularly with regard to the prioritisation of operational objectives in 1b.6, for which it is recommended that more than one assessor should participate, to reduce the level of subjectivity in the assessment). A record should, therefore, be kept of who has completed the work. Complete table 1b.7 with the relevant details.

Table 1b.7. Individuals involved in completion of Step 1b.

Section	Date	Name(s) of assessor(s)	Job title and organisation
1b.1			
1b.2			
1b.3			
1b.4			
1b.5			
1b.6			

Next omit action 1b.8 and progress to step 2.

Action 1b.8 Collate and summarise operational objective information

Complete this action if you are evaluating a single spatial management plan. You have been directed to this action from action 1a.5.

Collate and summarise in table 1b.8, the operational objectives described in the spatial management plan.

Table 1.b.8 Operational objectives of your spatial management plan or initiative.

Plan name	Date of implementation	Review cycle (years)	Objectives	Objective deadline

All objectives should be carried forward for assessment using the generic framework.

Once this action is complete, move to Step 2.

Step 2 Existing information collation and mapping

Step 2a Identify ecosystem components

The aim of step 2a is to identify the ecosystem components in the SMA which are relevant to the objectives that have been set in step 1b. Ecosystem components can be divided into natural (biophysical) (e.g. marine mammals) and socio-economic components (e.g. a wind farm). A list of natural ecosystem components taken from the MSFD Annex iii has been provided to give guidance on identifying the relevant ones. This is not an exhaustive list and it can be amended or expanded depending on the SMA that is being evaluated. Once ecosystem components are identified for the area, they should be mapped using GIS tools. Mapping should be done using the appropriate scale for each component (e.g. larger scales for marine mammals which are distributed over wide areas) and the GIS maps should aim to cover the entire SMA. The output from step 2a should be a list of relevant ecosystem components along with GIS maps of their coverage (where possible).

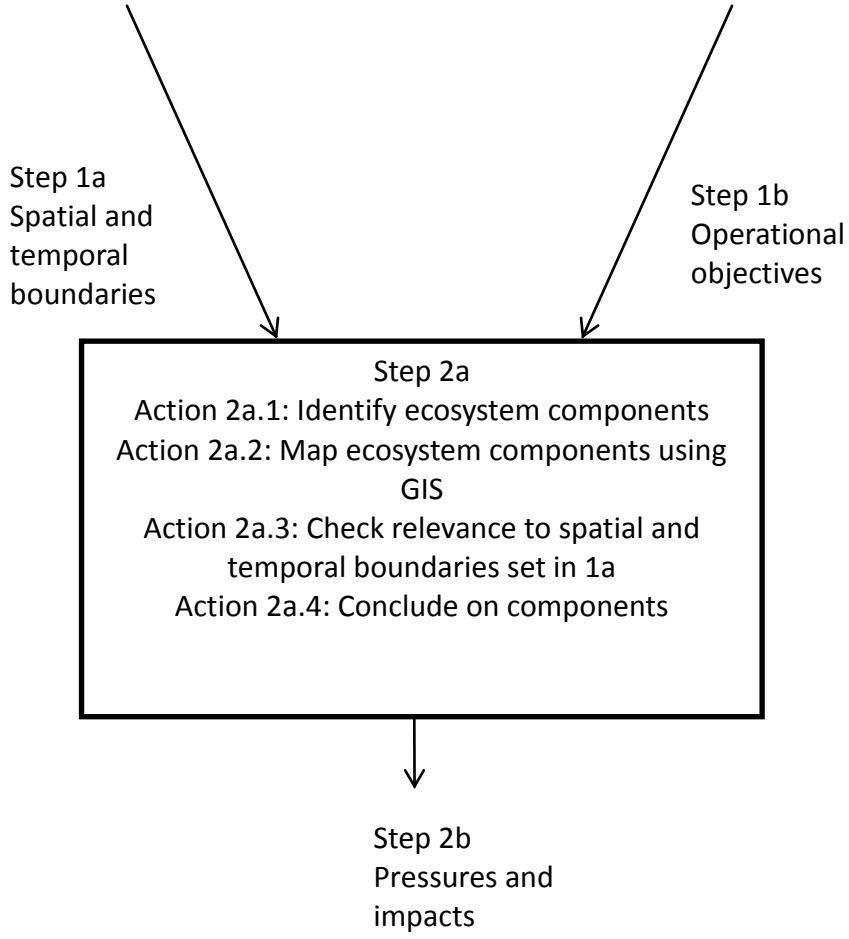


Figure 2a. Work flow for step 2a.

Action 2a.1 Using table 2a.1.1 provided, identify the ecosystem components relevant to the SMA and the objectives defined in 1b.

Table 2a.1.1 provides a list of ecosystem components taken from the MSFD Annex iii. This list can be amended to reflect the SMA under evaluation.

Table 2a.1.1. MSFD list of ecosystem components (from MSFD Annex iii).

Type	Ecosystem component
Physical and chemical	Topography and bathymetry of the seabed
	Temperature regime, current velocity, upwelling, wave exposure, mixing characteristics, turbidity and residence time
	Salinity
	Nutrients
	Marine acidification
Habitat types	Predominant habitat types
	Special habitat types
	Identification of habitats in special areas
Biological features	Biological communities including phytoplankton and zooplankton communities
	Angiosperms, macro-algae and invertebrate bottom fauna
	Fish populations
	Marine mammals and reptiles
	Seabirds
	Protected species
	Exotic species
Other features	Chemicals
	Any other features or characteristics typical of or specific to the SMA

Fill in table 2a.1.2 with the relevant ecosystem components in the SMA (columns 1 and 2). Indicate where these have been taken from table 2a.1.1 or where they have originated from another source (column 3). Indicate which operational objective listed in step 1b the component is relevant to (column 4). Please note the table should be populated with information that is both available and relevant to your SMA and its objectives; it may not be necessary to complete the entire table and it should be amended to suit your individual case.

Table 2a.1.2.*

1. Type	2. Ecosystem component	3. Reference	4. Relevant objective(s)	5. Spatial coverage (good/poor)	6. Temporal coverage (good/poor)	7. GIS Layer File Name
Physical and chemical	Topography and bathymetry of the seabed					
	Temperature regime, current velocity, upwelling, wave exposure, mixing characteristics, turbidity and residence time					
	Salinity					
	Nutrients					
	Marine acidification					
Habitat types	Predominant habitat types					
	Special habitat types					
	Identification of habitats in special areas					
Biological features	Biological communities including phytoplankton and zooplankton communities					
	Angiosperms, macro-algae and invertebrate bottom fauna					
	Fish populations					
	Marine mammals and reptiles					
	Seabirds					
	Protected species					
	Exotic species					
Other features	Chemicals					
	Any other features or characteristics typical of or specific to the SMA					

*Note this table could be expanded accordingly.

Action 2a.2 Collect spatial information on ecosystem components and map ecosystem components

When collating spatial maps of ecosystem components, the following aspects should be outlined:

- How will the maps be stored? E.g. A geodatabase.
- What scale of mapping will be used? This will vary depending on the component being mapped, for example, a special habitat type may be mapped in a much finer resolution than the breeding grounds of seabirds.
- Further details regarding co-ordinate systems, map projections and meta-data standards have been outlined in the 'Manual User Guide' at the front of this document.
- Restrictions on use or publication of existing spatial data.
- The MESMA Metadata Catalogue can assist with data collation as it details where some of the required data can be sourced.

Where possible, maps should cover the entire SMA. Once the necessary data has been gathered and displayed in map format, the precise information about the GIS data used to produce the maps (metadata), could be added to the MESMA Metadata Catalogue.

Information Collection

If available, collate relevant GIS layer files on the ecosystem components listed in table 2a.1.2, in as much detail as possible about the spatial coverage of that ecosystem component.

Where information on ecosystem components is not readily available, use expert judgement to compile GIS layer files on the spatial coverage of the ecosystem component. This may just be a rough polygon layer showing the possible area the component is likely to cover.

Where poor or no data is available, compile any available literature on the ecosystem components (that may enable a judgement to be made).

Where possible, fill in columns 5, 6 and 7 of table 2a.1.2 with the appropriate GIS layer file names and information about spatial and temporal coverage ascertained from examination of the GIS layers.

Action 2a.3 Ensure information is relevant to the spatial boundaries set in 1a

The information on ecosystem components should be relevant to both the spatial and temporal boundaries that were identified in step 1a. Where possible, information covering most of the area (with the appropriate scales of mapping within the area) should be presented and the timescale should be chosen appropriately.

Action 2a.4 Conclude on all relevant ecosystem components

Enter any remaining information into table 2a.1.2 (columns 5 and 6). Draw conclusions on which ecosystem components are relevant to the SMA.

Step 2b Identify pressures and impacts

The aim of step 2b is to analyse the spatial overlap of the relevant natural and socio-economic ecosystem components with pressures and impacts and assess potential interactions. The first action involves identification of sectors, future uses and the pressures these exert on the ecosystem components identified in step 2a. Collation of spatial information on pressures and impacts via GIS is an important next step. Data may be collected from models (e.g. current speed, wave action, tidal range, distribution of nutrients, primary production etc) or by geo-statistics based on a coarse sampling program (sediment, biota etc). Finally, potential cumulative impacts of pressures are identified. The final output of step 2b is a list of pressures and, depending on the availability of data, GIS maps showing their cumulative impacts on ecosystem components, or a table of ecosystem component sensitivity information.

Please note, the method of mapping pressures and impacts presented in step 2b is not the definitive method of mapping pressures and impacts; we appreciate that research using GIS to consider individual and cumulative impacts of pressures is ongoing and the method detailed here is a suggestion based on current research. It can therefore be followed, adapted or replaced.

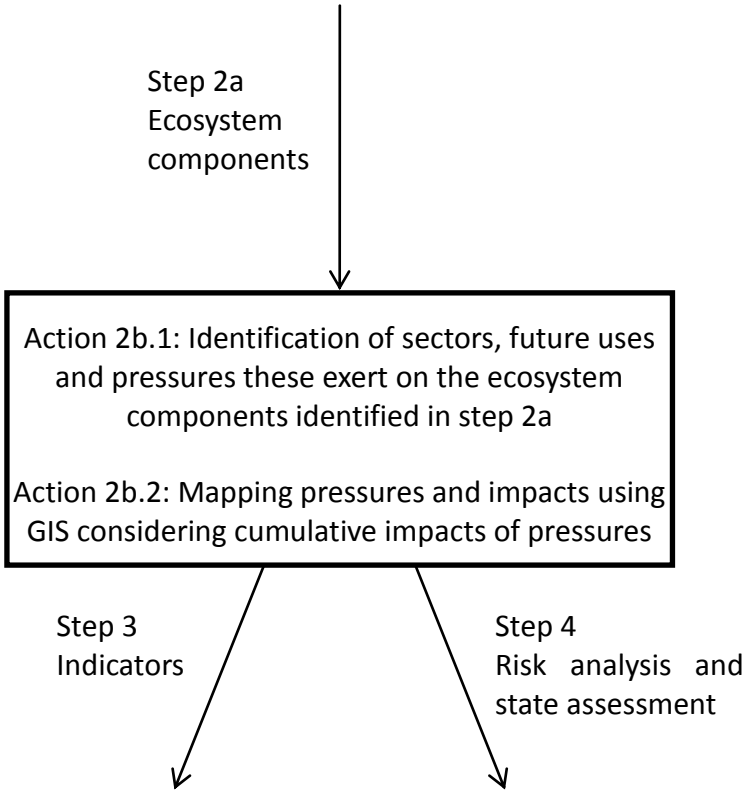


Figure 2b. Work flow for step 2b.

Action 2b.1 Identification of sectors, future uses and pressures these exert on the ecosystem components identified in step 2a.

Sectors, activities and the pressures these exert on ecosystem components in the SMA can be identified using table 2b.1.1 – this table, taken from the MarLIN initiative[2], identifies sectors, their activities and the pressures and impacts they have on the marine environment.

Table 2b.1.1. Marlin Matrix – indicates which environmental factors are likely to be affected by different maritime activities[3].

Using information collected in step 1 of the protocol:

- Identify from the first column in table 2b.1.1 the sectors that are relevant to the SMA.
- Next, identify which activities (from the second column) of each sector are carried out within the SMA.
- List the key pressures that might arise as a result of each activity from that sector in the SMA. Lists of pressures associated with various human activities can be found in the MarLIN matrix, 'Options for Delivering Ecosystem-Based Marine Management' (ODEMM) Linkage Tables[4] and associated Guidance[5] – these documents refer to sectors, activities and pressures in European Regional Seas, but the framework can be applied to any sea area.
- Indicate whether each key pressure is likely to have a possible (might happen) or probable (very likely to happen) effect as a result of activity from that sector in the SMA.

Fill in table 2b.1.2 to summarise which sectors, activities, pressures and impacts are likely to be occurring in the SMA and indicate whether the pressures associated with each activity are likely to have a possible or probable effect (an example has been provided). You may wish to refer to the completed table 1a.2 (if you are evaluating several management initiatives) or 1a.5 (if you are evaluating a single spatial management plan) for a list of sectors and activities in the SMA. The field "Sensitivity to human activities" provided for each European marine habitat in the MESMA Catalogue of European seabed biotopes (Deliverable D1.2) will assist in the completion of this step.

Table 2b.1.2

Sector/Driver	Sub-sector	Activity	Sector active? (yes/no)	Pressure	Probable (R) or possible (P)?
Commercial Fisheries	*Fisheries*	*Pelagic trawling*	*Yes*	*Noise disturbance*	*P*
				Visual presence	*P*
				Selective extraction of target species	*R*
				Selective extraction of non-target species	*R*

[2] http://www.marlin.ac.uk/maritimeactivitiesmatrix.php for the initiative
http://www.marlin.ac.uk/marinenaturaleffects.php#matrix for the matrix
[3] **Available at** http://www.marlin.ac.uk/marinenaturaleffects.php#matrix
[4] http://www.liv.ac.uk/odemm/data/
[5] http://www.liv.ac.uk/odemm/guidancedocuments/

Action 2b.2 Mapping pressures and impacts using GIS considering cumulative impacts of pressures.

In this step the spatial information on pressures and impacts is collated using GIS. It is important in this task to relate the identified pressure categories to the relevant natural ecosystem components before a more detailed spatial assessment takes place. This can be achieved using table 2b.2.1. Examples of how to map pressures and impacts using GIS and consider cumulative impacts of pressures can be found in the MESMA Toolbox on the MESMA website.

Table 2b.2.1

Sector	Activity	Pressure	Relevant natural ecosystem component	Impact (adverse or beneficial affects) - persistence and resilience
Example: Commercial Fishing	*Pelagic Trawling*	*Selective extraction of target species*	*Target and other non-target species*	*Adverse (permanent removal from the ecosystem)*

First, generic pressure maps should be produced (preferably) in GIS, displaying the footprint and intensity of the human activities. The footprint of an activity is the actual area affected by the activity. The intensity can be assessed from the frequency in time or any equivalent criteria indicating the severity of the footprint.

Information Availability

The available spatial information for human activities (needed to assess pressures and impacts) may vary in the level of detail. Therefore, a different approach may be needed depending on what information is available. It is outlined below how to assess the impact of human activities on the basis of the following levels of available information:

- **GIS based** information on human activities
- **Expert knowledge** based maps on human activities
- **Qualitative information** on human activities

It may be helpful, when completing this step, to verify pressure maps with stakeholder input, especially where data are missing or there is heavy reliance on expert knowledge or qualitative information. This can be organized as necessary/appropriate.

GIS based information on human activities

First, collate GIS maps for all activities in vector format. For all human activities, the footprint and intensity in relation to the spatial and temporal scales of the assessment should be determined. For instance, cables and pipelines can be associated with a certain width, or a demersal fishing track creates a certain footprint on the seabed.

Using the standard buffer tool in GIS, convert line and points maps that reflect the footprint and intensity of the human activities to polygons. Using the information in table 2b.2.1, identify which activities exert the same generic pressure on the natural ecosystem components.

GIS layers for these activities should be merged into single pressure layers.
Remember that the comparison of pressures with ecosystem components is only useful if they are mapped at comparable scales.

A vector grid with an adequate cell size reflecting a good compromise between the spatial resolution of the data used and the scale of the SMA should be superimposed onto the merged activities layer. This allows us to summarise the proportion of each grid cell affected by the footprint and/or intensity of all the human activities exerting the same pressure and produce respective pressure maps.

Fill in table 2b.2.2 to summarise these pressures, activities and the proportion of the SMA affected.

Table 2b.2.2

Pressure	**Activities which contribute to that pressure**	**Proportion of SMA affected by pressure (P) (footprint of the pressure as a proportion of the SMA)**

Create a GIS raster layer of pressures where the value in each cell is the proportion of the grid cell affected by the pressure (P).

Next the sensitivity of each ecosystem component to the human pressure should be determined. The measure of sensitivity should account for the resistance and resilience and there are many examples in the literature of how this can be determined. As an example the MarLIN sensitivity rationale (http://www.marlin.ac.uk/sensitivityrationale.php) uses intolerance and recoverability and combines these, as shown in table 2b.2.3, to define sensitivity. MarLIN also provides an online database of habitat and species sensitivity values to the range of pressures listed in table 2b.1.1.

Table 2b.2.3: Combining 'intolerance' and 'recoverability' assessments to determine 'sensitivity' [6].

		Recoverability						
		None	Very low (>25 yr.)	Low (>10/25 yr.)	Moderate (>5 -10 yr.)	High (1 -5 yr.)	Very high (<1 yr.)	Immediate (< 1 week)
Intolerance	High	Very high	Very high	High	Moderate	Moderate	Low	Very low
	Intermediate	Very high	High	High	Moderate	Low	Low	Very Low
	Low	High	Moderate	Moderate	Low	Low	Very Low	NS
	Tolerant	NS	NS	NS	NS	NS	NS	NS
	Tolerant*	NS*	NS*	NS*	NS*	NS*	NS*	NS*
	Not relevant	NR	NR	NR	NR	NR	NR	NR
		* NS = not sensitive, NR = not relevant						

[6] Taken from http://www.marlin.ac.uk/sensitivityrationale.php

This measure of sensitivity should be outlined in detail and summarised in table 2b.2.4 by listing natural ecosystem components along the column headings, human pressures along the row headings and populating the cells with sensitivity information for each ecosystem component on each pressure.

Table 2b.2.4 Summary of the sensitivity assessment for the example of pelagic trawling used in 2b.1.2 and 2b.2.1.

		Ecosystem Components	
		Target Fish population	
Human pressures	*Noise disturbance*	*Very low*	
	Visual presence	*NS or Very low*	
	Selective extraction of target species	*Very high*	
	Selective extraction of non-target species	*NR*	

The following method is an example of a tool that could be used to map the impact of the pressures. First, the measure of sensitivity needs to be converted from an ordinate scale to a numeric measure for sensitivity. The values are as follows: 0 (no measurable response), 0.25 (low), 0.5 (medium), 0.75 (high) and 1 (very high/disappearance).

Next, create a GIS raster layer of sensitivity information for ecosystem components where the sensitivity (S) for each raster cell is the numeric measure above for each of the sensitivities listed in table 2b.2.4.

To create a pressure impact layer the impact of a given pressure for each raster cell can be computed as:

$$I_i = P_i \cdot S_{ij}$$

With P_i as the measure of a pressure (i = 1, 2,…n) and S the sensitivity measure j (j = 1, 2,…m) of a component for the given pressure P_i.

Expert knowledge based maps on human activities

In cases where the geo-data of human activities have been generated by expert knowledge, the activity data should be merged by the generic pressure categories. A vector grid with an adequate cell size, reflecting a good compromise between the spatial resolution of the data used and the scale of the SMA, should be superimposed onto the merged activities layer. This enables the user to summarise the proportion of a grid cell affected by the footprint and/or intensity of all the human activities exerting the same pressure. The summarised information can be used to produce respective pressure maps.

The sensitivity of each ecosystem component (listed in table 2a.1.2) to the human pressure categories (from table 2b.1.2) should be determined and summarised in table 2b.2.5.

Table 2b.2.5 Sensitivity Assessment

		Ecosystem components*[1]		
Human pressures*[2]				

***[1]** from the completed table 2a.1.2

***[2]** from the completed table 2b.1.2

To map the impact of those pressures the measure of sensitivity needs to be converted from an ordinate scale to a numeric measure for sensitivity. The values are as follows: 0 (no measurable response), 0.25 (low), 0.5 (medium), 0.75 (high) and 1 (very high/disappearance).

Create a GIS raster layer of sensitivity information for ecosystem components where the sensitivity (S) for each raster cell is the numeric measure above for each of the sensitivities listed in table 2b.2.5.

To create a pressure impact layer the impact of a given pressure for each raster cell can be computed as:

$$I_i = P_i \cdot S_{ij}$$

With P_i as the measure a pressure (i = 1, 2, …n) and S the sensitivity measure j (j = 1, 2, …m) of a component for the given pressure P_i.

Qualitative Information on Human Activities

Based on table 2b.2.3 and the example of MarLIN sensitivity rationale, a measure of the sensitivity of each ecosystem component to the respective pressure categories should be summarised on a qualitative basis in table 2b.2.6.

Table 2b.2.6 Sensitivity Assessment

		Ecosystem components*[1]		
Human pressures*[2]				

***[1]** from the completed table 2a.1.2

***[2]** from the completed table 2b.1.2

Step 2c Identify existing management measures

The aim of this step is to identify the implemented and/or proposed management measures, using the information collected in step 1b, where the goals and operational objectives for the SMA were established. The effectiveness of any management is partly dependent on how well the management measures take into account and answer to the desired operational objectives. In successful and efficient management, it is of prime importance to match the implemented or proposed management measures as exactly as possible to operational objectives. Management measures range from, for instance, national laws and policies to implement the Habitats Directive, to codes of conduct that guide the activities of particular users in the SMA. The key focus of the review of existing management measures should be those related to the goal/objective of the SMA, including their links to and influence over other sectoral laws/policies. However, other sectoral laws/policies need not be reviewed in themselves, specifically unless it is to ascertain how they are related to the laws/policies concerning the goal/objective.

The outcome of this step will be a list of the existing or proposed management measures related to the operational objectives in step 1b. This list feeds directly into step 7 where the necessity for adaptation of the current management will be considered. Step 2c can draw on section 2 of the Governance Analytical Structure, which discusses existing management measures in relation to the priority objectives on which the governance analysis is focused.

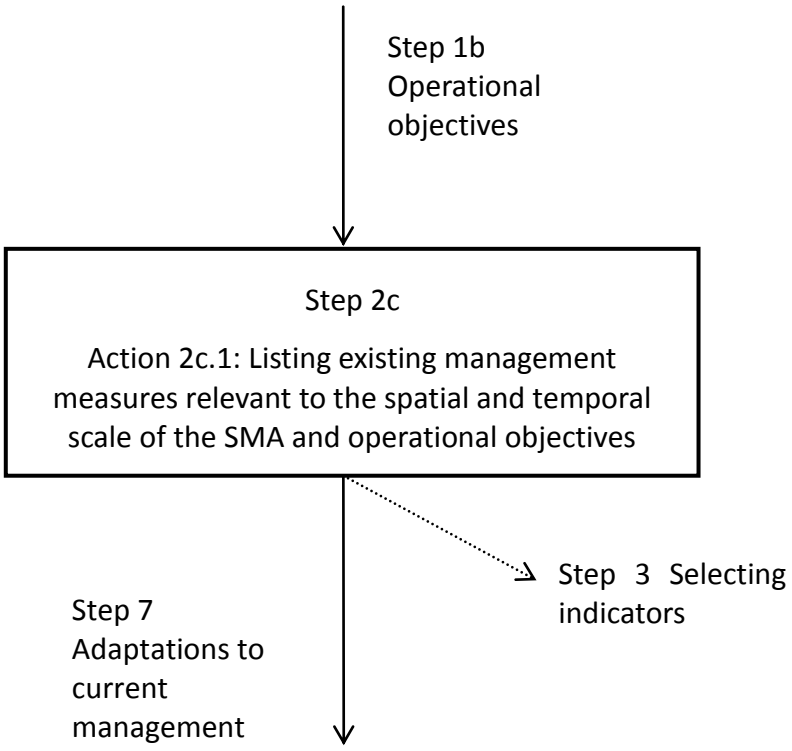


Figure 2c. Work flow for step 2c. See section 2 of the governance analytical structure.

Action 2c.1 Using data collected in step 1b list the existing management measures relevant to the spatial and temporal scale of the SMA and the operational objectives

Generally, management measures can be grouped according to:

- Economic measures
- Interpretative measures
- Knowledge measures
- Legal measures
- Participative measures

Management measures are discussed in the governance analysis – it will be helpful to refer to section 5 of the Governance Analytical Structure to complete this action. Please note that the governance analysis focuses only on one priority objective and so additional information may need to be gathered under this action to provide a comprehensive list.

Step 3 Selecting indicators and thresholds

The previous steps produced the spatial boundaries (step 1a) for the assessment and defined a suite of ecological, social and economic operational objectives (step 1b). The selected objectives have been related to the relevant ecosystem components (step 2a), with an examination of the spatial overlap between those components. The spatio-temporal distribution pattern of human pressures has also been assessed (step 2b).

The aim of this step is to guide the user through a standardized process of selecting indicators and respective thresholds in relation to the operational objectives specified in step 1b and the relevant ecosystem components identified in step 2b. The guidance consists of how to assess the appropriateness of the indicators (viability analysis) and how to report on both the rationale for selecting thresholds or using trends and gaps in data availability. The output of this step is a list of indicators suitable for assessing an existing marine spatial management plan or an envisioned spatial management scenario. The actual assessment of the state of the indicators or the potential risks in relation to a suggested management scenario in relation to human pressures will be conducted in step 4 (Figure 3.1).

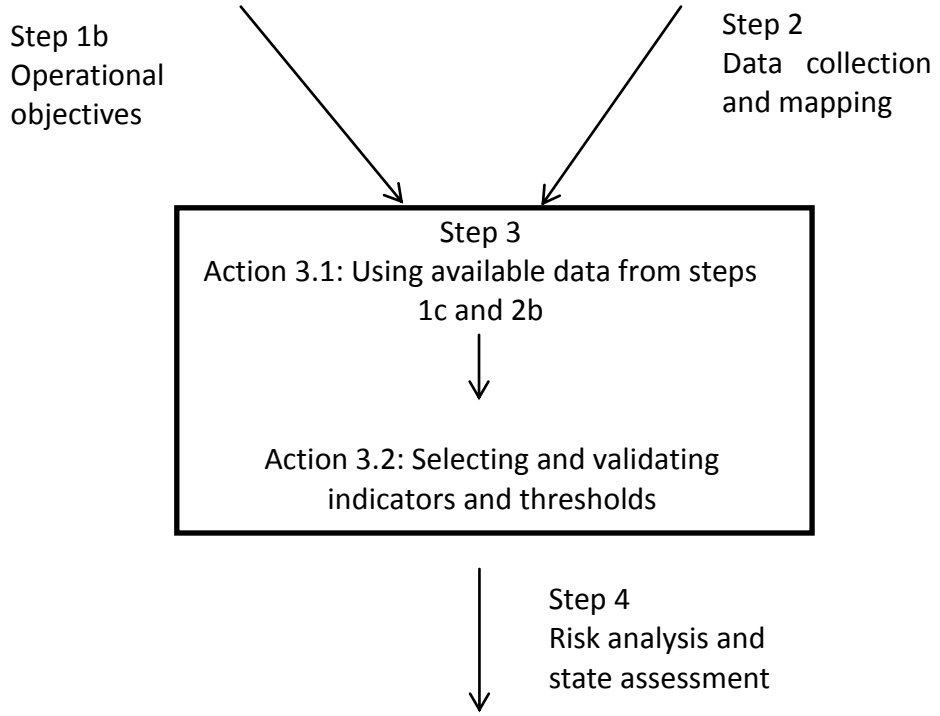


Figure 3.1. Work flow for step 3.

Action 3.1 Using available data from steps 1b and 2b

For each operational objective defined in step 1b, identify the relevant ecological, social, economic and other components (step 2a) and compile information on the availability of relevant data. Using this information, fill in table 3.1 for each operational objective.

Table 3.1

Operational objective	Environmental , social, economic, other component	Quality of available data (GIS based/Expert knowledge/Qualitative information)	Description /Source /Accessibility	Potential conflicts

Action 3.2 Selecting and validating indicators

The indicators will be chosen to enable tracking of the operational objectives set for the specific SMA, to see if they are met.

An extensive knowledgebase on indicators exists already and has been partly collated within MESMA. Examples of indicators can be taken from a number of sources. In the European Seas a global objective is Good Environmental Status (GES), as described in the Marine Strategy Framework Directive (2008/56/EC)[7] and the Commission Decision (2010/477/EU)[8]. The MSFD (Annex I) proposes 11 high level descriptors of GES (i.e. Biological diversity, Alien species, Commercial Fish, Food webs, Eutrophication, Sea floor integrity, Hydrography, Contaminants, Contaminants in food, Marine litter and Energy, including noise) that cover the most common components relevant for many of the different operational objectives. Several task groups developed a suite of 83 indicators (see D2.1) for those descriptors (2010/477/EU). Some of those indicators are already elaborated for the requirements of the WFD (2000/60/EC)[9] and were published and tested in the inter-calibration process. Others are in preparation and the final set of indicators for the 11 descriptors should be completed by 2015.

Another source of indicators is the 'Handbook for Measuring the Progress and Outcomes of Integrated Coastal and Ocean Management' (2006, UNESCO)[10]. Practical experience from the implementation of integrated coastal zone management (ICZM) produced an array of literature on relevant indicator selection (see for example, Diedrich et al. 2010 and references therein[11]). Like the implementations of ICZM, there are a number of studies that aim to evaluate the effectiveness of marine protected areas (MPAs) using indicators. For further

[7] European Council. Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive)'. Official Journal of the European Communities. 2008.

[8] Commission decision of 1 September 2010 on criteria and methodological standards on good environmental status of marine waters (2010/477/EU); (eur-lex.europa.eu).

[9] Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy.

[10] Heileman, S. I. O. Commission et al. 2006. A Handbook for Measuring the Progress and Outcomes of Integrated Coastal and Ocean Management. UNESCO.

[11] Diedrich A, Tintoré J, Navinés F. 2010. Balancing science and society through establishing indicators for integrated coastal zone management in the Balearic Islands. Marine Policy 34:772-81.

details and the references used in this section please consult the 'Generic Framework for Monitoring and Evaluation of Spatially Managed Areas', D2.1.

Indicators (state and pressure indicators) should be viable from both a scientific and a management perspective. For each of the selected candidate indicators, conduct a viability analysis by scoring the indicators as very good (5); good (4); intermediate (3); poor (2); very poor (1) or unsuitable (0), using the set of criteria listed in table 3.2.1 (modified after ICES criteria for good indicators). The table summarises the scoring results for all candidate indicators and indicates if the respective indicator has been selected for subsequent analysis. From the final set of indicators, identify which are most important for evaluation of ecological status, pressures, impacts, and management measures in the SMA; this enables prioritisation if resources are limited.

Table 3.2.1

Operational objective	Indicator	Criteria for viability analyses*											Total score	Selected (Y/N)
		Relatively easy to understand by non-scientists and those who will decide on their use	Sensitive to manageable human activity	Sensitivity to change (change over time)	Relatively tightly linked in time to that activity	Easily and accurately measured with a low error rate	Responsive primarily to a human activity, with low responsiveness to other causes of change	Measurable over a large proportion of the area to which the indicator metric is to apply	Based on an existing body of time-series of data to allow a realistic setting of objectives	State of the development of the methodology to calculate the indicator (all formulas and measurements defined (3); more work needed (2); none (1))	Complexity of managing the indicator (high level of coordination or expensive technological requirements)	Remarks /Uncertainty assessment		
Objective 1	Indicator 1													
Objective 1	Indicator 2													
Objective N	Indicator N													
		Scores for viability analyses: very good= 5; good = 4; intermediate= 3; poor=2; very poor=1; unsuitable = 0												

After selecting the most appropriate indicators for each goal/operational objective, fill in the following table 3.2.2 to identify gaps in the available data.

In table 3.2.2, availability means true access to the required data (restrictions in data sharing may obstruct access to existing data; such data should be indicated as unavailable and a comment should be provided in the 'Remarks' column explaining the reasons for inaccessibility).

Table 3.2.2

Goal/Operational Objective	Indicator	Needed data	Availability (YES/NO)	Remarks

Another important step is the definition of thresholds against which the status of the indicators can be assessed. Any thresholds or reference points should ideally reflect high level goals. Thus a respective reference point indicates a level of sustainable use or development. Whilst for some established indicators, respective thresholds may be defined, for others, thresholds have yet to be defined. List the indicators and the availability of thresholds in table 3.2.3.

Table 3.2.3

Indicator	Threshold already established (YES/NO)	If YES, explain how the threshold was derived (e.g. using the sustainability or precautionary principle)	Trend (e.g. rate, direction or sign of change)	If a trend is used instead, elaborate on a good and bad trend

For the indicators listed in table 3.2.3 where no threshold is established and no trend will be used, describe how the threshold will be derived to conduct step 4, using either: 1) historical data, 2) model estimates, 3) reference areas (high pressure vs. low pressure) or 4) expert knowledge. Subsequently, the rational and derived thresholds should be outlined.

Using the above tables, identify where there are gaps in the data and produce a (textual or tabular) summary of any gaps that are preventing estimation of the selected indicators. Suggest how it might be possible to solve this problem by obtaining access to unavailable data, for example through monitoring programs to collect additional data.

Step 4 Risk analysis and state assessment

After the performance indicators have been selected and their thresholds (or trends) determined (step 3), step 4 now looks into the technical characterisation of risk (step 4a) and/or state (step 4b). It is important to differentiate between the two (risk and state); both depend on the level of development of the spatial management plan. If a spatial management plan is not in place, step 4 should calculate the likelihood of meeting the operational objectives, as summarized by the indicators and their targeted thresholds or trends (i.e. risk analysis, step 4a). If a spatial management plan is in place, step 4 should (also) calculate whether or not the operational objectives were met, relative to the indicators and their targeted thresholds or trends (i.e. state assessment, step 4b). The output of step 4, the characterization of the risk or the actual state, will feed into the evaluation of meeting the operational objectives (step 5), where the interpretation of the risk analysis and or state assessment will be carried out.

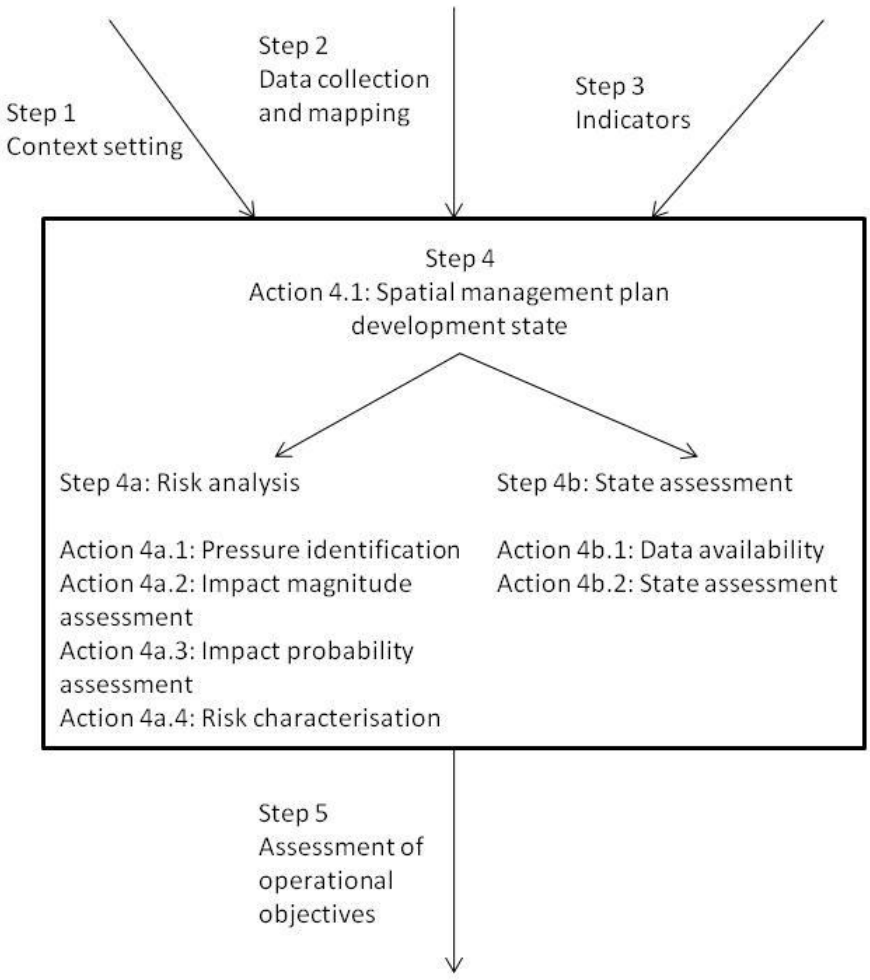


Figure 4.1. Work flow of step 4.

Action 4.1 Spatial management plan developmental state

Depending on the stage of development of the spatial management plan or initiative considered, step 4 will pass through a risk analysis (step 4a) or a state assessment (step 4b).

Before management measures to achieve the operational objectives are implemented, several alternative spatial management scenarios, each with specific management measures, should be developed and assessed. The likelihood of each scenario achieving its operational objectives (Step 1b), (as summarized by the set of indicators and associated thresholds or trends developed in Step 3), should then be assessed and compared through a risk analysis. The actions that should be taken in order to run this risk analysis are included in step 4a. This step presents a basic, spatially explicit risk assessment framework, comprising an assessment of the level of impact of a pressure on the ecosystem components described by the respective indicator, together with an estimation of the likelihood of a spatial overlap of the ecosystem component with the occurrence (in space and time) of the relevant human pressures.

When management measures to achieve the operational objectives are already implemented, the actual state, obtained through the implementation of the management plan, should be evaluated against the operational objectives (Step 1b), summarized by the suite of indicators and their thresholds or trends (Step 3). The steps to be taken to run this state assessment are included in step 4b.

It will be necessary to evaluate the spatial management plan developmental state, based on the results of Step 1. Consult the following bullet points for direction to the appropriate step:

- Spatial management plan not available - go to step 4a;
- Spatial management plan available but not implemented - go to step 4a;
- Spatial management plan implemented - go to step 4b.

Step 4a: Risk analysis

Action 4a.1 Pressure identification

For each of the selected indicators (step 3), summarise (in table 4a.1) the human pressures that have a direct or indirect effect on those indicators (collected in step 2b).

Table 4a.1

Indicator	Threshold / Trend	Pressure
Example: Species abundance (N/area)	*15% above 5 year average*	*Selective extraction*
		Eutrophication
		Abrasion

Action 4a.2 Impact assessment

Using available literature, assess the magnitude of the impact these pressures will have on the indicator. Is the impact direct or indirect, caused by the pressure, assessed as being high, medium or low? Complete table 4a.2 to capture this and carry out a (qualitative) assessment of the degree of uncertainty (based on data quality) in the assessment (e.g. using a high, medium and low reporting scale).

Since this action may require input from different assessors with a range of expertise, keep a record of the individuals involved in the assessment by entering their names into the last column of table 4a.2.

Example: *The likelihood of mortality of a harbour porpoise once entangled in a gill net, is considered high.*

Table 4a.2

Indicator	Pressure	Magnitude of Impact (high, medium or low)	Measure of uncertainty (high, medium or low)	Name of Assessor
Example 1: Harbour porpoise by-catch mortality	*(Non-selective) extraction of non-target species*	*High*	*Medium*	*John Smith*
Example 2: Number of long-lived species	*Abrasion*	*Medium*	*Medium*	*John Smith*

Action 4a.3 Impact likelihood assessment

Using GIS tools and the maps produced in steps 2a and 2b, identify where there may be overlap between the indicators and pressures. Produce GIS maps, indicating where these overlaps may occur, to assess the likelihood of occurrence of an impact. Qualify this likelihood as high, medium or low.

Example: *The likelihood of actual extraction of a harbour porpoise through e.g. gill netting is considered low.*

Table 4a.3

Indicator	Pressure	Impact likelihood (high/medium/low)	Measure of uncertainty (high/medium/low)
Example 1: Harbour porpoise by-catch mortality	*(Non-selective) extraction of non-target species*	*Low*	*Low*
Example 2: Number of long-lived species	*Positive trend*	*High*	*High*

Action 4a.4 Risk characterization

The information in tables 4a.2 and 4a.3 should be used to fill in the scoring matrix given in table 4a.4.1, to assess the overall relative risk where:

< 3 = Low relative risk
3-4 = Medium relative risk
> 4 = High relative risk

For example: *The likelihood that a harbour porpoise is killed by extraction (e.g. gill netting) in the Belgian part of the North Sea is considered medium.*

Table 4a.4.1

		Likelihood of impact		
		Low (1)	Medium (2)	High (3)
Magnitude of impact	High (3)	3	6	9
	Medium (2)	2	4	6
	Low (1)	1	2	3
Relative risk: Low:1-2, Medium: 3-4, High: 6,9				

Complete table 4a.4.2 below to characterise the relative risk and provide an overall description of uncertainty. (The risk analysis results will be summarised in step 5.)

Table 4a.4.2

Indicator	Pressure	Relative risk (low, medium or high)	Uncertainty (low, medium or high)
Example 1: Harbour porpoise by-catch mortality	*(Non-selective) extraction non-target species*	*Medium*	*Medium*
Example 2: Number of long-lived species	*Positive trend*	*High*	*High*

Finally, provide some concluding remarks on the likelihood that each management option will fail to meet the stated operational objectives.

Step 4b State assessment

Action 4b.1 Data availability assessment

This action evaluates the data availability (taken from step 2) for a proper evaluation of the status of the indicators, relative to their respective thresholds or trends (taken from step 3). This action should be performed on an indicator-by-indicator basis. If good data are available for a given indicator, the indicator's status can be evaluated in action 4b.2. If poor data are available for a given indicator, then the state assessment halts here until the appropriate data can be collected. In this case, the risk analysis outlined in step 4a has to be undertaken as an intermediate solution.

To proceed, answer the question: does the available data (from step 2) allow for the assessment of the status of the indicators, selected in step 3? Qualify data available as sufficient or insufficient. Where data are unsuitable (or 'insufficient'), return to step 4a to conduct a risk analysis before progressing through the rest of the framework – it should be possible to return to complete step 4b at a later date when sufficient data have been collected. Where data are fit for purpose (or 'sufficient'), progress to step 4b.2.

Table 4b.1

Indicator	Data availability - sufficient or insufficient?	Go to Step 4a or 4b.2?
Example 1: harbour porpoise bycatch mortality	*Insufficient*	*Step 4a*
Example 2: Wind energy production	*Sufficient*	*Step 4b.2*
Example 3: Employment in fisheries	*Sufficient*	*Step 4b.2*

Action 4b.2 Indicator state assessment

When good (sufficient) data are available, these data should be used to quantify (or qualify) the status of the selected indicators (this is monitoring, based on existing data) and evaluate this figure relative to the indicator's threshold or trend (which is an indicator-specific target). Qualify as target met or not met.

Table 4b.2

Indicator	Indicator status	Indicator threshold or trend	Evaluation: Target met (+) or not met (-)?
Example 1: Wind energy production	*1200 MWh*	*900 MWh min.*	+
Example 2: Employment in fisheries	*432 persons*	*600 persons min.*	-

Step 5 Assessing findings against operational objectives

The aim of step 5 is to look at the results of the risk analysis and/or state assessment and interpret these results in terms of whether the operational objectives have been achieved or failed and by how much, together with their relative importance in terms of future management adaptations. Several actions are proposed in order to achieve the aims of this step. Firstly, a summary of the state or potential state of the indicators and how these are linked to the operational objectives is completed. Secondly, production of an overall table listing the operational objectives and indicating if these have been achieved or failed, how successful or unsuccessful they were, how important operational objectives were to each other and how they can be weighted to inform future management (step 7). Finally, there is an opportunity to revisit the evaluation of indicators (step 3) to assess if the indicators used in step 4 were appropriate for analysis.

The outputs from step 5 will be:

- Table 5.2 assessing the operational objectives, which will feed into step 6 and step 7;
- A second table (5.3), highlighting whether indicators used for analysis were appropriate. This will also feed into step 7.

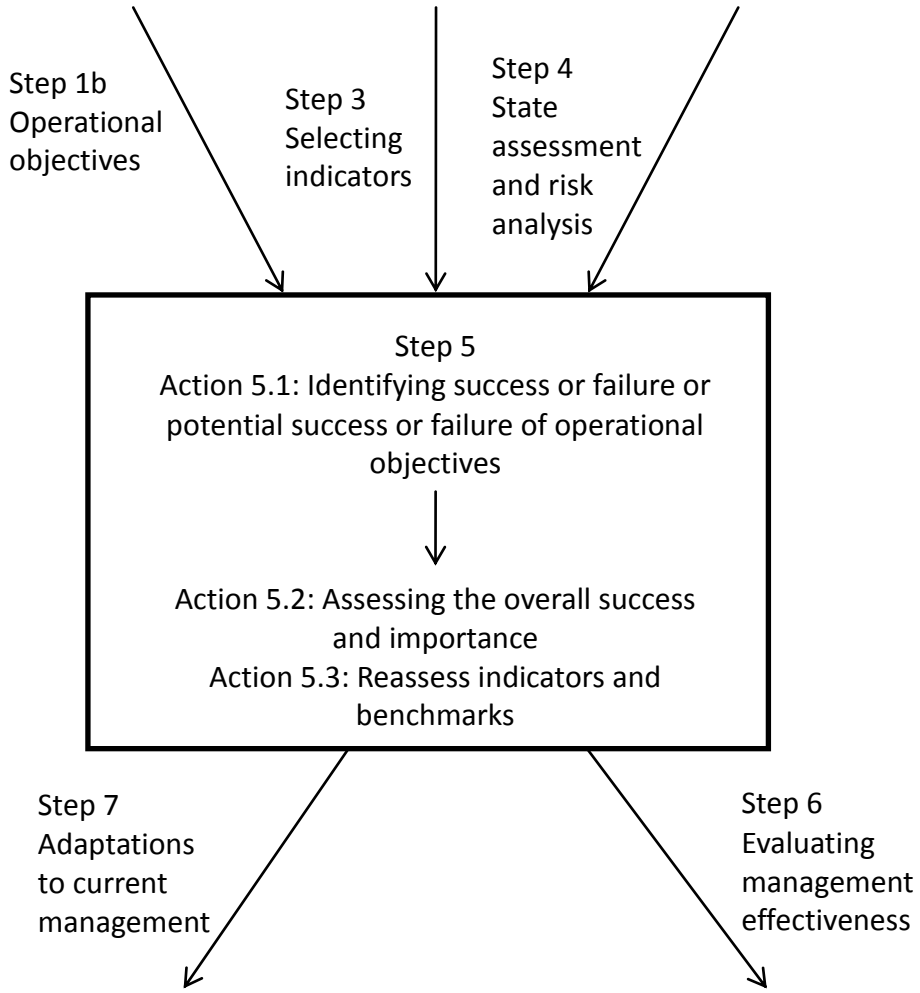


Figure 5.1. Work flow for step 5.

Action 5.1 Identifying success and failure of objectives

This task provides a technical summary of the risk analysis and goes one step further by linking indicators back to their operational objectives. It is divided into two sections depending on the type of analysis that has been carried out in the risk analysis / state assessment of step 4. If a **risk analysis** (see step 4a) has been carried out, then we can only investigate the risk of the objective failing the state assessment. If a **state assessment** (see step 4b) has been carried out, then it is possible to clearly identify whether objectives have been met or not. Where trends have been used as benchmarks (see step 4) then descriptive text on their performance should be provided. Where a threshold is used then a definitive answer on state or potential state of the indicator should be presented, as well as an indication of the extent of the gap.

To effectively assess the success and failure of objectives, an assessment (steps 4 and 5) should be carried out at regular intervals for multiple indicators and decision-makers should (ideally) plan to undertake regular assessments as part of a long-term programme of monitoring. This will help to assess management effectiveness and identify where changes might be needed.

Risk analysis

Using the results of the risk analysis (step 4a.4), summarise the risk of an indicator being in an undesirable state by classifying as high, medium or low risk. Link this to the operational objectives by completing table 5.1.1.

Table 5.1.1.

Operational objective	E / S / Ec / O?*	Indicator	Risk (high, medium or low) (see 4a.4)	Reason

*Indicate whether operational objective is Ecological (E), Social (S), Economic (Ec) or Mixed/Other (O)

State assessment

Using the indicators selected in step 3 and the trend assessment performed in step 4, compare the current status to the target indicator. In case the target was not quantitatively defined, provide a qualitative or semi-quantitative assessment, and describe what this assessment is based on (e.g. expert opinion, reported assessments by others). Use these to complete table 5.1.2. The extent of the gap can either be described quantitatively or qualitatively e.g. 'the current level deviates a bit/a lot from the threshold, but the trend shows a decline/decrease'.

Table 5.1.2.

Operational objective	E / S / Ec /O?*	Indicator	Current level	Threshold/Trend	Extent of gap (where applicable)

*Indicate whether operational objective is Ecological (E), Social (S), Economic (Ec) or Mixed/Other (O)

In the next step, prioritise each gap in terms of the importance of meeting the operational objective i.e., identify and describe the gaps that currently deviate the most from the objective and expected future development. This ranking in terms of significance or severity includes some level of subjectivity and therefore the reasoning behind the assessor's prioritisation should be described; why is one gap considered to be more important than another? This will feed into steps 6 and 7.

Enter operational objectives in table 5.1.3 in decreasing order of priority.

Table 5.1.3.

Operational objective	E / S / Ec / O?*	Gap (in order of most important to least important)	Comments
		1)	
		2)	
		3)	
		4)	
		...)	

*Indicate whether operational objective is Ecological (E), Social (S), Economic (Ec) or Mixed/Other (O)

Action 5.2 Assessing the level of success and importance

This action requires confirmation of whether the operational objectives have been achieved or failed and completion of a weight assessment of their importance for the development of future management options. As part of this action you should:

- Indicate in table 5.2 whether the operational objective has been achieved (A) or has failed (F), based on the results summarised in tables 5.1.1 - 5.1.3.
- Describe why the operational objective was assessed as having been achieved or failed (e.g. because the trend was positive, or the state was too low); underpin the assessment by stating the reason for the outcome of the assessment.
- Give objectives a weighting based on their need for future management and the higher level goals of the SMA, where 1 is not relevant (e.g. objective is met, so no adaptations to management are needed) and 5 is very relevant (e.g. failure to meet an important operational objective for a high level goal of the SMA so adaptation of current management regime is important).
- Include the reasoning behind the assigned weighting.

Complete table 5.2 to summarise outputs of the actions described.

Table 5.2

Operational objective	E / S / Ec / O?*	Achieved (A) or failed (F)	Describe why it has been achieved or failed	Weighting of relevance for future management	Reasons

*Indicate whether operational objective is Ecological (E), Social (S), Economic (Ec) or Mixed/Other (O)

Action 5.3 Reassessing indicators and thresholds

Step 3 of this protocol (table 3.2.1) describes the criteria for selecting appropriate indicators and thresholds. It provides an opportunity to evaluate how effective indicators and thresholds are in conveying the success or failure of operational objectives. Using table 5.3, for each indicator, enter the information that is available, substantiate each score and where relevant give suggestions for improvement.

Table 5.3

Indicator	**Evaluation Question***					**SUM**	**Viability Score (from step 3)**
	Did/does the indicator provide a response directly related to the intended objective?	Were the indicators and thresholds easy to communicate (especially to stakeholders)?	Were sufficient data available to measure the indicator? (Refer to uncertainty assessments)	Is the indicator sensitive enough to change over the relevant temporal scale as defined by the management initiative?	Was the indicator cost effective?		
	*** Use score (good = 3; medium = 2; poor = 1)**						

Score from action 5.3 assessment:
5-8 = Indicator's performance was poor and an alternative indicator should be developed to assess that type of objective. In step 7, suggestions need to be made with regard to this and may include the need for better definition of the indicator, the collection of more (monitoring) information, or use of alternative indictors that may be more cost-effective.

9-12 = Indicator's performance was medium. Take some time to look into the areas where the indicator did not perform well (e.g. cost effectiveness) before assessing if a change to the indicator is necessary.

13-15 = Indicator's performance was good and should be reported as a useful indicator to assess that particular objective.

The performance of the indicator can, therefore, be summarised using the two scores from steps 3 and 5 (table 5.3).

Step 6 Evaluate management effectiveness

The aim of step 6 is to evaluate the success of existing or planned management measures in terms of achieving the operational objectives (implemented or recommended). Where there is no management plan in place, existing management measures can be evaluated to ascertain how they might contribute to achieving operational objectives. This will identify possible gaps where new management measures might be needed.

Step 6 involves assessment of the success of the management measures (as defined in step 2c) in light of the objectives (step 1b) and discussion about why individual management measures were or were not successful in achieving operational objectives (as listed in step 5). The output of this step will be a table showing which management measures were/were not/were partly successful in meeting their objectives. The table will be accompanied by explanatory text that focuses on the objectives that have not or only partly been met and will consider possible reasons for these outcomes, with respect to management measures in place.

It is important to recognize that management effectiveness in achieving the goal/objectives for each SMA will be evaluated on a scientific basis and this evaluation will examine the key pressures from particular sectoral activities, identified through previous steps of the MESMA framework. To complement this scientific evaluation, it is important to understand the views of different stakeholders (governance, management, operational and others) on the validity of objectives and effectiveness of existing management measures in achieving those environmental goals/objectives. It is also important to understand the process by which those stakeholders interact with each other. To some extent this is explored through the governance research. The Governance Analytical Structure will include discussions of the effectiveness of existing governance approaches and incentives used. The final output of this step should identify where adaptation to current management is needed and this will feed into step 7.

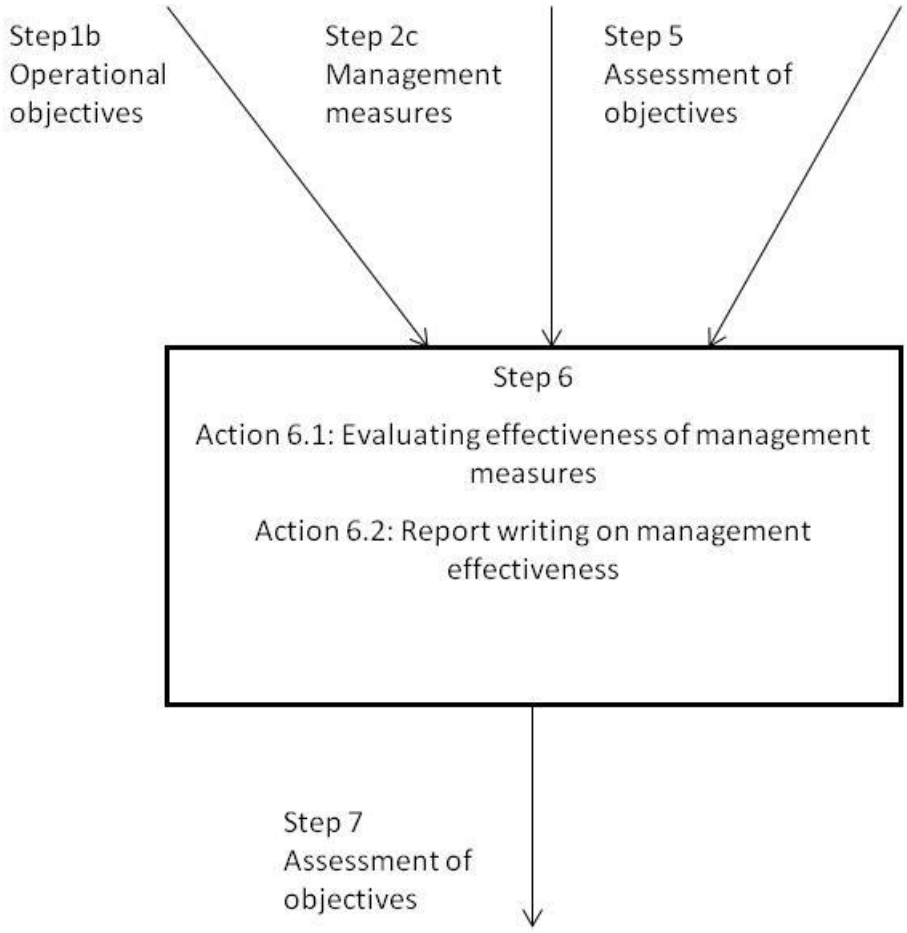


Figure 6.1. Work flow for step 6.

Action 6.1 Evaluate effectiveness of management measures

Using the outputs from steps 1b, 2c and 5, summarise the management measures that are being used to help achieve the respective operational objectives. Where a management plan or initiative exists, populate table 6.1 with the relevant management measures and operational objectives. Where there is no management plan or initiative in place and no measures are set for specific objectives, enter information about existing management measures in table 6.1 and link these to how they might contribute to the operational objectives. You may wish to amend the table to accommodate any additional information.

Table 6.1.

Operational objective	Management measure	Useful? yes/no/partly	Achieved yes/no/partly

Where the effectiveness of an existing management plan or initiative is evaluated, table 6.1 should be used to discuss for each operational objective which management measures have contributed most to the success or failure of an objective. This exercise is largely based on expert judgement, so it is important to select individuals with the relevant background and expertise (and it may be helpful to keep a record of who is completing the evaluation). It is also important to integrate expert opinion with stakeholder views to give a full picture of the effectiveness of each management measure, together with their distributional effects. Since stakeholders' views and perspectives on the effectiveness of management measures are explored through governance research, please refer to section 5.1 in the Governance Analytical Structure. This section summarises the key incentives that have been applied to promote the achievement of the priority operational objective. These can include:

1. Economic incentives – using economic and property rights approaches to promote the fulfilment of strategic objectives (market control);
2. Interpretative incentives – promoting awareness of the ecological and cultural values of the marine environment through related objectives for long-term planning and management of the marine environment, the policies for achieving these objectives and support for related measures (market, state or people control);
3. Knowledge incentives – respecting and promoting the use of different sources of knowledge (local/traditional and expert/scientific) to better inform decisions (market, state or people control);
4. Legal incentives – use of relevant laws, regulations etc as a source of 'state steer' to promote compliance with decisions and thereby the achievement of marine spatial planning obligations (state control);
5. Participative incentives – providing for users, communities and other interest groups to participate in and influence marine spatial planning decision-making that may potentially affect them in order to promote their 'ownership' of the initiative and thereby their potential to cooperate in the implementation of decisions (people control).

(Adapted from the 'Guidelines for MESMA WP6 Governance Research'.)

Section 5.1 of the Governance Analytical Structure also addresses related conflicts in the existing initiative under evaluation and includes an indication of how a particular individual or combination of incentives has been particularly effective or ineffective. The exercise lists and elaborates on the incentives drawn from Appendix III of the 'Guidelines for MESMA WP6 Governance Research'. However, only incentives that are applicable / relevant to the initiative under evaluation are listed and evaluated. Note that as part of the governance analysis, the effectiveness of incentives may be determined from expert judgement, interviews with stakeholders or other information.

In cases where no existing management plan is evaluated the assessor should list the suggested management measures in relation to the assessed operational objectives and provide some narrative as to why certain management measures are expected to be successful. This narrative should be directly extracted from the results of the risk analysis (step 4a).

Action 6.2 Write a report on the management effectiveness

Next, write a report on the current management effectiveness. Where an existing management plan or initiative has been evaluated and the assessor has been able to undertake a state assessment, the report should be based on both the overall findings of the governance analysis and information from the previous steps and action 6.1. This will feed into step 7 and should include:

- A discussion of the current management system and where it has been successful or where it is failing.
- A list of gaps where new management measures are needed in order to meet the operational objectives (this applies where there is no management plan in place).
- Consideration of why the management measures have been useful or not, including environmental, socio-economic and governance reasons.

Where there are management plans under development or created but not implemented and a risk assessment has been undertaken, the report could:

- Provide a summary of where management measures might be needed in order to achieve the operational objectives.
- Consider the expected (ecological and economic) impacts of different recommended management measures (although this will be further examined in the exercise to develop alternative scenarios in step 7).

Please use the following structure when writing the report:

- Write short summary paragraphs on each objective from table 6.1 focusing individually on the management measures that (i) were successful; (ii) were partly successful; (iii) were unsuccessful. These paragraphs should each include ideas on why management measures were successful / partly successful / unsuccessful.
- Summarise whether each management measure was mainly successful / partly successful / unsuccessful in contributing to the objective. This should include a critical evaluation of whether or not the taken management measure is linked well to the operational objective.
- Where applicable, discuss gaps where new management measures are needed to help achieve the operational objectives.

Step 7 Recommend adaptations to current management

Depending on the suitability of the current management regime, adaptations might be needed. The aim of step 7 is to write a report on adaptive management needs for the SMA. In order to write this report, results from steps 5 and 6 are used to determine if adaptations to current management are needed and results are prioritized according to action 5.1. Alternative policy scenarios are developed, improvements in management strategies are recommended and a reality check of the recommendations is performed. Recommendations are also checked against EU policies. Finally a report on adaptive management needs for the SMA is written. The output is the report on adaptive management needs for the SMA.

Step 7 links to sections 5.2 and 6 of the Governance Analytical Structure by assessing the governance approaches that could support the implementation of the management recommendations. Section 5.2 of the Governance Analytical Structure considers incentives that could potentially improve governance and section 6 discusses cross-cutting institutional issues. Hence, step 7 is the key stage at which the MESMA framework and the governance research analyses are integrated or 'blended', drawing on: 1) The validity and feasibility of the goal/objective from a governance analysis perspective and scientific perspective (generic framework); 2) Potential restrictions suggested from a scientific perspective (generic framework), for example temporal/spatial restrictions or complete bans on particular sectoral activities that lead to pressures that undermine effectiveness of achieving goals and objectives; 3) The validity and feasibility of implementing these restrictions from political, legal, policy and stakeholder perspectives (governance analysis).

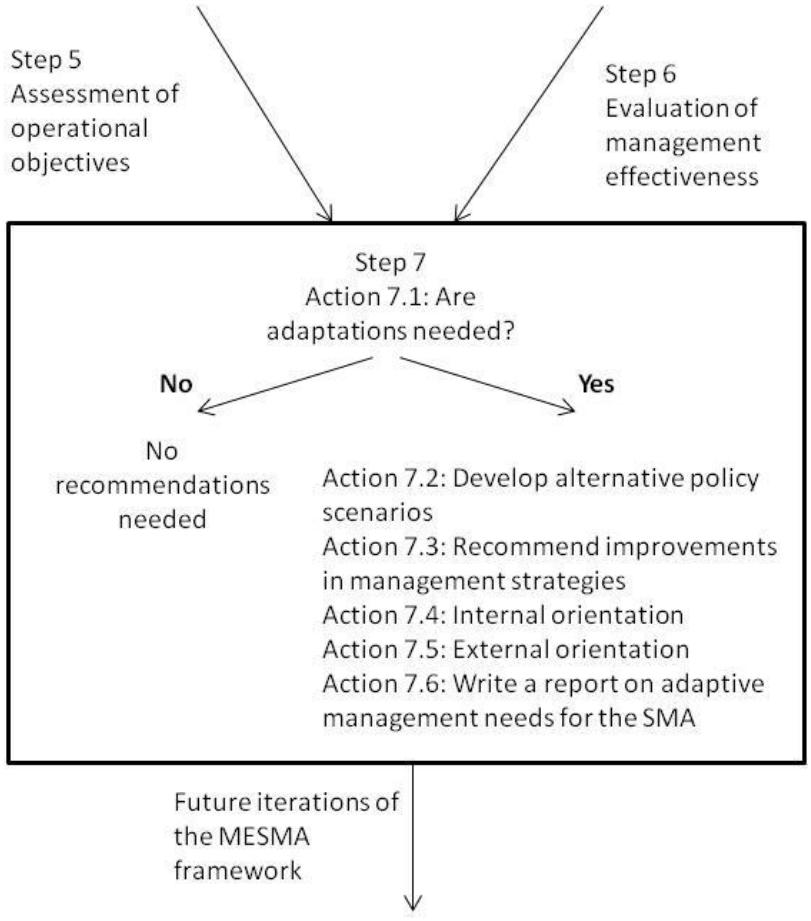


Figure 7.1. Work flow for step 7.

Action 7.1 Using the outputs from step 5 and 6, identify if adaptations to current management are needed

Use the outputs from step 5 and 6. Are there any gaps or drawbacks?

- If no, then no recommendations are needed. Go to action 7.6.
- If yes, proceed to action 7.2.

Action 7.2 Develop alternative scenarios

In this step, the term 'scenario' is applied to an alternative future scenario and means 'a well-defined, connected sequence of features, events and processes that can be thought of as an outline of a possible future condition of the repository system' (see glossary). In this context, a scenario based approach is a technique for presenting alternative futures to decision makers. At the end of the process, it may be practical to present management with a selection of two or three alternative scenarios (with a focus on specific management measures), as this may help to focus attention on the most important issues.

Scenarios might include, for example, a key change or break-through in the planning or legislative process, more space for stakeholders to influence the policy process, or more input from scientists (i.e. different means of achieving an objective, as considered in the Governance Analysis). Other scenarios might include re-definition of operational objectives. Developed scenarios should not be purely hypothetical, and a reality base for the scenarios is needed, for example, through grounding your scenarios on real examples in the vicinity of the SMA. A description of the incentives that could support these scenarios could be provided (and this could draw on some of the information from Appendix III of the Governance Analytical Structure).

In order to develop alternative scenarios, it may be helpful to re-define operational objectives. Use the priority list from table 5.2 to choose operational objectives for scenario writing. Next, select the main type of the alternative scenario to develop: 1) studying the facts of a situation, 2) selecting something that may happen (for instance seawater warming (an environmental scenario) or a change in policy), and 3) imaging the various ways for that development to occur and the sequence of events that it might follow. For types 2 and 3, apply trend-impact analysis as a method to predict the future by looking at the effects of trends over time and decide the main drivers for change.

Select the scenarios to be presented and list them in table 7.2. Scenarios should then be developed by identifying the:

- Costs (e.g. expenditure, time, effort (one of the factors determining efficiency));
- Actors (bearing the costs);
- Benefits (often expressed in money terms; can also be public's willingness to pay to obtain the impacts of an intervention; something that promotes or enhances well-being; an advantage);
- Beneficiaries of the alternative scenario.

The points above can be described qualitatively and presented in table 7.2. Alternatively, a formal socio-economic analysis (SEA) could be undertaken to provide information about the benefits and costs of a range of implemented and/or suggested measures. The most commonly used forms of SEA are Cost-benefit analysis (CBA), Cost-effectiveness analysis (CEA) and Multi-criteria analysis (MCA). More information on these analyses is detailed in Appendix 2.

Table 7.2.

	Costs	Actors	Benefits	Beneficiaries
Present policy				
Alternative scenario 1				
Alternative scenario 2				

For each scenario, include a short piece of text to describe each scenario. Since different consequences result from different policy alternatives; the consequences (or the expected effects) should be compared.

Finally, any potential conflicts (for each scenario) should be identified and reported. Write a short summary of these points for each alternative scenario.

Where there is no local or regional information about future changes, consider mean global future changes or drivers such as climate change.

Having placed the most important adaptive management needs in logical groupings (table 7.2 scenarios), the next action is to work out, very approximately at this stage, what the connection is between them. What does each group of needs represent? It is advisable to have two complementary scenarios. The reason for this is that it helps managers to avoid 'choosing' just one, 'preferred' scenario and negating the benefits of using 'alternative' scenarios to allow for alternative, uncertain futures. This can be challenging where managers are used to looking for opposites; a good and a bad scenario, or an optimistic one versus a pessimistic one. Preferably, the two scenarios are required to be equally likely, and between them cover all the possibilities. Ideally they should not be obvious opposites, which might once again bias their acceptance by users, so the choice of 'neutral' titles is important.

Action 7.3 Recommend improvements in management strategies

Select the preferred alternative policy scenario(s) from table 7.2 above. Each scenario can be used to identify and select management measures.

Information collected in steps 5 and 6 and the governance analysis will help to complete this action. Table 7.3.1 shows the information that is needed and where some of it can be found in the protocol or in the respective section of the Governance Analytical Structure. Please note that whilst information can be sourced from the Governance Analysis, it is important to remember this information stems from the analysis of one priority objective, which is defined in the Governance Analytical Structure as 'the objective on which the governance analysis is focused, recognising that this should also be a key priority in the existing initiative you are evaluating'. Since the MESMA framework is designed to enable assessment of multiple operational objectives, any recommendations for improvements to management (in action 7.3) should be made with respect to multiple operational objectives and not just the priority operational objective selected for analysis in the Governance Analytical Structure.

Table 7.3.1

Input	**Source**
The level of success of operational objectives	Table 5.2
Gaps which indicate that objectives are not met	Tables 5.1.2 – 5.1.3
Were indicators appropriate for assessment?	Table 5.3
How failure is explained	Report from step 6.2

Effectiveness of different governance approaches	Section 4, Governance Analytical Structure considers effectiveness of different governance approaches in achieving the priority objective
Equity, knowledge, power and other related concerns for governance	Governance analysis – discusses equity, knowledge, power and other related concerns for governance raised by the priority objective
Balance and difference between local and high level objectives	Governance analysis - discusses validity of priority objective from some different perspectives

Using this information, the output of steps 5 and 6 are essential input for the identification and proposition of management improvements. In addition the outcome of the governance analysis gives us relevant information for formulating recommendations in management, monitoring and/or participation strategies. If we have some idea of 'dominance or orientation' of institutions in a SMA then we may be able to formulate recommendations for improvement, if management, monitoring and/or participation strategies prove to be ineffective.

To make recommendations for an improved strategy, it may help to answer, as far as possible, the questions detailed in table 7.3.2, using the information sources signposted in table 7.3.1.

Table 7.3.2

Question	**Answer**
Which institutions are 'dominant' in the SMA, based on the described and analysed institutional landscape?	
What management improvements are needed, management strategy, monitoring strategy, participation strategy, or a combination?	
What choices must be made in improving management, monitoring strategy – or both – given the described and analysed institutional landscape?	
Which adjustments must be made in objectives to implement the new management strategy	
How can the adjusted objectives be balanced between local and EU policy frameworks and their objectives?	
Which adjustments must be made in indicators to implement the new monitoring strategy?	
How can the adjusted indicators be balanced with indicators in EU-policy frameworks?	
Which adjustments must be made in the involvement of stakeholders to implement the new participation strategy?	
What are the institutions that need to be changed or developed to support the implementation of the recommended strategies?	
What are the implications for policy development and reform at the EU level?	
How can the adjusted involvement of stakeholders be balanced with the (required) stakeholder involvement in EU-policy frameworks?	
What does the improved overall strategy – management,	

monitoring and participation – look like and how can it be monitored and evaluated?	

Finally, use the answers in table 7.3.2 to fill in table 7.3.3 to conclude on suggested improvements to management, monitoring and participation strategy through adjusted objectives, indicators and stakeholder involvement. Where necessary, refer to information in the governance analysis.

Table 7.3.3

Alternative scenario:		
Improvements in...	**Changes in...**	**What are the changes...?**
Management strategy	Ecosystem objectives	
	Social objectives	
	Economic objectives	
	Operational objectives	
	Other objectives e.g. sectoral/policy/conservation	
Monitoring strategy	Natural indicators	
	Human indicators	
Governance	Institutions and governance approaches	
Participation strategy	Intensity and diversity of stakeholder involvement	
Combination of management, monitoring or participation strategy	Mixed adjustments	

Action 7.4 Internal orientation: reality check for improvement in management measures

Action 7.4 demands a reality check of the suggestions for improved management; an evaluation of the adequacy of your new objectives and suggested improvements. Ask the question 'are the improvements realistic?' This will also be considered through the governance analysis and more specifically section 5.2 of the Governance Analytical Structure.

Action 7.5 External orientation: Relation with the EU policy framework

In order to make sure that an alternative policy scenario is in line with the relevant EU policy framework, it has to be checked against relevant policies. Some policies of general importance at EU level are the Marine Strategy Framework Directive, Water Framework Directive, Common Fisheries Policy and the Habitats Directive. Relevant regional, national and local policies should also be taken into consideration.

- Identify relevant policies using information from step 1b and other available or new sources and list them in the table 7.5 below.
- Fill in new operational objectives and management measures (according to recommendations from table 7.3.3) in the checklist and describe the links between each new aspect and policy.
- Check whether the new operational objectives and management measures are in line with relevant policies or not. If not, explain why and fill in the changes that have to be made.

Table 7.5.

New operational objective and management measure from alternative policy scenario	Relevant policy	Level (EU, national, regional, or local)	Describe link of new aspect to relevant policy	Check if new aspect is in line with relevant policy. If not, explain changes that have to be made

Action 7.6 Write a report on adaptive management needs for the SMA

Depending on whether a spatial management plan is in place or not, this action will create a report on adaptations of an existing management plan or write recommendations for a new management plan. Using the results from the actions 7.1 – 7.5, write a report including:

- Identified desired future condition.
- Chosen policy scenario (from 7.2). The preferred scenario should consider the long-term policy objectives.
- Prioritized recommendations (from 7.3).
- A timeline with actions and a description of development stages.

The report should be written in a clear language with clear recommendations; a suggested template is included below.

Report on adaptive management needs for the SMA *Name and location of SMA*
Results from application of MESMA generic framework. (Text in italics is to be replaced by the author's input.)
SMA *Name and geographical location*
Author *Name(s)*
Institution *Name(s)*
Date *xx.xx.201x*

Current state of spatial management in SMA (to be used as a checklist):

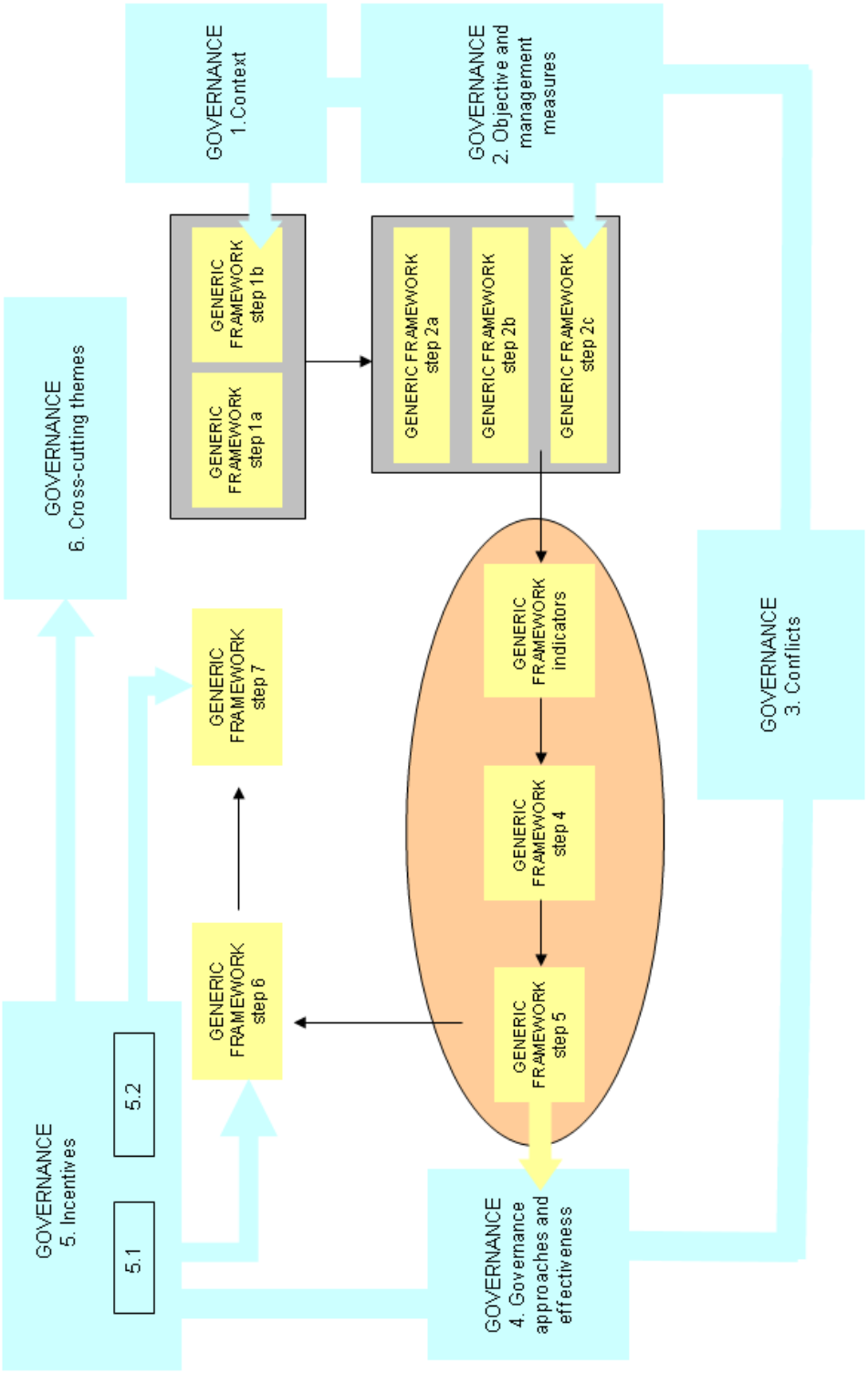
- Recommendations for a new management plan;
- Recommendations for adaptations of an existing management plan;
- If there are no existing gaps or drawbacks in current management, no recommendations are needed and current management will be continued.

Report on the results from actions 7.1 – 7.5:

- Identified desired future condition;
- Description of the preferred policy scenario (choose from table 7.2), it should consider the long-term policy objectives;
- Prioritized recommendations for improvements in management strategies (from action 7.3, new assessments, new decisions, and/or new implementation);
- Evaluation of the level of implementation of EBM, by relation of the objectives to the criteria of EBM;
- Timeline with actions and a description of development stages.

APPENDIX 1 – LINKS BETWEEN THE GENERIC FRAMEWORK AND GOVERNANCE ANALYSIS

This diagram has been adapted from the 'Guidelines for MESMA WP6 Governance Research'. The linkages shown are contingent on the Generic Framework and Governance Analysis sharing the same operational/priority objective. In the diagram, 'Generic Framework' refers to the Protocol for Application of the Generic Framework (D2.3) and 'Governance' refers to the Governance Analytical Structure.



APPENDIX 2 – SOCIO-ECONOMIC ANALYSIS

Socio-economic analysis is a method to clarify and highlight all the important consequences of an action before a decision on implementation is made. It can be used in the evaluation of different measures, ranging from small projects to projects with big budget effects and reforms.

Socio-economic analysis provides information about the benefits and costs of a range of measures, which in turn, provides a basis for ranking of and prioritization between alternative actions. Increased use of such analyses is an important prerequisite for more efficient use of resources.

The most commonly used forms of SEA are:

1. Cost-benefit analysis (CBA)
    - Provides a framework for comparing the costs and benefits of a proposal (as they would be measured in economic resource or opportunity cost terms).
    - Qualitative or quantitative.
    - Aims to determine if a proposal is worthwhile from a social perspective.

2. Cost-effectiveness analysis (CEA)
    - Assesses proposed environmental measures.
    - Can be used to determine the most cost-effective means of achieving pre-set targets or goals, which are often defined by governmental guidelines or legislation.
    - Provides evidence with respect to the cost-effectiveness of a given measure (without the use of any pre-set goals).
    - Helps the regulator to compare a range of measures, with respect to the level of benefits achievable at a given level of cost.

3. Multi-criteria analysis (MCA)
    - Semi-quantitative or qualitative.
    - Techniques range from checklists to trend analysis, to intricate mathematical procedures.
    - Converts the potential impacts of a proposed measure into a common unit of measurement to allow direct comparison of the measure's critical elements.

There are six main steps associated with performing a socio-economic analysis:

1. Describe the problem and objective;
2. Specify the measures;
3. Describe and assess the impacts;
4. Calculate the economic profitability;
5. Highlight the uncertainty;
6. Give an overall assessment and make recommendations.

APPENDIX 3 – UNCERTAINTY CHARACTERISATION

Background

Throughout the application of the framework uncertainty accumulates within each framework step. To promote a transparent assessment of the plan(s) or initiative(s), the outputs should be delivered together with a description and/or quantification of uncertainty. Uncertainty exists in any integrated assessment, environmental impact assessment, risk assessment or policy analysis (Walker et al. 2003). The typology of uncertainty is manifold and there is no agreed terminology to refer to certain types of uncertainty. In relation to model-based decision support, three dimensions of uncertainty have been distinguished by Walker et al. (2003):

- Location of uncertainty;
- Level of uncertainty;
- Nature of uncertainty.

The location of uncertainty identifies where uncertainty establishes within the (conceptual) model complex. The location can refer to the context (e.g. problem framing stage or boundaries), model (model structure, technical model, model inputs) and input (data, measurements, etc). The level of uncertainty reflects the statistical uncertainty (as uncertainty can be described by statistics), scenario uncertainty (where the range of possible outcomes and mechanisms leading to the outcomes are not well understood), and recognized ignorance demonstrates a fundamental uncertainty about the mechanisms and functional relationships being studied. The nature of uncertainty can be distinguished by epistemic uncertainty (imperfection of knowledge may be reduced by more research) and variability uncertainty (where there is inherent variability in a studied system). A detailed description of this terminology can be found in Rotmans and van Asselt (2001) and Walker et al. (2003).

Thus a systematic documentation and characterization of uncertainty allows for a better understanding of the types of uncertainty. Moreover, it allows prioritization of efforts for future research and subsequent application of the framework.

Guidance on the documentation and characterization of uncertainty in the framework application

To develop basic guidance on the characterization of uncertainty within the framework, we modified the uncertainty matrix developed by Walker et al. (2003) (Table 1). Each framework step corresponds to a number of actions in the protocol (D2.2) which guides the collation of information and/or estimation of interim results. The user should deploy the template matrix in parallel with the application of the framework to assess, for each action point, if and how uncertainty needs to be documented. In some cases there may be an overlap in categories, whilst in others it will not be necessary or possible to document uncertainty. However, when an action is associated with a certain location and level of uncertainty, its nature should be documented as well. The matrix shown in Table 1 is a possible heuristic tool to document uncertainty. For instance, in cases where statistical uncertainty is stated, a number of tools can be used to assess it (see e.g. Rotmans and van Asselt 2001; Van der Sluijs et al. 2004). Monte Carlo simulations can be used to quantify the parameter probabilities within a model (see tool example GLUE, available at www.es.lancs.ac.uk/hfdg/freeware/hfdg_freeware_glue.htm). The further use of the matrix and the need for respective tools to assess or quantify uncertainty for some protocol actions is being further developed by MESMA.

References

Rotmans J, van Asselt MBA (2001) Uncertainty management in integrated assessment modeling: Towards a pluralistic approach. Environ Monit Assess 69: 101-130

Van der Sluijs JP, Janssen PHM, Petersen AC, Kloprogge P, Risbey JS, Tuinstra W, Ravetz JR (2004) RIVM/MNP Guidance for Uncertainty Assessment and Communication: Tool Catalogue for Uncertainty Assessment. Copernicus Institute & RIVM, Utrecht/Bilthoven. (www.nusap.net/downloads/toolcatalogue.pdf)

Walker WE, Harremoes P, Rotmans J, van der Sluijs JP, van Asselt MBA, Janssen P, Krayer von Krauss MP (2003) Defining Uncertainty. A Conceptual Basis for Uncertainty Management in Model-Based Decision Support. Integrated Assessment 4: 5-17

Table 1. Uncertainty matrix modified after Walker et al. 2003 to localize and characterize the uncertainty within the framework application.

	Location			**Level of uncertainty**			**Nature of uncertainty**		**Remarks**
Action	**Context**	**Model** (Structure Technical Inputs)	**Data**	**Statistical uncertainty**	**Scenario uncertainty**	**Recognized ignorance**	**Knowledge related**	**Variability related**	
Example: 1a2		Inputs					**X**		Identify / map planned sectoral initiatives
…									
…									

GLOSSARY OF TERMS

Term	Definition
Actor	People from wider society, non-governmental organisations, user groups, regulatory agencies, corporate interests, *etc.* who interact with each other in governance processes.
Arc Marine	Arc Marine is a geo-database model tailored specifically for the marine GIS community.
Benchmark	A numerical value that gives a measure of the performance of a computer product in a specific test.
Characteristics	"… Member States shall … determine, for the marine waters, a set of characteristics for good environmental status, on the basis of the qualitative descriptors listed …"
Criteria	"distinctive technical features that are closely linked to qualitative descriptors".
Criteria and methodological standards	"to ensure consistency and to allow for comparison between marine regions or sub-regions of the extent to which good environmental status is being achieved."
Data integration	Data integration involves combining data residing in different sources and providing users with a unified view of these data.
Data quality	Indications of the degree to which data satisfies stated or implied needs. This includes information about lineage, completeness, currency, logical consistency and accuracy of the data.
Descriptors	Qualitative descriptors for determining good environmental status : 1) Biological diversity, 2) Non-indigenous species, 3) Commercial fish, 4) Foodwebs, 5) Eutrophication, 6) Sea floor integrity, 7) Hydrography, 8) Contaminants, 9) Contaminants in food, 10) Marine litter, 11) Energy including noise.
EcoQOs (Ecological Quality Objectives)	"can take the form of targets (values where there is a commitment to attain them), limits (values where there is a commitment to avoid breaching them) or indicators (values which highlight a change in the ecosystem and can trigger research to explain what is happening)."
Ecosystem approach	A strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way.

Ecosystem approach to management	The Ecosystem Approach to Marine Management involves an integrated management of human activities based on knowledge of ecosystem dynamics to achieve sustainability of ecosystem goods and services and maintenance of ecosystem integrity.
Ecosystem Based Management	Ecosystem based management is an environmental management approach that recognizes the full array of interactions within an ecosystem, including humans, rather than considering single issues, species, or ecosystem services in isolation.
Ecosystem Based Marine Spatial Management	Ecosystem based marine spatial management (EB-MSM) is an approach that recognizes the full array of interactions within an ecosystem, including humans, rather than considering single issues, species, or ecosystem services in isolation.
End user committee	A committee consisting of a representative range of stakeholders.
Environmental Target	"a qualitative or quantitative statement on the desired condition of the different components of, and pressures and impacts on, marine waters in respect of each marine region or sub-region."
Feature	A feature is an abstraction of a real world phenomenon. A geographic feature is a feature associated with a location relative to the Earth.
Framework	In MESMA, the 'Generic framework for monitoring and evaluation of Spatially Managed Areas (SMAs)', Deliverable 2.1.
Generic framework	In MESMA, the 'Generic framework for monitoring and evaluation of Spatially Managed Areas (SMAs)', Deliverable 2.1.
Geographic Information System (GIS)	A geographic information system (GIS) is a computer-based tool for mapping and analyzing things that exist and events that happen on earth. GIS technology integrates common database operations such as query and statistical analysis with the unique visualization and geographic analysis benefits offered by maps.
GIS Web Service	GIS Web services are a constantly emerging technology that allows many divers Web based applications to interact in order to exchange geospatial data and GIS software.
Goal	Purpose, aim, or the anticipated result which guides action.

Good Environmental Status	"the environmental status of marine waters where these provide ecologically diverse and dynamic oceans and seas which are clean, healthy and productive within their intrinsic conditions, and the use of the marine environment is at a level that is sustainable, thus safeguarding the potential for uses and activities by current and future generations."
Governance	The involvement of a wide range of institutions and actors in the production of policy outcomes….. involving coordination through networks and partnerships. Or Steering human behaviour through combinations of people, state and market incentives in order to achieve strategic objectives.
Governance approach	A style of governing involving a particular combination of incentives, and/or a particular allocation of authority and responsibilities between different actors, e.g. communities, governments and business corporations.
Governance analysis	Qualitative research to explore different perspectives amongst different stakeholders on the validity, legitimacy and effectiveness of different governance approaches for achieving strategic objectives through MSP in the context of specific case studies, employing a standard set of themes.
Governance Analytical Structure	Refers to the structured approach to assessing governance, as indicated in the document entitled 'Guidelines for MESMA WP6 Governance Research'.
Indicator	Progress in relation to operational objectives will be measured using indicators and associated reference points and directions. An indicator is a measure, or a collection of measures, that describes the condition of an ecosystem or one of its critical components; in socio-economic objectives, indicators can be a desired outcome, e.g. the amount of kilowatt produced by a wind park.
Incentive	Particular SMA institutions that are instrumentally designed to encourage people to choose to behave in a manner that provides for certain policy outcomes, particularly conflict management & ecosystem restoration, to be fulfilled.

INSPIRE	Infrastructure for Spatial Information in Europe.
INSPIRE Directive	The INSPIRE directive aims to create a European Union (EU) spatial data infrastructure. This will enable the sharing of environmental spatial information among public sector organisations and better facilitate public access to spatial information across Europe.
INSPIRE Portal	A geoportal provide the means to search for spatial data sets and spatial data services, and subject to access restrictions, view and download spatial data sets from the EU Member States within the framework of the Infrastructure for Spatial Information in the European Community (INSPIRE) Directive.
Institution	Very broad term covering a wide range of agreements, interactions, etc., which remain relatively stable or predictable over a certain period of time, including: mutually agreed modes of cooperative behaviour (norms); interactions through markets; local – distant, Government policies and programmes and Legal instruments and related obligations.
Integrated spatial management plan	An instrument that aims to manage the spatial/temporal allocation of multiple uses/activities. In the MESMA generic framework, this refers to overarching plans that apply to marine plan areas at a large scale and consider multiple activities.
Interoperability	The ability of two or more autonomous, heterogeneous, distributed digital entities (e.g. system, applications, procedures, registries, services or data set) to communicate and interact or be used together despite their differences in language, context, format or content. These entities should be able to interact with one another in meaningful ways without special effort by the user, the data producer or consumer, be it human or machine.
ISO 19115	ISO 19115 "Geographic Information – Metadata" is a standard of the International Organization for Standardization. It defines the schema required for describing geographic information and services. It provides information about the identification, the extent, the quality, the spatial and temporal schema, spatial reference, and distribution of digital geographic data.

ISO 19119	ISO 19119 "Service" is a standard of the International Organization for Standardization. It identifies and defines of the architecture patterns for service interfaces used for geographic information and definition of the relationships to the Open Environment mode, presents a geographic services taxonomy and a list of example geographic services placed in the services taxonomy. It also prescribes how to create a platform-neutral service specification, how to derive conformant platform-specific service specifications, and provides guidelines for the selection and specification of geographic services from both platform-neutral and platform-specific perspectives.
ISO 19139	ISO-19139 "Geographic information - Metadata - XML schema implementation" is a standard of the International Organization for Standardization. It provides a XML implementation of ISO-19115 metadata standard.
Layer	A logical separation of mapped data usually representing a theme, such as roads, political boundaries, etc. Layers are all registered to one another by means of a common coordinate system.
Marine Protected Area (MPA)	Any area of the intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment.
Marine Spatial Planning (MSP)	Marine spatial planning (MSP) is a public process of analyzing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic, and social objectives that are usually specified through a political process.
Management initiative	A statement of intent to introduce management measures.
Management measures	Actions or packages of actions implemented to manage activities to achieve targets/operational objectives.
Manual	Deliverable 2.3, the document containing the Protocol for the Application of the Generic Framework.
MESMA Framework	Generic framework for monitoring and evaluation of Spatially Managed Areas (SMAs).

Metadata	Metadata is structured information that describes, explains, locates, or otherwise makes it easier to retrieve, use, or manage an information resource. Metadata is often called data about data or information about information.
MSFD	The Marine Strategy Framework Directive (MSFD) is a high level document and requires further development and specification ('operationalisation') before it can be applied to specific regions.
Operational objective	A short-term goal, defining a clear, often measurable, outcome of a process (SMART objectives).
Pressure	Human pressures exerted by human activities.
Priority Objective	The objective on which the governance analysis is focused, recognising that this should also be a key priority in the existing initiative you are evaluating.
Protected area	A clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values.
Protocol	A set of semantic and syntactic rules that determine the behaviour of entities that interact. In MESMA, the protocol is for the application of the generic framework as outlined in document D2.3 (otherwise known as the 'manual').
Replacement cost	Replacement cost and variants such as relocation cost (sometimes called shadow project) are based on the concept that the cost of replacement of a damaged environment is somehow a measure of the value of that environment.
Sea use management	Sea use management promotes sustainable development (based on achieving a balance of environmental, socio and economic objectives), uses a strategic, integrated and forward-looking framework, applies an ecosystem-approach to management, identifies and safeguards important components of marine ecosystems and uses MSP to minimise conflicts on the use of space.
Spatially Managed Areas/SMA	Areas where a marine spatial planning framework is in place or is being developed in order to conserve structure, function and processes of the constituent marine ecosystems through the management of the cumulative pressures of different sectoral activities inside or outside the area concerned, and including the threats posed by climate change and geohazards.
Spatial Management Plan/SMP	An instrument that aims to manage the spatial/temporal allocation of multiple uses/activities.
Stakeholder	Stakeholders relevant to the MESMA project are divided into the following categories:

Stakeholder (operational)	Operational stakeholders: groups whose core activities and economic performance is closely related to exploiting or using marine resources or marine areas, i.e. engaged in or related to fishing, mariculture, marine renewables, aggregates, oil/gas, industries etc.
Stakeholder (indirect)	Indirect stakeholders: members of the public who passively interact, e.g. through aesthetic appreciation, with the marine area in question or have an indirect stake in it (hold existence values, bequest values, etc.).
Stakeholder (policy)	Policy stakeholders: responsible authorities or bodies who have to put forward the legal framework and policies related to strategic objectives for marine areas, e.g. national governments, EC, international bodies.
Stakeholder (regulatory)	Regulatory stakeholders: bodies or agencies that manage marine or coastal areas, e.g. management bodies of MPAs, fisheries regulatory and enforcement authorities.
Stakeholder (science & advocacy)	Science & advocacy stakeholders: engaged in research and/or advocacy, e.g. environmental NGOs, universities.
Synergistic institution	An institution that is conducive to or supportive of the achievement of a particular goal/objective.
Web-based GIS or WebGIS	Web-based GIS (Web-based geographic information system or simply WebGIS) is a distributed geographic information system across a computer network to integrate, disseminate and communicate geographic data visually on the Web. Web-based GIS refers to use of Internet technologies to distribute and delivery geospatial information in a variety of forms, including maps, images, datasets, spatial analysis operations and reports.
Water Framework Directive (WFD)	Water Framework Directive (WFD) entered into force in December 2000. The WFD is a legislative framework that rationalises and updates existing water legislation by setting common EU wide objectives for water (inland surface waters, transitional waters, coastal waters and groundwater) and introduces an integrated and coordinated approach to water management in Europe.

XML	Extensible Markup Language (XML) is a W3C-recommended general-purpose markup used for describing many different kinds of data.