SEVENTH FRAMEWORK PROGRAMME

Monitoring and Evaluation of Spatially Managed Areas

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Deliverable 2.2

Protocol for application of generic framework

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Introduction

This deliverable D2.2 comprises a manual containing the protocol for the application of the generic framework to the MESMA case studies. The generic framework (deliverable D2.1) is the central document for the subsequent work packages of MESMA. It provides a best practice guide for monitoring and evaluation of Spatially Managed Areas (SMA) in seven distinctive and clearly outlined steps which comprise 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 and 7) adaptation of the current management regime based on the outcome of the assessments (for details see D2.1).

It is envisioned that the first version of the manual will be specifically tailored to be used by the case studies (WP3 of MESMA). It should be an aid by which the case study investigators can test the application of the framework in practice. Thus, feedback on the performance of the framework and the manual will guide the production of a revised framework and manual (D2.3) in two years time. The revised versions will then be made available to the wider scientific community and management bodies.

As outlined in more detail in D2.1 , we have identified several links between both the framework and manual on the one hand and governance issues (WP6) on the other, which are indicated at the respective framework steps. The MESMA generic framework and manual will not cover specific governance issues. The MESMA case study research will thereby have two streams – the MESMA framework and the governance research analyses. Further guidance on the governance research elements of the case studies will be developed for each individual case study based on the research effort available and the attributes of the case study. This essentially aims to address the following questions: 1) Different perspectives amongst different stakeholders on the effectiveness of existing management measures and governance approaches; 2) Different perspectives amongst different stakeholders on the validity of potential management measures and governance approaches that could be implemented to improve effectiveness; 3) Different perspectives amongst different stakeholders on related issues such as equity, knowledges, power, top-down/bottom-up balance, etc. This 'two stream' approach will provide a clear way forward for combining the MESMA framework and governance research to the case studies in an integrated and coherent manner. As a result, issues that will be covered by the governance work package are outlined briefly in the introduction of each framework step and actions which will be largely carried out under the governance research are only summarised and the link to WP6 highlighted. For further details a separate document '**governance inputs to the MESMA framework manual**' provides details on how the two streams of work will be linked and appendix 1 shows a visualisation of the linkages between the two streams of work.

The practical implementation of the framework is also linked to specific tools which will be identified and developed in WP4 and the data handling standards specified in WP5. A revised version of the manual should then interlink the actions underneath each framework step with a set of practical tools comprising technical and conpceptual tools.

Manual user guide

The manual shall guide users in the application of the generic framework within the regional case studies. The intention of the manual is to provide clear and user friendly instructions at each step of the framework, along with specific information on how to proceed to the next step. The manual also provides specific action points which are necessary to successfully complete your management evaluation. It is a document which can be filled in and used to present the outcomes of the evaluation.
Below is some guidance for using the manual:

1. Under most actions there are tables which will help complete each action and summarise results. These should be completed at all stages. If more columns are needed the tables can be expanded in separate sheets.
2. For some tables information may have been already collected at a previous stage of the manual. Where this has happened these just need to be copied to the new table.
3. All background information used to compile the manual has been discussed and referenced in the parallel deliverable D2.1. Therefore document D2.1 should be refered to for background information.
4. Where appropiate each action has been broken down into what to do if you have good, intermediate or poor/no data available for fulfilling the task. It is useful to take some time before starting an action to assess the level of data available to you before proceeding with that action.
5. Where an action is impossible due to lack of data or expertise this information should be noted and can feed into step 7 where recommendations for future adaptations can be made.
6. The framework is intended as both an iterative process (something that runs several times where the output from one 'iteration' is used as the input to the next 'iteration') but also as a tool which can be used several times (from a new starting point) using a combination of objectives or different spatial and temporal boundaries.
7. As a general rule, start with the short exersice titled 'What can the MESMA framework deliver for the case studies?' This will help focus on the particular case study and what to expect from the framework. Next, continue to step 1a; each action should then be carried out in order before moving on the the next step. Final tables or maps for each step should be retained and will be used again in step 7. They should also be retained to be compared if further iterations are carried out.
8. There are several steps in the manual where there will be a level of uncertainty in analysing results or making decisions. At this stage in the manual where there is any uncertainty this should be reported on however a fully qualitative or quantitive method for reporting uncertainty will be further explored through feedback from the case studies and will be included in the updated manual D2.3.
9. WP5 will guide case studies on the data issues in the case studies but some general information is provided here. There is a plan to use a metadata format that is compliant with both ISO core (19115, and 19139) and INSPIRE core. A bespoke web-based tool will be used to create, share and view metadata records (GeoNetworks). For further details on this please consult D5.1.
10. All mapping exercises should result in final maps using a coordinate system WGS84 and Mercator projection format. The details will be decided based on review of accrued metadata records in 6 months time, when we hope be in a position to propose a final format. For further details on this please consult D5.1.
11. It is envisaged that an example of how the manual should be used will be completed and will be made available to all case studies when it is ready.
12. Links to the governance analysis have been highlighted using this symbol 

The application of the generic framework (general)

The rational of the developed framework is outlined in D2.1. It is essential that this document is used in conjunction with this manual. It provides further details as well as key references for the information drafted in this deliverable. The preparatory work and the sequence of steps and related tasks are described in detail in this deliverable.

Before starting with the actual assessment each case study should describe in which way the MESMA framework will be applied. For instance in some cases the single steps are processed, while in other cases the framework will be used to evaluate the process of implementing current spatial management plans. Thus each case study should outline how the framework is going to be used and what the expected outcomes are. Each step gives clear guidance on the methods and tools to be used to conduct the single steps.

In Figure 1 below, the practical implementation of each framework step is described taking into account data availability and the related variation of activities under each task. Underneath each step a number of actions are defined based on the results of the WP2 workshop. Three categories of data availability (good, intermediate, and poor) are distinguished and for each case the actions are described with clear guidance on the methods and tools to be used.

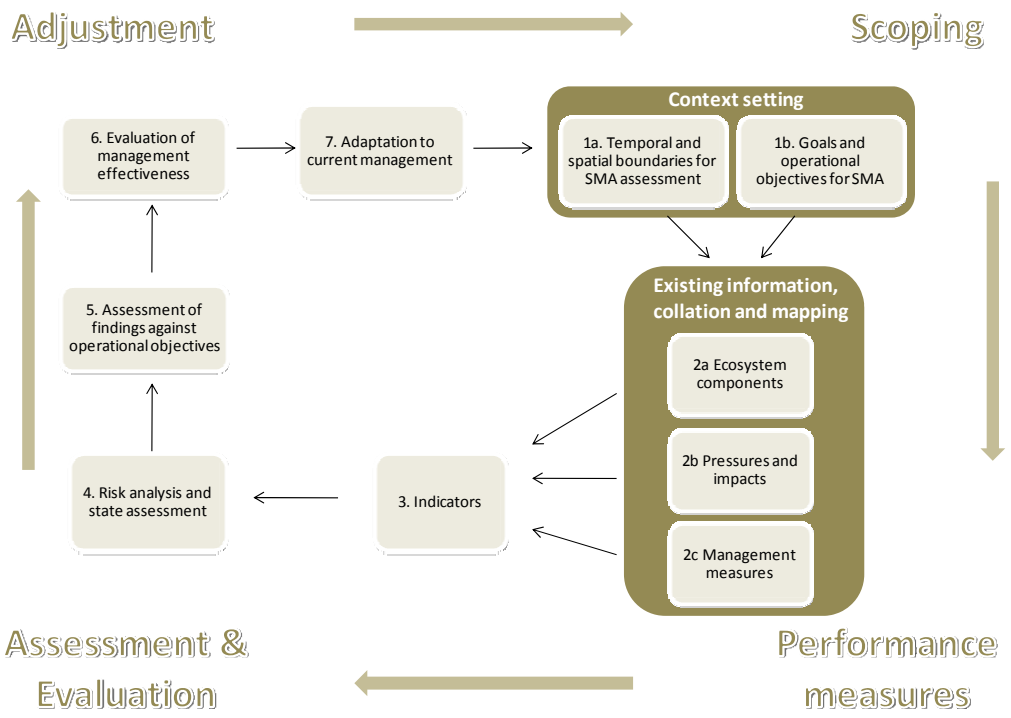


Figure 1: Proposed MESMA framework outlined in detail in D2.1

What can the MESMA framework deliver for the case studies?

With the help of a few standardised questions each case study can assess how the MESMA framework is used for the particular case and what the expected outcomes are:

i) Give a brief (150 words) description of the case study highlighting the main issues regarding its spatial management

ii) Describe the relative position of the case study within the skim below (see detailed description in D2.1):

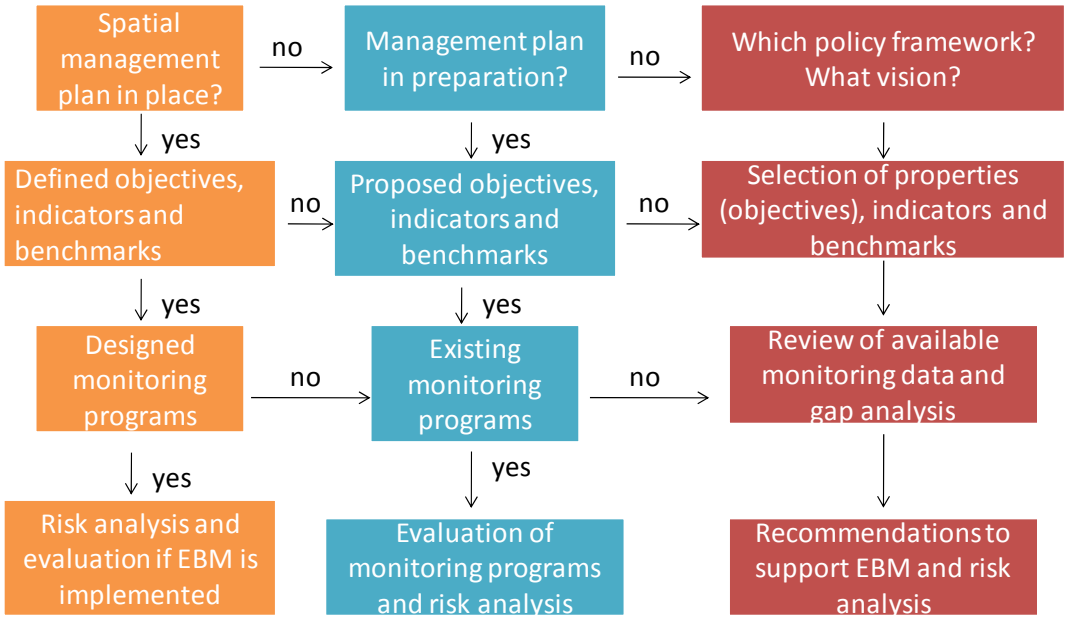


Figure 2: **Conceptual flow diagram which relates the maturity of a given spatial management in a SMA together with the available data to expected assessment outcomes.**

iii) How will the MESMA framework be used for the case study?

iv) What are the expected outcomes of the application of the MESMA framework?

Step by step guidance on the application of the generic framework

1 Context setting

Step 1a: Set temporal and spatial boundaries for SMA assessment

The aim of step 1 is to set the spatial and temporal context for the framework evaluation (1a) and to define the goals and operational objectives (1b). Both steps are carried out in conjunction and between them they should set the context for the physical area involved as well as the overarching aims of the SMA. Having decided which goal/objective will be the focus of the MESMA framework, the boundaries will often be specified in the relevant legal and policy documents and these should be the boundaries that are used in the MESMA case study research, recognising that these boundaries may themselves be a focus for disputes. The delimitation of these boundaries may be based on biogeographic or political boundaries and such this could influence disputes as well as influencing the potential to achieve conservation objectives. This way the case study research is based on actual, real policy initiatives and related conflicts, rather than hypothetical scenarios generated through stakeholder participation. Conflicting objectives such as conservation goal/objective and other local and sectoral objectives will be considered through the governance research analyses.

Thus step 1a begins by identifying and mapping existing management plans, spatial management initiatives, the patterns of activities and the 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 aid decisions. The output from step 1a is a finalised temporal scale and spatial boundary which alongside the output from step 1b will feed into step 2 to ensure that all information that is collated is at the relevant temporal and spatial scales.

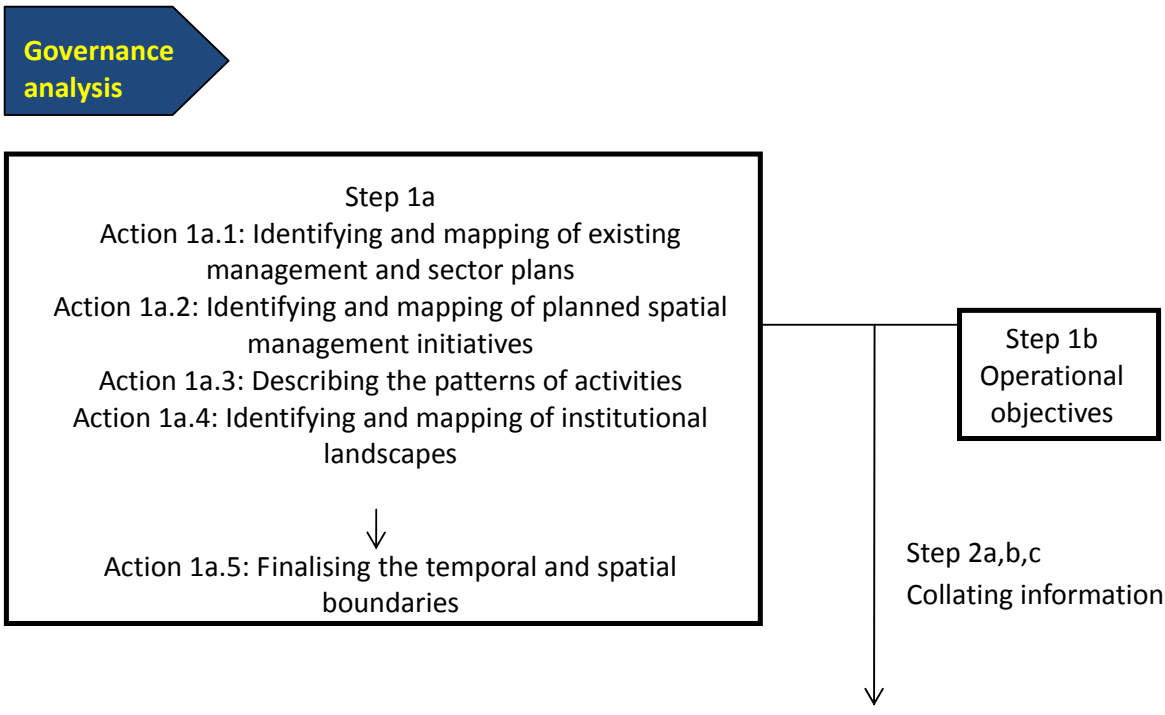


Figure 1a.1: Work flow for step 1a

Action 1a.1: Identifying and mapping of existing management plans and sector plans

Good data

Where there is an existing management plan in place this should be checked for its temporal and spatial scale.
For the temporal scale of the study fill out the table below:

Table 1a.1.1

When was the management plan implemented?	How often do audits or reviews take place?

The spatial scale of the study should be mapped using GIS software. This may be a basic polygon of the area under management or may be a more complex map of the different managed areas.
Any sectors which are active in the area but which do not come under the existing management plan should be identified and listed below.

Table 1a.1.2

List of sectors active in the area but which are not included in the spatial management plan

Intermediate data

Where a management plan is in preparation it should be checked for its proposed spatial and temporal limits.
For the temporal scale of the study fill out the table below:

Table 1a.1.3

Is the management proposal complete and does it include a set temporal and spatial scale? If no move to action 1a.2.	When is the management plan due to be implemented?	How often will reviews to the management plan take place?

The spatial scale of a proposed management plan should be mapped using GIS software. This will likely be a single GIS polygon outlining the area under planning.
Any sectors which are active in the area but which do not come under the existing management plan should be identified and listed below.

Table 1a.1.4

List of sectors active in the area but which are not included in the spatial management plan

Poor/no data

Where there is no management plan in place or one to be proposed in the near future move to action 1a.2.

Action 1a.2: Identifying and mapping of planned spatial management initiatives

Good data

Using available literature list the sectors active in the general area and indicate whether any of their activities have a spatial management initiative. Compile precise GIS layers of the spatial scale of the different sectors.
Fill out the table below:

Table 1a.2.1

Sector	Spatial management initiative? Yes/no	Date of implementation	Length of initiative? E.g. 10 year plan

Intermediate data

Using the list compiled in table 1a.1.4 and available data and where necessary expert advice list the sectors active in the area. Compile GIS layers of the sectors which have spatial management initiatives. For those sectors for which the spatial scale is less well known compile polygons or point layer files using the best of available knowledge. Fill out table 1a.2.2 below:

Table 1a.2.2

Sector	Spatial management initiative? Yes/no/don't know

Poor/no data

If there is little or no information on sectors which have spatial management plans, move on to action 1a.3.

Action 1a.3: Describing the patterns of activities (existing, in progress and future planned)

Good data

Using available data fill out the table below regarding any activities that occur or will occur in the area and compile precise GIS layers for where these activities occur.

Table 1a.3

Activity	Whole region/certain location (specify)	Seasonal (specify)/ year round	Is it an important activity in the area?

Intermediate data

Using available data or where necessary expert opinion fill out the table under good data above. Where good information exists on an activity compile precise GIS layers of its spatial scale. For activities where less information is available GIS layers containing estimated polygons or points should be compiled.

Poor/no data

Where there is little or no data available on existing activities then move to action 1a.4.

Action 1a.4: Identifying and mapping of institutional landscapes

The identification and mapping of institutional landscapes will compile information on Regulatory bodies, Countries, Legislation and policies and Research institutes. This will be explored through WP6 governance research.

Using the information collated through WP6 compile GIS layers showing the relevant boundaries for each of the institutional landscapes identified.

Action 1a.5: Finalising the temporal and spatial boundary for your SMA

Use the flow chart below to define the spatial boundary

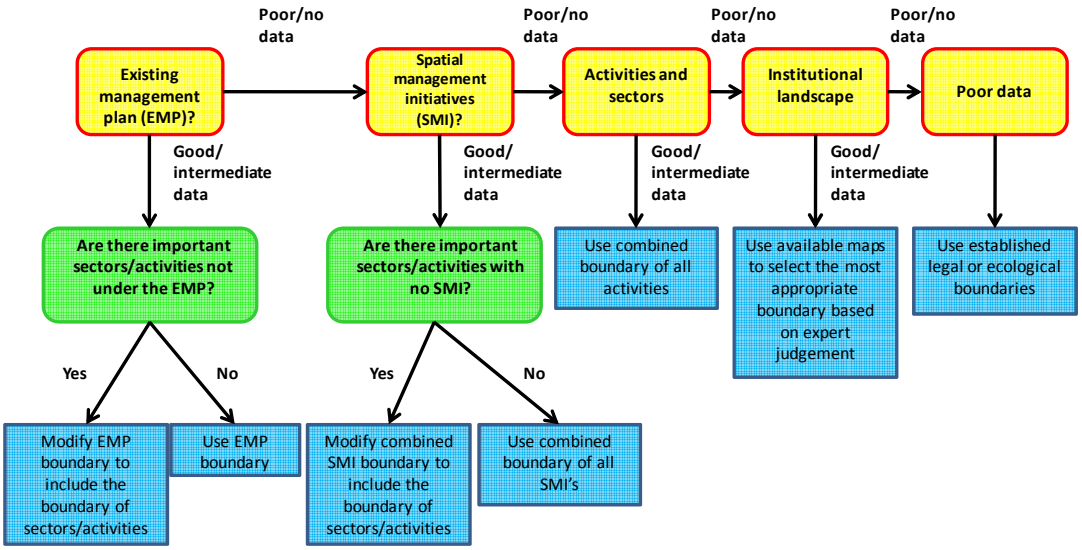


Figure 1a.2: Flow chart to define the spatial boundary. EMP (existing management plan), SMI (Spatial management initiative).

The temporal boundary can be defined using the following rules:

- Where a time scale has been defined in the management plan this should be used
- If this is not officially defined then the time between reviews/ audits should be used
- If none of this information is available then a default time scale should be thought about and decided upon.

Step 1b: Goals and operational objectives for 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 together they provide details of the physical area as well as the overarching aims to be evaluated. Step 1b uses similar literature and approach to step 1a. The first actions are the identification on the existing or proposed management plan and collection of objectives which may come from legal obligations. Next looking at objectives and how they contribute to the ecosystem as well as ensuring that the ecological and socio-economic objectives are well balanced is important. In order to assess operational objectives they need to 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 for example achieving good environmental status for the Marine Strategy Framework Directive. This evaluation will be complemented by the WP6 governance research, which will focus on the stakeholders' perspectives on the validity of the goals and objectives, potential/actual conflicts between different goals and objectives, and the potential for achieving a balance between high-level, top-down obligations and local priorities. Finally the output is a list of clearly defined goals and operational objectives for the SMA and a paragraph describing any potential compliance issues 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 met or not, and finally in step 7 to identify adaptive management needs. The final important output from step 1b is a list of stakeholders in the SMA, identified through the WP6 governance research.

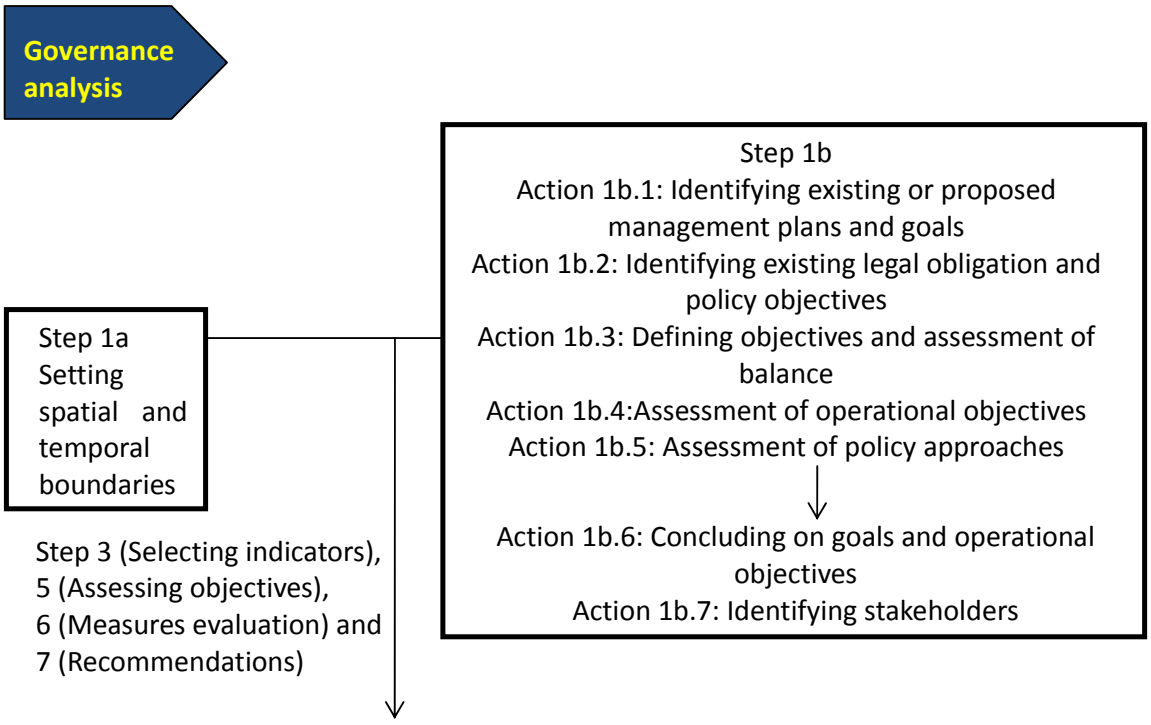


Figure 1b.1: Work flow for step 1b

Action 1b.1: Identifying existing or proposed management or sectoral plan and goals

Good data

If there is an existing management plan or sectoral plan in place this plan should be checked for the goals and operational objectives. To give an overview of the goals in the management/sectoral plan fill out the table below:

Table 1b.1.1

Which goals are addressed in the management/sectoral plan?	Define the area for which the goal is set (entire case study area, or just a specific part or specific habitat/species)	By which year should the goals be achieved?	How often are the management/sectoral plan and its goals reviewed?

In the case of several management/sectoral plans in one case study area:

- fill the table above for each management plan.
- check for any overlapping or conflicting goals between the management plans (in order to get a complete overview of all goals stated).

Intermediate data

Where a management plan is in preparation it should be checked for its proposed goals.
Fill out the table below:

Table 1b.1.2

Is the management proposal complete?	When is it due to be implemented?	Which goals are addressed?	Define the area for which the goal set (i.e. entire case study area?)	By which year should the goals be achieved?	How often will reviews take place?

In case of several (proposed) management plans in one case study area follow the steps as stated under 'good data'.

Poor/no data

Where there is no management plan in place or no management plan to be proposed in the near future move to action 1b.2.

Action 1b.2: Identifying existing legal obligations and policy objectives

Good data

Using available sources list the laws, statutes and regulations applicable to the area including domestic legislation transposing international and European obligations and local byelaws. Identify related policy objectives and guidance and fill out table 1b.2 below.

Table 1b.2

Statute - title and reference	Implementing department or agency	Key regulations and byelaws - reference	Related policy objectives and guidance - reference

Intermediate Data and poor/no data

Legal obligations are clearly defined and recorded data. Expert legal opinion should be obtained to ensure that all obligations have been identified and recorded in table 1b.2.

Action 1b.3: Defining objectives and assessment of balance

It is important that the ecological and socio-economic operational objectives that are chosen for evaluation are considered for how they contribute to a healthy and functioning ecosystem. Fill out table 1b.3 considering this for each goal or operational objective.

Table 1b.3

Operational objective	How does it contribute to a healthy and functioning ecosystem?

Usually an SMA will have a range of ecological and socio-economic objectives. It is important for evaluation that these are well balanced. How well the ecological and socio-economic objectives are or can be balanced will be evaluated through the WP6 governance research, drawing on the institutional settings and the views and perspectives from stakeholders of the SMA.

Action 1b.4: Assessment of operational objectives

Operational objectives should be SMART (Specific, Measurable, Achievable, Realistic and Time-bound), for definitions see D2.1. Filling out Table 1b.4.1 will show which objectives are not SMART.

Table 1b.4.1

Operational objective	Specific (yes or no)	Measurable (yes or no)	Achievable (yes or no)	Realistic (yes or no)	Time-bound (yes or no)	Comments

Where an objective has been found to not be SMART then action should be taken in order to make it SMART i.e. make it operational. Fill out table 1b.4.2 with the new list of fully SMART operational objectives.

Table 1b.4.2

Operational Objectives

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 both. The balance between these policy approaches will give an indication of how likely end-users will be to follow enforcement laws in the SMA. This assessment will be carried out through the governance analysis.

Governance analysis

Action 1b.6: Concluding on goals and operational objectives

Using table 1b.4.2 fill in table 1b.6.1 below to give an overall view of the goals and operational objectives. When filling the table, if possible, put linked legal obligations, policy goals or operational objectives or management goals or operational objectives on one line. Where a legal obligation or policy goal or operational objective is additional to a management plan or where a management plan does not exist this column will remain empty.
Defined area, time scale and review period may not be equal between 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

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

Using the list of operational objectives in table 1b.6.1, rank the operational objectives in order of importance depending upon the higher level goals of the SMA. Fill out table 1b.6.2 to reflect this giving information on reasons why these decisions were made:

Table 1b.6.2

Operational objective	Rank	Reasons

Action 1b.7: Identifying stakeholders

Stakeholder participation is required at several steps in the framework and will be facilitated by the governance research analysis. Here all relevant stakeholders and their interests in the area will be explored through the governance analysis in WP6.

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 added to and expanded depending on the SMA that is being evaluated. Once ecosystem components are identified for the area they need to 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.

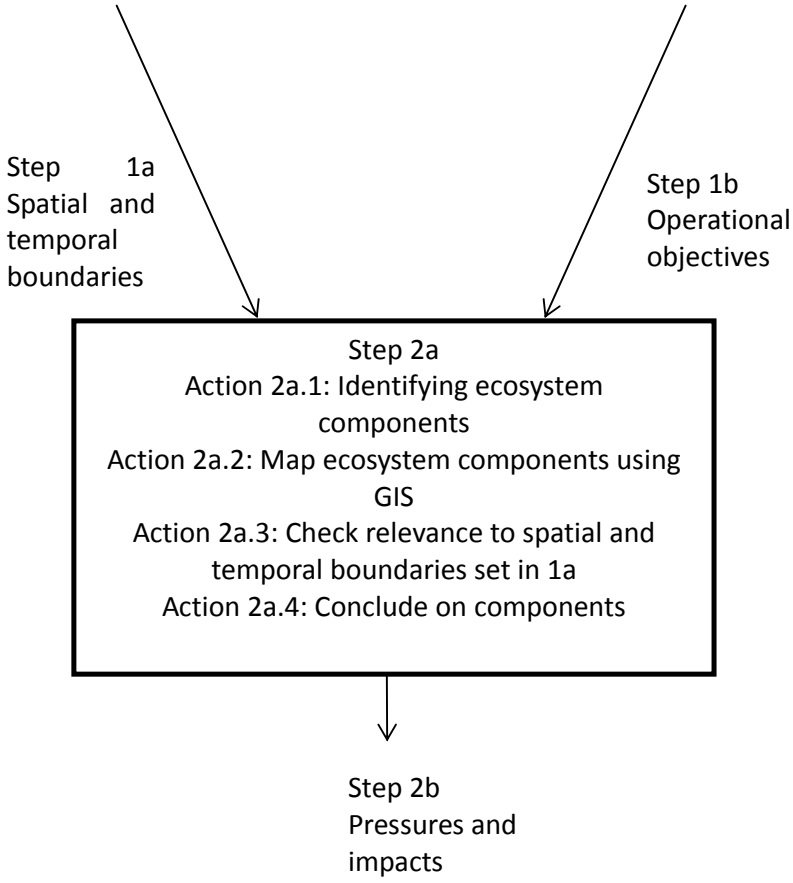


Figure 2a.1: Work flow for step 2a

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

Table 2a.1.1: MSFD list of ecosystem components (Table has been taken from the MSFD annex iii and can be added to depending upon the SMA under evaluation).

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 out table 2a.1.2 below with the list of ecosystem components in the SMA. Indicate where these have been taken from table 2a.1.1 above or some other reference and indicate which operational objective listed in step 1b the component is relevant to.

Table 2a.1.2

Ecosystem component	Reference (e.g. MSFD or other)	Relevant objective

Action 2a.2: Collect spatial information on ecosystem components / map ecosystem component

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 e.g. 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 are outlined further under the 'manual user guide'.
- Restrictions on use or publication of existing spatial data.

These issues should be discussed and decided upon before taking any further action in close cooperation with WP5. Where possible maps should cover the entire SMA.

Good data

Where there is good information available on the ecosystem components listed in table 2a.1.2 above collate relevant GIS layer files in as much detail as possible about the spatial coverage of that ecosystem component.

Intermediate data

Where information on ecosystem components is not readily available then 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.

Poor/ no data

Where there is poor or no data available then any available literature on the ecosystem components should be compiled that may enable a judgement to be made.

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

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

Action 2a.4: Conclude on all relevant ecosystem components

Fill out table 2a.4 below which concludes on all ecosystem components relevant to the SMA.

Table 2a.4

Ecosystem component	Relevant objective	Spatial coverage (good/poor)	Temporal coverage (good/poor)

Step 2b: Identify pressures and impacts

The aim of step 2b is to analyse the spatial overlap of the distribution pattern of the relevant natural and socio-economic ecosystem components with pressures and impacts and an assessment of potential interactions. The first action is to identify 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 geostatistics 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.

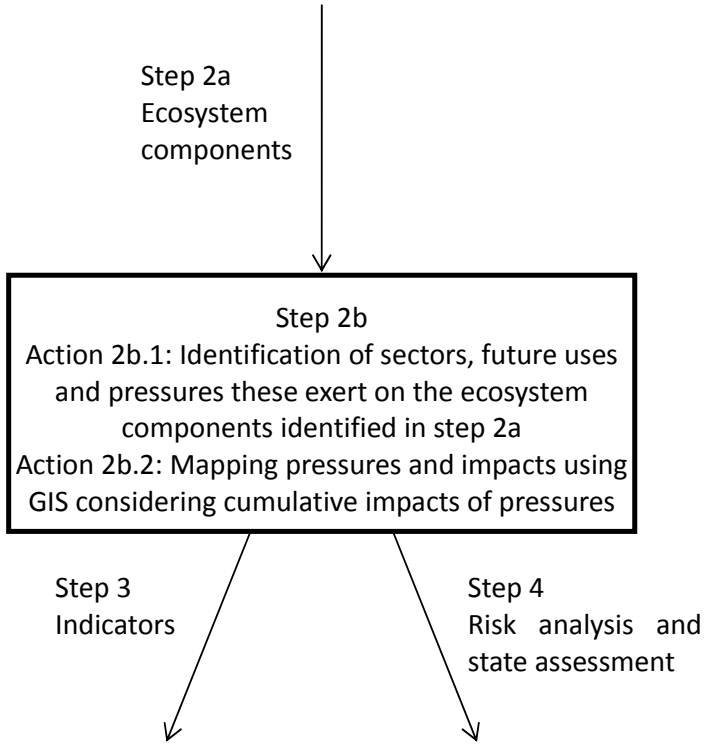


Figure 2b.1: Work flow for step 2b

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 the ecosystem components can be identified using table 2b.1.1 **(this table is large so it will be made available on the sharepoint to accompany the manual)**. This table, taken from the MarLIN initiative (see http://www.marlin.ac.uk/maritimeactivitiesmatrix.php, for details) identifies sectors, their activities and the pressures and impacts they have on the marine environment. Using information collected in step 1 of the manual, 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. Finally use the key to list the key pressures that are likely to be having a possible (might happen) or probable (very likely to happen) effect from that sector in the SMA. Fill out table 2b.1.2 to summarise the sectors, activities, pressures and impacts likely to be occurring in the SMA and to indicate if this is a possible or probable effect. The field “Sensitivity to human activities”

provided for each European marine habitat in the MESMA Catalogue of European seabed biotopes (Deliverable D1.2) will be helpful to complete this step.

Table 2b.1.2

Sector	Activity	Pressure	Probable (R) or possible (P)?

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 via table 2b.2.1 below.

Table 2b.2.1

Sector	Activity	Pressure	Relevant natural ecosystem Component	Impact (adverse affects). Persistence and resilience

First generic pressure maps need to be produced in GIS accounting for the footprint and intensity of the human activities. The footprint of an activity is the actual area affected by the activity.

Good data

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 to 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 which 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. 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 to the merged activities layer. This allows us to summarise proportion of each grid cell affected by the footprint and/ or intensity of all the human activities exerting the same pressure and to produce respective pressure maps.
Fill out table 2b.2.2 to summarise these pressure, 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)

Create a GIS raster layer of the pressures where the value in each cell is the proportion of 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 for determining this. 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'. NS = not sensitive, NR = not relevant taken from http://www.marlin.ac.uk/sensitivityrationale.php

		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

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 and the human pressures along the row headings and filling in the sensitivity information for each ecosystem component on each pressure.

Table 2b.2.4

		Ecosystem components		
Human pressures				

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), 0.2 (low), 0.6 (medium), and 1 (high). 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 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.

Intermediate data

Similar to good data, in cases where the geodata of human activities have been generated with expert knowledge the activity data should be merged by the generic pressure categories. A vector grid with an adequate cell size reflecting a good comprise between the spatial resolution of the data used and the scale of the SMA should be superimposed to the merged activities layer. This allows to summarise proportion of a grid cell affected by the footprint and/ or intensity of all the human activities exerting the same pressure and to produce respective pressure maps.

The sensitivity of each ecosystem component to the human pressure categories should be determined and summarised in table 2b.2.5. This may be limited to expert judgement.

Table 2b.2.5

		Ecosystem components		
Human pressures				

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), 0.2 (low), 0.6 (medium), and 1 (high). 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 an 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.

No data

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

Table 2b.2.6

		Ecosystem components		
Human pressures				

Step 2c: Identify existing management measures

The aim of this step is to identify the implemented and/or proposed management measures. The information collected during the actions in step 1b, where the goals and operational objectives for SMA are established, will be used. The effectiveness of any management measures taken is partly depending on how well the management measures take into account and answer to the desired operational objectives. In successful and efficient management it is therefore 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, through 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, other than in so far as how they are related to the laws/policies concerning the goal/objective. Further guidance on which existing management measures should be reviewed in relation to the case study goal/objective will be developed in relation to each case study via the governance research analysis. 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 the adaptation of the current management will be considered. Step 2c links to the governance analysis. An initial task under WP6 will be to collate information on the existing management measures in relation to the related objectives on which the study is focused.

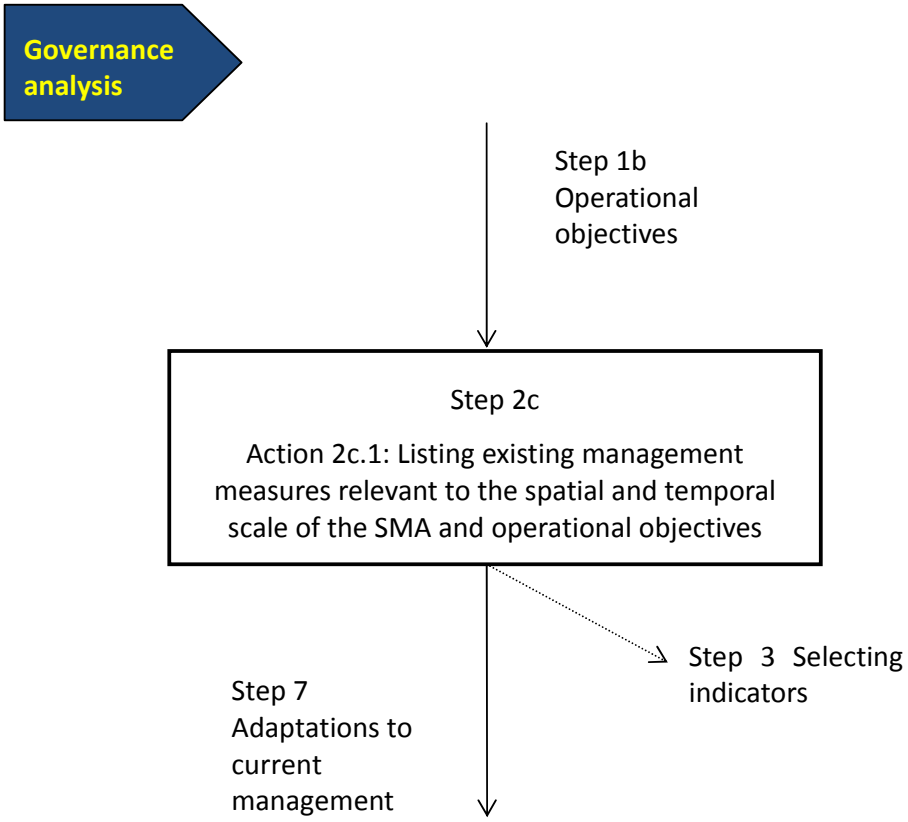


Figure 2c.1: Work flow for step 2c. See also the governance analysis for further visualisation of step 2c.

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

Generally, management measures can be grouped according to:

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

However, since management measures are largely controlled through governance this will be dealt with through the governance analysis undertaken by WP6.

Step 3: Selecting indicators and thresholds

The previous steps produced the spatial and temporal boundaries (step 1a) for the assessment and defined a suit of operational objectives (step 1b) balanced between the number of environmental and socio-economic objectives. The selected objectives have been related to the relevant ecosystem components (step 2a) and the spatial overlap between those components and the spatio-temporal distribution pattern of human pressures has been assessed (step 2b). The aim of this step is to guide through a standardised process on how to select 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 comprises how to assess the appropriateness of the indicators (viability analysis) and to report on both the rational for selecting thresholds or using trends and gaps in data availability. The output of this step is a list of indicators suitable to assess an existing marine spatial management plan or an envisioned spatial management scenario. The actual assessment of the state of the indicators in relation to human pressures will be conducted in step 4 (see Figure 3.1).

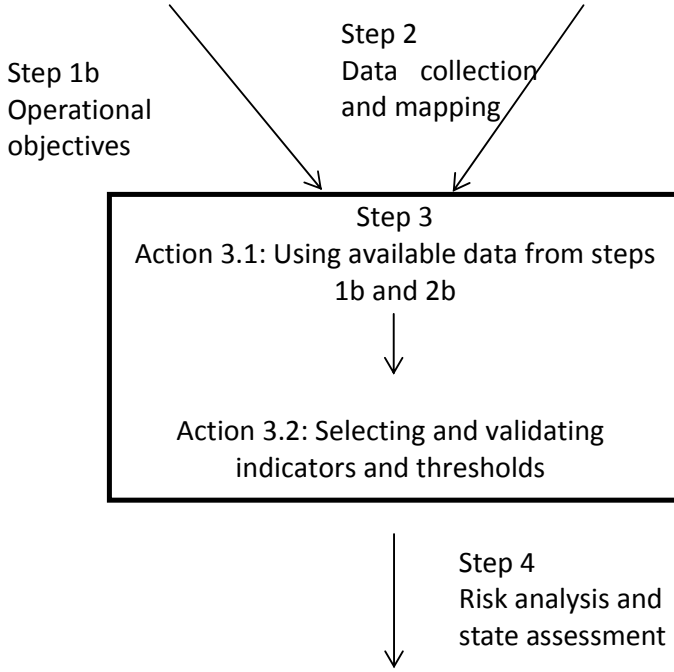


Figure 3.1: Work flow diagram for step 3

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

For each operational objectives defined in step 1b identify the relevant environmental and socio-economic components (step 2a) and compile information on the availability of relevant data. Using this information fill out table 3.1 for each operational objective:

Table 3.1

Operational objective	Environmental or socio-economic component	Quality of available data			Description /Source /Accessibility
		Good	Intermediate	Poor/no data	

Action 3.2: Selecting and validating indicators

The indicators will be chosen to facilitate tracking whether the operational objectives set for the specific SMA are met.

An extensive knowledgebase on indicators exists already and has been partly collated within WP1 of MESMA. In the following some example sources are listed: In the European Seas a global objective is the Good Environmental Status, as described in the Marine Strategy FD (2008/56/EC) and the Commission Decision 2010/477/EU. The MSFD (Annex I) proposes 11 descriptors of the GES (Biological diversity, Alien species, Commercial Fish, Food webs, Eutrophication, Sea floor integrity, Hydrography, Contaminants, Contaminants in food, Marine litter, Energy including noise) that cover the most common components relevant for likely operational objectives. Several task groups developed a suit of 83 indicators (see D2.1) for those descriptors (2010/477/EU). Some of those indicators are already elaborated for the needs of the Water FD (2000/60/EC), published and tested in the Inter-calibration process. Some others are in preparation and the complete set of indicators for the 11 descriptors will be ready by 2015. Another source of indicators is the Handbook for Measuring the Progress and Outcomes of Integrated Coastal and Ocean Management, 2006, UNESCO. Practical experience from the implementation of integrated coastal zone management (ICZM) produced an array of literature on relevant indicator selection (see e.g. Diedrich et al. 2010 and references therein). 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 details on these and for the references used in this section please refer to D2.1.

Indicators (state and pressure indicators) should be viable from both a scientific and a management perspective. Thus for each of the selected candidate indicators conduct a viability analysis by scoring the indicators good (3), medium (2) or poor (1) using the set of criteria listed in table 3.2 (modified after ICES criteria for good indicators). One table should be filled out per candidate indicator.

Table 3.2

Criteria for viability analyses	Score (good=3; medium=2; poor=1)
Relatively easy to understand by non-scientist 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 a 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); non (1))	
Complexity of managing the indicator (high level of coordination or expensive technological requirements)	
Sum	

Insert the results of the individual indicator assessment in the following table and indicate if the respective indicator is selected for the subsequent analysis. From the final set of indicators, identify which are most important to evaluate the ecological status, pressures and impacts, and management measures in the SMA in question, in order to prioritise if resources are limited.

Table 3.3

Candidate indicator	Total Score	Selected (Y/N)

After having selected the most appropriate indicators for each goal/operational objective, fill in the following Table 3.3 to identify gaps in available data (separately for each goal/operational objective):

Table 3.4

Goal/Operational Objective:

Indicator	Needed data	Availability		Remarks
		YES	NO	

Availability means true access to the needed 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 *Remarks* explaining the reasons for non-accessibility).

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 the high level goals for instance such as the sustainable use, thus a respective reference point indicates a level of sustainable use or development. For some established indicators respective thresholds may be defined, while for others thresholds have to be defined. List in table 3.5 the indicators and the availability of thresholds.

Table 3.5

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

For the indicators listed in table 3.5 where no threshold is established yet and no trend will be used describe how the threshold will be derived to conduct step 4 either using 1) historical data, 2) model estimates, 3) reference areas (high pressures vs. low pressure) or 4) expert knowledge. Subsequently the rational and derived thresholds should be outlined.

Based on the above tables summarise the existing gaps preventing the estimation of the selected indicators and propose solutions, such as a monitoring program to collect additional data to fill these gaps, or how to obtain access to existing data that are not open.

Step 4: Risk analysis and state assessment

After the performance indicators have been selected and their thresholds (or trends) were determined (step 3), step 4 now looks into the technical characterisation of risk (step 4.a) and state (step 4.b) and the differentiation between both depending on the actual state 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 (i.e. risk analysis, step 4.a). If a spatial management plan is in place, step 4 should (also) calculate whether or not the operational objectives were met (i.e. state assessment, step 4.b). 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.

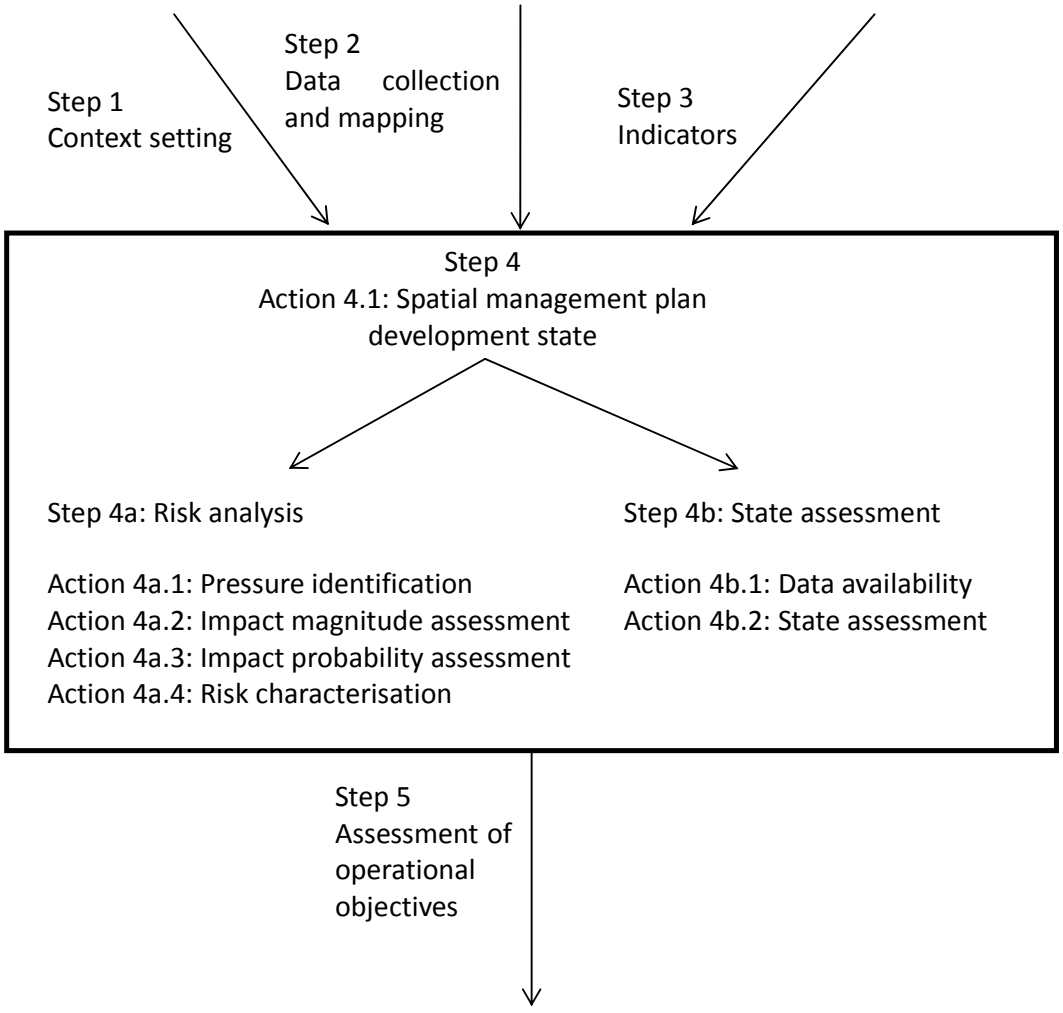


Figure 4.1: Work flow of step 4

Action 4.1: Spatial management plan developmental state

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

Before management measures to achieve the operational objectives are implemented, several alternative spatial management plans (= scenario's), each with their specific management measures should be developed and their anticipated efficiency evaluated and compared through a risk analysis. The steps to be taken to run this risk analysis are comprised under step 4.a.

When management measures to achieve the operational objectives are implemented, the actual state, as obtained through the implementation of the management plan, should be checked against the anticipated thresholds or trends of the indicators (Step 3). The steps to be taken to run this state assessment are comprised under step 4.b.

Evaluation of the spatial management plan developmental state based on the results of Step 1:

- spatial management plan not available: go to step 4.a.
- spatial management plan available, but not implemented: go to step 4.a.
- spatial management plan implemented: go to step 4.b.

Step 4a: Risk analysis

Action 4a.1: Pressure identification

Using the information on pressures, collected in step 2b, and the indicators, taken from step 3, list them in table 4a.1 below.

Table 4a.1

Indicator	Pressure

Action 4a.2: Impact magnitude assessment

Using available literature, assess the magnitude of the impact these pressures will have on the indicator. In other words: Is the impact high, medium or low? Fill out table 4a.2 to summarise this.

Table 4a.2

Indicator	Threshold / Trend	Pressure	Magnitude of Impact (high, medium or low…)

Action 4a.3: Probability assessment

Using the maps produced in steps 2a and 2b and GIS tools identify where there may be overlap between the indicator and pressures. Produce GIS maps which indicate these overlaps occur and whether the likelihood of occurrence of an impact is high, medium or low.

Table 4a.3

Indicator	Threshold / Trend	Pressure	Likelihood of occurrence

Action 4a.4: Risk characterization

The information in table 4a.2 and 4a.3 shall be used to fill out the scoring matrix given in table 4a.4.1 to assess the overall severity of the impact. < 3: Low risk; 3-4: Medium risk: > 4: High risk.

Table 4a.4.1

Likelihood	High (3)	3	6	9
	Medium (2)	2	4	6
	Low (1)	1	2	3
	Impact	Low (1)	Medium (2)	High (3)
	Severity: Low:1-2, Medium: 3-4, High: 6,9			

Fill out table 4a.4.2 below to characterise the risk.

Table 4a.4.2

Indicator	Pressure	Risk (low, medium or high)

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 no good data are available for a given indicator, then the process of its state assessment halts here until the appropriate data can be collected. In this case, the risk analysis outlined in the previous actions has to be undertaken as an intermediate solution.

Question to be answered:
Does the available data, taken from step 2, allow for the assessment of the status of the indicators, selected in step 3?

Table 4b.1

Indicator	Data availability?

Action 4b.2 Indicator state assessment

When good (= appropriate) data are available, these data are now to be used to quantify (or qualify) the status of the selected indicators (= monitoring, based on existing data) and evaluate this figure relative to the indicator's threshold or trend.

Table 4b.2

Indicator	Indicator status	Indicator threshold or trend	Evaluation

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, by how much and their relative importance in terms of future management adaptations. In order to achieve the aims of this step several actions are proposed. First, a summary of the state or potential state of the indicators and how these are linked to the operational objectives is completed. Secondly, an overall table which lists the operational objectives and indicates if these have been achieved or failed, how successful or unsuccessful they were, how important operational objectives were in terms of 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) will highlight if indicators used for analysis were appropriate which will feed into step 7.

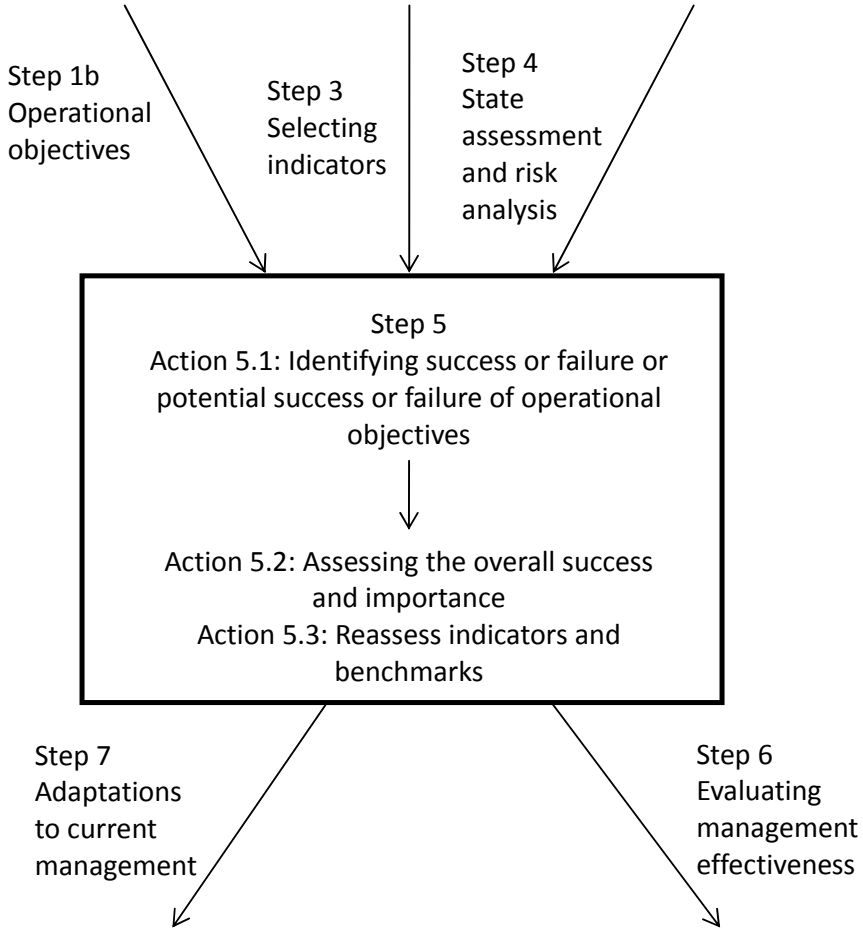


Figure 5.1: Work flow for step 5

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 broken up 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 **state assessment** is carried out then it is possible to clearly identify whether objectives have been met or not. If a **risk analysis** has been carried out then we can only investigate the risk of the objective to fail the state assessment. Where trends were used as benchmarks then descriptive text on their performance should be provided. Were a threshold is used then a definitive answer on state or potential state of the indictor should be presented as well as an indication of the extent of the gap.

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. Use these to fill the tables below for both environmental and socio-economic objectives. The extent of gap can be either a qualitative or quantitative description of the observed gap.

Table 5.1.1

Environmental operational objective	Indicator	Current level	Threshold/Trend	Extent of gap (where applicable)

Table 5.1.2

Socio-economic operational objective	Indicator	Current level	Threshold/Trend	Extent of gap (where applicable)

In the next step, prioritise the gaps in terms of importance to meet the operational objective i.e., identify the gaps which are most severe. Fill table 5.1.3 below in decreasing order of priority:

Table 5.1.3

Operational objective	Gap (in order of most important to least important)
	1)
	2)
	3)
	4)
	...)

Risk analysis:

Using the results of the risk analysis summarise where the risk of the indicator being in an undesirable state is high, medium or low and link this to operational objectives by filling out the summary tables below for environmental and socio-economic objectives.

Table 5.1.4

Environmental operational objective	Indicator	Risk (high, medium or low)

Table 5.1.5

Socio-economic operational objective	Indicator	Risk (high, medium or low)

Action 5.2: Assessing the level of success and importance

This action requires confirmation on whether the operational objectives have been achieved or failed, and a weight assessment on their importance for the development of future management options.

- Based on the results summarised in tables 5.1.1-5.1.5 above indicate in table 5.2. whether the operational objective has been achieved (a) or failed (f).
- Fill out column three using decisions made based on importance from table 1b.6.2 regarding the rank of operational objectives in order of importance depending upon the higher level goals of the SMA.
- Give objectives a weighting based on their need for development of future management where 1 is not relevant e.g. objective is met therefore no adaptations to management is needed and 5 is very relevant e.g. failure in an important operational objective for the high level goals of the SMA therefore it is important that adaption's to current management are made.

Fill in table 5.2 to summarize this:

Table 5.2

Operational objective	Achieved (A) or failed(F)	Rank of importance of objective	Weighting of relevance for future management

Action 5.3: Reassessing indicators and thresholds

Step 3 of this manual 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. Use a separate table for each indicator.

Table 5.3

Evaluation question	Score (good=3; medium=2; poor=1)
Did the indicator provide a response directly related to the intended objective?	
Were the indicators and thresholds easily to communicate (especially to stakeholders)?	
Was there sufficient data available to measure the indicator?	
Was the indicator sensitive enough to change over the relevant temporal scale defined in step 1a?	
Was the indicator cost effective?	
Sum	
Viability score from step 3	

Score from this assessment:
5-8= Indicators performance was poor and an alternative indicator should be developed to assess that type of objective
9-12= Indicators 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= Indicators performance was good and should be reported as a useful indicator to assess that particular objectives.
Overall using the two scores from step 3 and step 5 the performance of the indicator can be summarised.

Step 6: Evaluate management effectiveness

The aim of step 6 is to evaluate the success of the chosen management measures in terms of achieving the operational objectives (implemented or recommended). In order to achieve this aim, we will assess the success of the management measures (as defined in step 2c) in the light of the objectives (step 1b), which includes an discussion about why individual management measures did or did not meet the expectation in achieving an operational objective (as listed in step 5). The outcome of this work package will be a table about which management measures were/ were not/were partly successful for which objectives. The table will be accompanied by a text explaining the outcome of the table. This text will be focussing on the objectives that have not or only partly been met and discuss potential explanations to these outcomes with reference to management measures used. It is important to recognise that the management effectiveness in achieving the goal/objectives for each SMA will be evaluated on a scientific basis, including the key pressures from particular sectoral activities, 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 effectiveness of the existing management measures in achieving the environmental goals/objectives, including their views on the validity of these objectives. These views will be explored through the governance research and input into the MESMA framework analyses. Thus the final output of this step will make clear where (recommendations for) adaptation to current management is needed, which is used as input in step 7. The governance framework will assess effectiveness of management measures in terms of existing and potential governance approaches and stakeholder views on effectiveness.

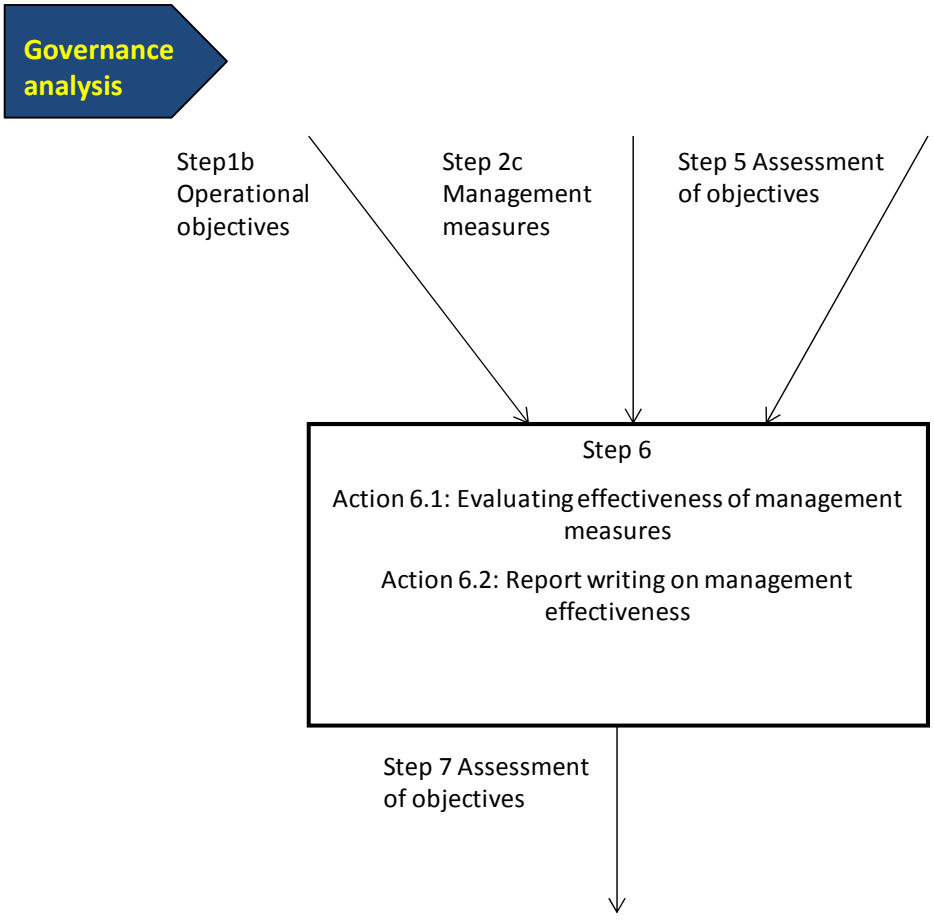


Figure 6.a: Work flow chart of step 6

Action 6.1: Evaluate effectiveness of management measures

Using the outputs from actions 1b, 2c and 5, summarise what management measures are being used to help achieve the respective operational objectives

Fill out the table 6.1 below linking management measures to objectives.

Table 6.1:

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

Using table 6.1 above discuss for each operational objective which management measures have contributed most to the success or failure of an objective. This activity is largely an expert based opinion approach and those involved with discussions should be carefully selected. It is also important to integrate such expert opinions with stakeholder views to give a full picture of the effectiveness of the management measures and their distributional effects. Stakeholders' views and perspectives on the effectiveness of management measures will be explored through the WP6 governance research.

Action 6.2: Write a report on the management effectiveness

A final report which will feed into step 7 should now be written and includes information which discusses the current management system and where this is being successful or where this is failing. The reasons why the management measures are useful or not will also be considered and ideally include ecological, socio-economic and governance reasons.
To discuss the current management measure(s) please use the following structure:

- 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.
- Summarize for each management measure if it mainly was successful/partly successful / unsuccessful in contributing to the objective. This includes a critical evaluation of whether or not the taken management measure is linked well to the operational objective.

Step 7: Recommend adaptations to current management

Depending on the suitability of the current management, adaptations might be needed. In step 7 recommendations of adaptations are produced if needed. Step 7 is based on results from earlier steps, using the outputs from step 5 and 6 as inputs. 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 will link to the governance framework (WP6) by assessing the governance approaches that could support the implementation of the management recommendations. This 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 stakeholder (governance analysis) and scientific perspective (generic framework); 2) Potential restrictions that are recommended from a scientific perspective (generic framework), i.e. the application of the MESMA framework, ranging from temporal/spatial restrictions to complete bans, on particular sectoral activities that lead to pressures that are undermining effectiveness in achieving goals/objectives; 3) The validity and feasibility of implementing these restrictions from political, legal, policy and stakeholder perspectives (governance analysis).

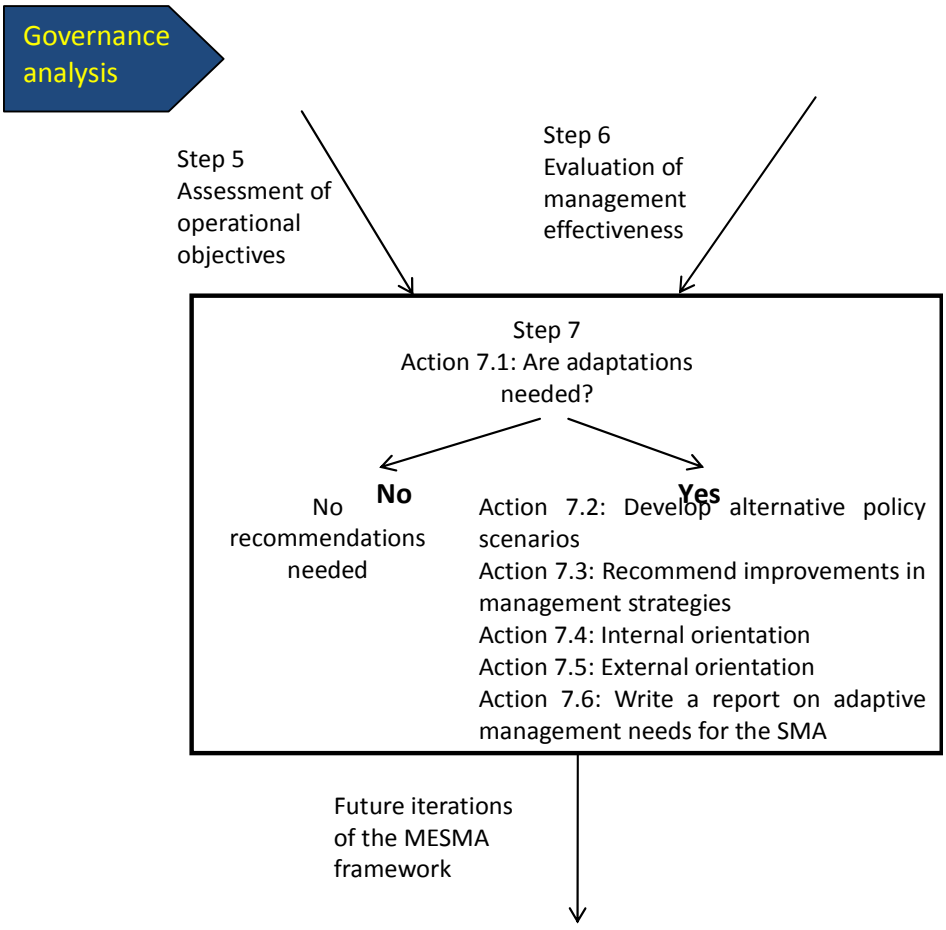


Figure 7.1: Work flow for step 7

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

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

- If not, no recommendations needed. Go to action 7.6.
- If yes, proceed with action 7.2.

Action 7.2: Develop alternative policy scenarios

Good and Intermediate data

In order to develop alternative policy scenarios first redefine 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 (e.g. seawater warming), 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.

Once scenarios have been chosen they should be developed by identifying the costs, actors, benefits and beneficiaries of the alternative scenario in table 7.2 below.

Table 7.2

	Costs	Actors (bearing the costs)	Benefits	Beneficiaries
Present policy				
Alternative scenario 1				
Alternative scenario 2				

For each alternative scenario different consequences of policy alternatives (e.g. as result of policy scenario writing); these consequences (or the expected effects) are compared. Finally the identification of any potential conflicts should be carried out. Write a short summary including each of these points for each alternative scenario.

Poor/no data

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

Action 7.3: Recommend improvements in management strategies

Select the preferred alternative policy scenario from table 7.2 above. This scenario can be used to identify and select the management measures.
Input is needed which has been collected from step 5 and 6 and also from the governance work package (WP6). Table 7.3.1 shows the information that is needed and where it can be found in the manual or through other work packages:

Table 7.3.1

Input	Where it can be found
The level of success of operational objectives	Table 5.2
Gaps which indicate that objectives are not met	Tables 5.1.1 – 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	Governance analysis (WP6)
Equity, knowledges, power and other related concerns for governance	Governance analysis (WP6)
Balance and difference between local and high level objectives	Governance analysis (WP6)

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, the questions in table 7.3.2 should be answered using the information indicated above:

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 out table 7.3.3 to conclude on the suggested improvements to management, monitoring and participation strategy through adjusted objectives, indicators and stakeholder involvement (this information will link back in to the governance analysis).

Table 7.3.3

Alternative scenario:		
Improvements in...	Changes in...	What are the changes...?
Management strategy	Natural objectives	
	Human objectives	
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

An internal orientation poses the question 'Are the improvements realistic?' Therefore evaluating the adequateness of the new objectives. This question will be addressed through the governance analysis in WP6.

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, regional, national 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 following the template below.

Report on adaptive management needs for the SMA *Name and location of SMA*
Results from application of generic MESMA 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*

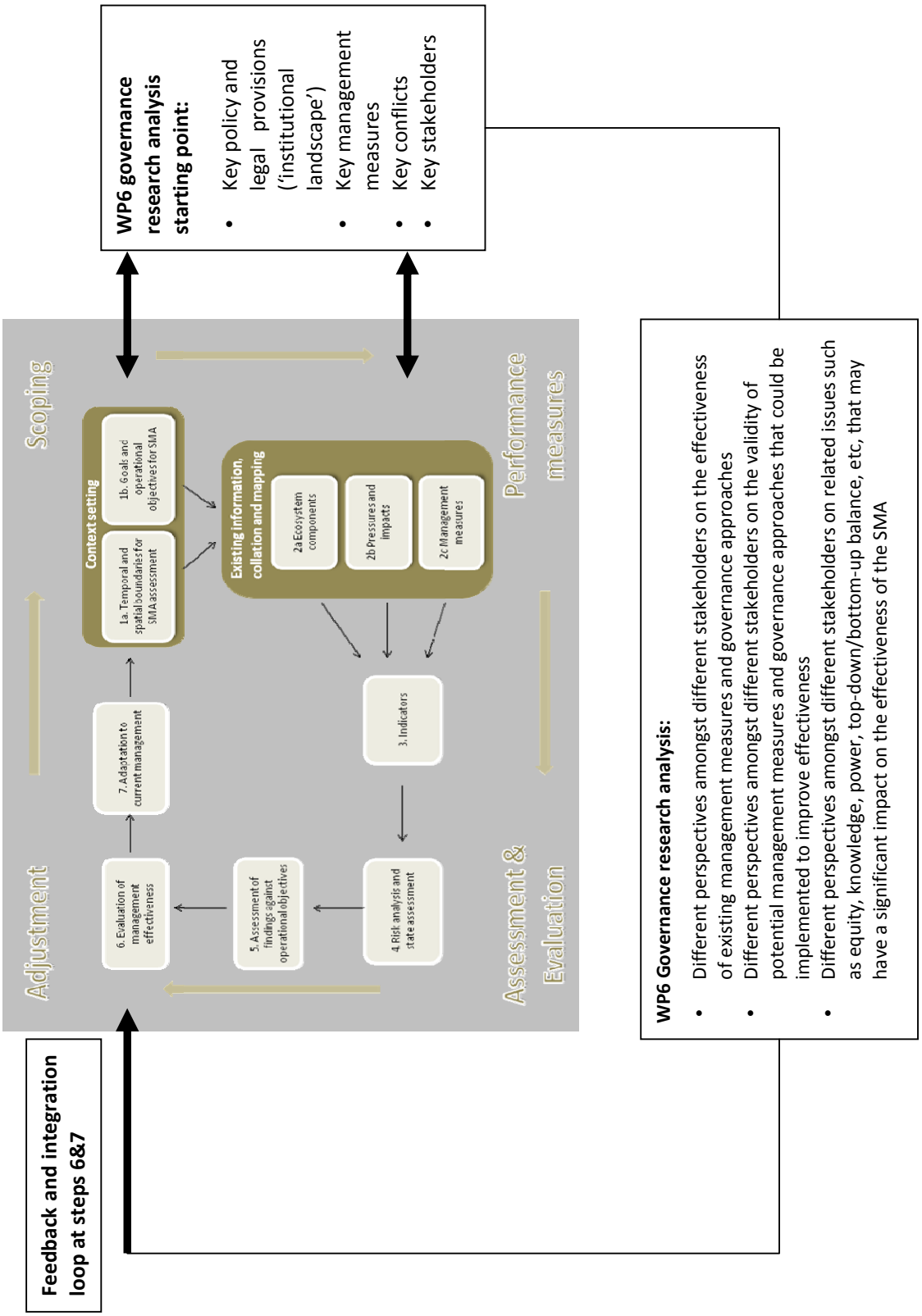
Current state of spatial management in SMA (tick boxes when complete):

□ 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. 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


WP6 governance research analysis starting point:
• Key policy and legal provisions ('institutional landscape')
• Key management measures
• Key conflicts
• Key stakeholders
Scoping
Performance measures
Assessment & Evaluation
Adjustment
Context setting
1a. Temporal and spatial boundaries for SMA assessment
1b. Goals and operational objectives for SMA
Existing information, collation and mapping
2a Ecosystem components
2b Pressures and impacts
2c Management measures
3. Indicators
4. Risk analysis and state assessment
5. Assessment of findings against operational objectives
6. Evaluation of management effectiveness
7. Adaptation to current management
WP6 Governance research analysis:
• Different perspectives amongst different stakeholders on the effectiveness of existing management measures and governance approaches
• Different perspectives amongst different stakeholders on the validity of potential management measures and governance approaches that could be implemented to improve effectiveness
• Different perspectives amongst different stakeholders on related issues such as equity, knowledge, power, top-down/bottom-up balance, etc, that may have a significant impact on the effectiveness of the SMA
Feedback and integration loop at steps 6&7