

## A NEW ADAPTIVE MARINE POLICY TOOLBOX TO SUPPORT ECOSYSTEM-BASED APPROACH TO MANAGEMENT

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### 1-The Ecosystem-Based Approach (EBA) to management

Marine ecosystems (including estuaries, coastal waters and open sea) provide several ecosystem services such as food provision, leisure, purification of waters or climate regulation, which are directly and/or indirectly used by humans (Bertram and Rehdanz, 2013). However, these ecosystems –and thus the benefits they create - are subjected to competing uses such as fishing, food and energy production, waste disposal and marine transport to name a few. These activities together with the impacts of climate change are leading to concurrent shifts in marine ecosystems, with potentially wide-ranging biological effects (Bertram and Rehdanz, 2013). Under this scenario, in order to enable good governance of the marine ecosystems and ensure their sustainable exploitation whilst ensuring their preservation, decision support tools and methodologies need to be developed to support the implementation of the Ecosystem-Based Approach (EBA) to management.

The EBA for management has grown consistently over the last number of decades. EBA represents a much broader view than how marine ecosystems have been managed traditionally, taking into account the interconnectedness and inter-dependent nature of the components of ecosystems, and the fundamental importance of ecosystem structure and functioning in providing humans with the broad range of services that are taken for granted (Curtin and Prellezo, 2010). Accordingly, several regulations have recognized and require applying the EBA for managing the marine environment, including the UNEP's Mediterranean Action Plan-Ecosystem Approach, the Coastal Zone Management Act and the Common Fisheries Policy among others. From a European policy perspective, in 2008 the European Commission adopted the Marine Strategy Framework Directive (2008/56/EC) which aims to achieve or maintain the Good Environmental Status of Europe's seas by 2020. For this purpose, European countries need to develop marine strategies based on the EBA to management.

In order to assist policy-makers developing and implementing the EBA to management under the requirements of the Marine Strategy Framework Directive, a new Adaptive Marine Policy Toolbox (AMP-Toolbox) has been developed. The main objective of this policy briefing is to present this innovative toolbox. For this purpose, firstly the requirements of the Marine Strategy Framework Directive will be revised. Secondly, the objectives and the structure of the AMP-Toolbox will be presented.

### Key Points

- *As a consequence of increasing threats to the marine ecosystems, new decision support tools are necessary to support the implementation of the Ecosystem-Based Approach (EBA) to management in order to ensure their sustainable exploitation whilst ensuring their preservation.*
- *To operationalize Ecosystem-Based Approach (EBA) to management and translate scientific knowledge into decision tools, an innovative Adaptive Marine Policy Toolbox has been created. It provides policymakers with necessary framework and resources to develop adaptive policies according to the EBA.*
- *The Adaptive Marine Policy Toolbox provides a one-stop single location to access all the guidelines and resources necessary to design and implement adaptive marine policies according to the Marine Strategy Framework Directive.*
- *The toolbox presents a high transferability to additional regulations calling for the Ecosystem-Based Approach to management such as the Ecosystem Approach of the Mediterranean Action Plan and the Black Sea's Strategic Action Plan.*
- *The Resources existing within the toolbox are presented in a user-friendly format. The presence of assessments and models capable to cope with uncertain conditions allows for high flexibility and adaptation in management strategies when future conditions change.*

## 2-Requirements of the Marine Strategy Framework Directive

The Marine Strategy Framework Directive establishes a framework to enable European Member States to develop marine strategies and take the necessary measures to achieve or maintain Good Environmental Status in the marine environment for 2020. The overall aim of these marine strategies is to prevent, protect and restore the coastal and marine ecosystems and thus the benefits they provide for humans. These marine strategies should include different elements: an initial assessment, determination of Good Environmental Status, establishment of targets and indicators, development and implementation of monitoring programmes, development and implementation of Programmes of Measures (Figure 1).

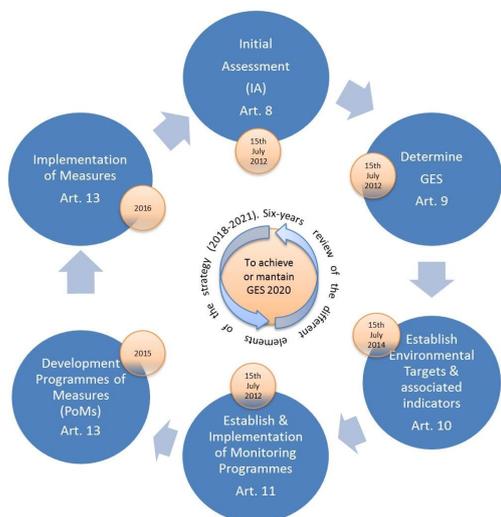


Figure 1: The Marine Strategy Framework Directive management cycle. Key: Blue circles represent the different elements that may be included in the marine strategies; and, small orange circles represent the timeline to include the elements. Modified from: <http://ec.europa.eu/environment/marine/eu-coast-and-marine-policy/>

-Adoption of an EBA to management: marine strategies under the Marine Strategy Framework Directive are required to apply EBA to the management of human activities. The reason is to ensure that the collective pressures of such human activities is kept within levels compatible with achievement of Good Environmental Status and that the capacity of marine ecosystems to respond to human-induced changes is not comprised, while enabling the sustainable use of marine goods and services by present and future generations. In fact, efforts to understand and apply the EBA have been boosted by the Marine Strategy Framework Directive. In fact, several projects exist regarding the EBA to management of marine and coastal habitats and the Marine Strategy Framework Directive which have been funded by the European Commission (see [http://www.perseus-net.eu/en/database\\_projects/index.html](http://www.perseus-net.eu/en/database_projects/index.html)). However, these projects have been focused on specific problems as well as on knowledge and evidence gathering. Thus, more policy oriented procedures are necessary to overcome the gap between science and policy, as well as to execute policy and decisions effectively.

-Adaptive management: one important requirement of the Marine Strategy Framework Directive is adaptive management. The Marine Strategy Framework Directive states that the determination of Good Environmental Status may have to be adapted over time in view of the dynamic nature of marine ecosystems and their natural variability; and given that the pressures and impacts on them may vary with the evolvement of different patterns of human activity and the impact of climate change. In addition, it is appropriate that the Programme of Measures is flexible and adaptive and takes account of scientific and technological developments. Accordingly, Member States are also required to ensure that their marine strategies are kept up to date on a six-yearly basis starting from the initial assessment in 2012. This six-yearly management cycle, means that there will be regular opportunities to review the sustainability and effectiveness of different elements (i.e. determination of Good Environmental Status, the environmental targets and associated indicators and the Programme of Measures) as well as to adapt them. This means that apart from using the management itself to pursue management objectives (i.e. to achieve or maintain Good Environmental Status), simultaneously we learn about management consequences. In fact, a well-designed plan provides the opportunity to learn about the decision process (i.e. institutional learning) and the resource system (technical learning) (Williams and Brown, 2014). However, management cannot be defined as adaptive only because of the application of a cyclical process where lessons learnt and arising scientific and technological developments are introduced; but also because participatory approaches as well as adaptive and flexible tools or elements -capable of accounting for future uncertainties and coping with a wide range of future conditions- are included (e.g. scenario analysis and modelling). Actually, forward looking policies allow for a great amount of flexibility and for adaptation when the future turns out to be other than expected (Environmental Law Institute, 2009).

## 3- The Adaptive Marine Policy Toolbox (AMP-Toolbox)

In this context, to overcome the gap between science and policy, as well as to execute policy and decisions effectively, the PERSEUS project (<http://www.perseus-net.eu/>) through an innovative combination of natural and socio-economic science, aims to

design an effective and resourceful research governance framework across the Southern European Seas, based upon newly collected and sound scientific knowledge. The project aims to: (i) assess the current environmental status of the Mediterranean and Black Seas, in a coherent and integrated manner; (ii) fill the existing scientific knowledge gaps; and, (iii) then design and support an EBA to management. For this last purpose the AMP-Toolbox has been developed ([http://www.perseus-net.eu/en/about\\_the\\_apf\\_toolbox/index.html](http://www.perseus-net.eu/en/about_the_apf_toolbox/index.html)).

### 3.1 Objectives of the AMP-Toolbox

The overall objective is to provide policy-makers with the necessary regulatory framework and resources to develop adaptive policies or measures to achieve or maintain Good Environmental Status under the requirements of the Marine Strategy Framework Directive. The AMP-Toolbox is a specific decision support system which includes four key and fundamental characteristics to be adaptive: (i) use of scenario planning methods; (ii) stakeholder involvement; (iii) a scientific, Ecosystem Based Approach to management (EBA); and, (iv) a cyclical process path where learning about the resources' structure and function as well as about the management consequences are simultaneously incorporated.

The added values of the AMP-Toolbox are: (i) the possibility of providing policy-makers with a new and necessary research-governance framework and resources to develop adaptive policies or measures in order to achieve or maintain Good Environmental Status under the requirements of the Marine Strategy Framework Directive; and, (ii) its transferability to additional regulations calling for the EBA to management. In fact, the AMP-Toolbox provides a unique one-stop single location to access all the resources and tools needed to develop and implement truly adaptive marine policies.

### 3.2 Structure of the AMP-Toolbox

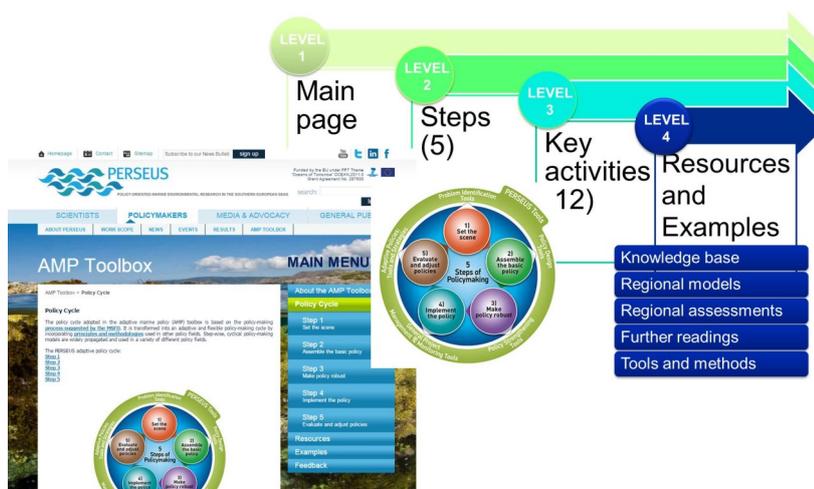
For any web-based toolbox a clear and recognizable structure is very important, as it helps users to find their way easily through an abundance of information. The toolbox has been structured in four levels of information (Figure 2).

**Level 1-Main page:** In the first level, the structure of the toolbox is shown, which is based on the policy-making process suggested by the Marine Strategy Framework Directive ([http://ec.europa.eu/environment/marine/eu-coast-and-marine-policy/marine-strategy-framework-directive/index\\_en.htm](http://ec.europa.eu/environment/marine/eu-coast-and-marine-policy/marine-strategy-framework-directive/index_en.htm)). Moreover, it is transformed into an adaptive policy-cycle incorporating the principles and methodologies mentioned above. The toolbox is organized in a policy-cycle containing 5 steps: 1-set the scene; 2-assemble a basic policy; 3-make the policy robust; 4-implement the policy; and, 5-evaluate and adjust the policies. These steps can be linked from the main page or directly through the main menu (Figure 2).

**Level 2-Steps:** All the steps present the same structure, including some basic information such as the objective, requirements and outputs of the step in question. In addition, and most importantly, the key activities necessary to accomplish each step are presented. Note that the same activity can be addressed within different steps.

**Level 3-Key activities:** The 12 activities present the same structure as well, including an introduction, key questions, key actions and links to the resources necessary to develop the activity in question (Figure 2).

**Level 4-Resources and examples:** The resources comprise: (i) the knowledge base, including 7 databases; (ii) different tools and methods; (iii) the regional assessments and models dedicated to the Mediterranean- and the Black Seas; and, (iv) further readings. Note that a given resource can be multifunctional or useful for different purposes, thus it can be linked to different activities and steps. The resources can be accessed through each activity, but also directly through the main menu (Figure 2).



[Figure 2: Four-level structure of the Adaptive Marine Policy Toolbox ([http://www.perseus-net.eu/en/policy\\_cycle/index.html](http://www.perseus-net.eu/en/policy_cycle/index.html)).

As mentioned above, one of the most important objectives of the AMP-Toolbox is to make available scientific data, information and models (especially those developed within the PERSEUS project) to users and in doing so to support policy-making. Whereas the “Knowledge base”, the “Regional assessments” and the “Regional models” have been developed from the work performed within the PERSEUS project; the tools for the “Tools and methods” have been selected from different toolboxes or references already available in the literature or on the web. These sources include:

- (i) Monitoring and Evaluation of Spatially Managed Areas (MESMA) toolbox (<https://publicwiki.deltares.nl/display/MESMA/Home>);
- (ii) Marine Scotland Toolbox;
- (iii) Food and Agriculture Organization’s Ecosystem Approach to Fisheries (FAO-EAF) Toolbox (<http://www.fao.org/fishery/eaf-net/en>);
- (iv) Different governmental departments (e.g. Directorate General of Development and Cooperation, EuropeAid) and environmental research groups or companies.

Finally, some examples of adaptive management strategies implemented worldwide are also provided within the examples section (within the main menu) (Figure 2). The aim of the examples is to enhance the comprehension and visualization of the different components of an adaptive policy.

#### 4. Future steps: Implementation and lessons learnt

In order to investigate the usefulness of the AMP-Toolbox and promote its adoption by policy-makers, different tests will be performed using real-world problems. These tests will be completed at two levels: (i) Pilot Case level (including the Western Mediterranean, the Adriatic, the Aegean and the Western Black Sea); and, (ii) basin level (including the Mediterranean and Black Seas). Applications will be focused on situations where there is a risk of not achieving Good Environmental Status during the 2020-2030 horizon. For the tests, a participatory approach will be employed involving different stakeholders. From the learnt lessons during the testing phase with the stakeholders, the framework will be improved. In fact, the testing phase of the AMP-Toolbox has a two-fold objective, to support stakeholders pursuing their management objectives (i.e. to design a Programme of Measures to achieve Good Environmental Status) and to learn simultaneously about the pros and cons of the AMP-Toolbox in order to improve it (<http://www.perseus-net.eu/en/feedback/index.html>). To conclude, the toolbox will be updated in order to accommodate all the improvements and lessons learnt during the testing phase and thus actualized on the website.

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#### Acknowledgements

This work has been developed within the PERSEUS (Policy-oriented marine Environmental Research in the Southern European Seas) project, funded by the EU under FP7 Theme “Oceans of Tomorrow” OCEAN.2011-3. Grant Agreement No. 287600.



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