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Scoping study of the assessment of the costs of degradation of the Mediterranean marine ecosystems

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**Scoping study of the assessment of the costs of degradation of the Mediterranean
marine ecosystems**

Summary

To support the identification of key marine protection problems and the implementation of cost-effective solutions that will ensure a healthy Mediterranean ecosystem while contributing to the sustainable development of the Mediterranean basin, the contracting parties of the Barcelona Convention have committed to implement the Ecosystem Approach for the management of the human activities that may impact the Mediterranean coastal and marine ecosystems (short-named EcAp). The ecosystem approach accounts for all social and economic aspects related to the human activities that impact on, or benefit from, the quality and ecological health of coastal and marine ecosystems. This socio-economic information will then be used to support the selection of measures that will contribute cost-effectively to improvements in the ecological status of marine and coastal ecosystems.

As part of EcAp, a scoping study on the costs of degradation has been carried out by Plan Bleu. This scoping study discusses the relevance of different assessment methods that could be applied for assessing the costs imposed on society by the current state of degradation of the Mediterranean marine & coastal ecosystems.

The cost of degradation corresponds to a loss of welfare. It can be assessed in different ways, e.g. through a foregone benefit, a loss of profits, or the increase in production costs, or of mitigation costs. Assessing the cost of degradation can be done qualitatively or quantitatively. In practice, such assessments will face different challenges, such as: the definition of the reference against which the degradation will be assessed; the difficulty to establish causal relationships between the state of the ecosystem and economic activities; the difficulty to put monetary values on impacts that result from the environmental degradation, in particular for sectors that benefit from a healthy ecosystem but that do not operate on markets/have market values.

Assessments of the costs of degradation in the Mediterranean region have been developed in particular during the last ten years, including in the context of the implementation of the Marine Strategy Framework Directive in the European Mediterranean countries. The literature review stresses that much attention has been given to the economic impact of poor quality of coastal ecosystems on the tourism sector. In the context of the implementation of the MSFD, European countries have used different approaches for assessing the cost of degradation, the ecosystem service and cost-based methods being the methods mostly used. As a result, comparing the results obtained from such assessments remains challenging. And it is very difficult to compare or to aggregate existing data. The current efforts, however, stress the usefulness of the assessment of the cost of degradation at national scales, and the potential the results of such assessment might have to guide decision making.

Assessing the costs of degradation of the marine and coastal ecosystems of the Mediterranean Sea at the regional scale is a clear challenge. In this study, different options for moving ahead with such assessments at the Mediterranean scale are proposed, stressing the pros and cons of each option. In coherence with the EcAp process, it is suggested that priority is given first to the assessment of the current costs of coastal and marine ecosystem protection, and then to the assessment of the economic losses imposed on key economic sectors such as tourism and fisheries. These assessments will deliver useful knowledge for assessing the costs and benefits of the action plans and programmes that form the final step of the EcAp process.

FOREWORD

This report is the result of work conducted by the Plan Bleu as part of the initial economic and social analysis of the ECAP project, Ecosystem Approach for the Management of human activities, coordinated by the Coordinating Unit of the MAP. This work has also led to the development of another report entitled " Economic and social analysis of the uses of the coastal and marine waters in the Mediterranean, characterization and impacts of the Fisheries, Aquaculture, Tourism and recreational activities, Maritime transport and Offshore extraction of oil and gas sectors."

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The present version of this report will be submitted for approval to the EcAp Coordination Group during the 4th Meeting of the Group, which will be held on the 9-10 October 2014, Athens.

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Abbreviations

BAU	Business As Usual
CoD	Cost of Degradation
EcAp	Ecosystem Approach (a MAP initiative)
ESA	Economic and Social Analysis
EC	European Commission
EU	European Union
GES	Good Environmental Status
MAP	Mediterranean Action Plan
MSFD	Marine Strategy Framework Directive
MSSD	Mediterranean Strategy for Sustainable Development
VA	Value Added
WB	World Bank
WTP	Willingness-to-pay

Introduction

The protection of marine ecosystems is increasingly recognised as a policy priority in the Mediterranean basin and in Europe, as demonstrated by the Barcelona Convention and the Mediterranean Action Plan (MAP), and by the recently adopted European Union (EU) Marine Strategy Framework Directive (MSFD). Overall, the contracting parties of the Barcelona Convention are committed to ensure the protection of the Mediterranean marine and coastal ecosystems, while contributing to sustainable development in the region. This results from the combination of ecological and socio-economic concerns vis-à-vis degraded marine ecosystems, their poor ecological status being often translated into (negative socio-economic) impacts on sectors that benefit from the goods and services these ecosystems provide.

To support the identification of key marine protection problems and the implementation of cost-effective solutions that will ensure a healthy Mediterranean ecosystem while contributing to the sustainable development of the Mediterranean basin, the contracting parties of the Barcelona Convention have committed to implement the Ecosystem Approach for the management of the human activities that may impact the Mediterranean coastal and marine ecosystems (short-named EcAp). This approach underpins a number of international and regional initiatives (CDB, CGPM, MSSD) as well as the EU MSFD. As for the MSFD, EcAp aims to achieve at term a Good Environmental Status (GES) of the marine environment. The application of the ecosystem approach has been entrusted to UNEP-MAP with a seven-step roadmap (see Box 1) for the period 2008-2018. The third step, i.e. the initial assessment that supports the identification of priority problems, is being finalized. Throughout the implementation process, the ecosystem approach accounts for both social and economic aspects related to the human activities that impact on, or benefit from, the quality and ecological health of coastal and marine ecosystems. This socio-economic information will then be used to support the selection of measures that will contribute cost-effectively to improvements in the ecological status of marine and coastal ecosystems.

Box 1 The seven steps of the EcAp road-map

The seven steps of the EcAp road map are as follows (UNEP/MAP, 2012):

- Step 1 : Definition of an ecological vision for the Mediterranean
- Step 2 : Setting of common Mediterranean strategic goals
- Step 3 : Identification of important ecosystem properties and assessment of ecological status and pressures
- Step 4 : Development of a set of ecological objectives corresponding to the vision and strategic goals
- Step 5 : Definition of operational objectives with indicators and target levels
- Step 6 : Revision of existing monitoring programmes for ongoing assessment and regular updating of targets
- Step 7 : Development and review of relevant action plans and programmes

Work on the socio-economic dimensions of Mediterranean marine and coastal ecosystems in the context of the Barcelona Convention has started as early as 2008, with in particular the publication in 2010 by Plan Bleu of a study on the economic benefits rendered by Mediterranean marine ecosystems (Mangos *et al.*, 2010). This preliminary study has been followed by three actions implemented by Plan Bleu in the context of EcAp:

An assessment of **the socioeconomic importance of uses** of the marine and coastal environment has been carried out at the scale of the Mediterranean Sea. This socioeconomic assessment, or **Economic and Social Analysis (ESA)**, mobilises existing (national) data for characterising the socio-economic

importance of key maritime sectors for the Mediterranean basin as a whole and disaggregated into the four sub- regional basins used for the Initial Assessment, fulfilling step 3 of the ecosystem approach process.

As part of this ESA carried out under EcAp, a **scoping study on the costs of degradation** has also been carried out, subject of this report. Building on a series of illustrations, this scoping study discusses the relevance of different assessment methods that could be applied for assessing the costs imposed on society by the current state of degradation of the Mediterranean marine & coastal ecosystems. Although different definitions exist for the cost of degradation, it can be defined simply as “the welfare foregone reflecting the reduction in the value of the ecosystem services provided compared to another state” of the marine ecosystem (WG ESA, 2010). Overall, assessing the cost of degradation imposed on society can be seen as a complementary socioeconomic argument that justifies the need to improve or maintain the state of the marine environment. However, the evaluation of the cost of degradation by comparing the economic welfare of two distinct counterfactual environmental statuses at the scale of the Mediterranean basin is a clear challenge from a methodological and knowledge requirement points of view. Thus, it was decided to carry out first a scoping study on this issue¹.

In parallel, as part of the Regional Governance and Knowledge Generation project (short-named *ReGoKo*), Plan Bleu has launched a complementary action for strengthening the knowledge base on the socio-economic importance of maritime activities in the Mediterranean basin and on the cost of degradation of the marine environment at national level. This initiative includes the **development of socio-economic assessments of key maritime activities and of ecosystem service losses for three selected Mediterranean countries**, namely Lebanon, Tunisia and Morocco. In the medium term, this initiative will help raising awareness among Mediterranean decision makers on the potential role socio-economics can play in supporting (national and regional) policy-making in marine environment.

The **three actions are implemented with synergies** and regular feedbacks between activities performed at the regional and national scales. For example, illustrations on the costs of degradation in Lebanon, Tunisia and Morocco developed in the context of the ReGoKo initiative are feeding into the wider EcAp scoping study on the costs of degradation. Also, the assessments of the socio-economic importance of maritime activities developed at the regional scale (EcAp) and for the same three countries (ReGoKo) will help identifying gaps in the field of socio-economic knowledge while contributing to the development of common methodological guidance for socio-economic assessment.

The subject of this report is to present the results of the scoping study **on the costs of degradation**.

¹ This decision was endorsed by the ESA Correspondence group (COR ESA Group) set up to support the MAP Coordination Unit on the socioeconomic assessment during the first meeting of this group that took place in April 2013.

Objectives

The overall objective of the scoping study is to identify **possible options for assessing the costs of degradation for the Mediterranean Sea** that could be implemented in the context of the EcAp process and discuss them with the COR ESA Group.

More specifically, the scoping study addresses the following key questions:

- What are the **different methods** that can be applied for assessing the costs of degradation of marine and coastal ecosystems?
- What are the **strengths and weaknesses of these methods** – in particular in terms of the information used, level of complexity, relevance of their results for supporting decisions, etc.?
- What could be **options/way forward for assessing the costs of degradation of the Mediterranean Sea** in the context of the UNEP-MAP EcAp – along with the pros and cons of each option?

The study builds on a literature review complemented by discussions and feedbacks with representatives of the different Mediterranean countries that contribute to the EcAp initiative and that participate in EcAp meetings. It also benefits from the national socio-economic assessments carried out for Lebanon, Morocco and Tunisia as part of the ReGoKo initiative, the different illustrations of the costs of degradation developed under these national assessments being used and scrutinized in the context of the scoping study.

After presenting the overall institutional context under which the scoping study takes place (Section I above) and its overall objectives (this section), the report:

- Presents what **we mean by the “costs of degradation” (Section III)** so a common understanding of this relatively new concept in the field of marine and coastal policy can be reached;
- Describes the **different methods that can be applied for assessing the costs of degradation (Section IV)**, stressing in particular the pros and the cons of each method. In particular, this section builds on the methodological discussions that are taking place in Europe in the context of the implementation of the EU MSFD, and on guidance (WG ESA, 2010) that has been developed for the assessment of the costs of degradation;
- **Illustrates the costs of degradation (Section V)**, building in particular on the first assessments of the costs of degradation developed in the context of the implementation of the EU MSFD in some Mediterranean countries and on illustrations developed under the parallel ReGoKo initiative for Lebanon, Morocco and Tunisia;
- Presents initial **issues and thoughts on the assessment of the costs of degradation at the Mediterranean Sea scale (Section VI)**, identifying **possible options** for such assessment along with possible links/synergies with the seven steps of the EcAp road map.

The costs of the degradation: what are they?

Following important pressures exerted by human activities on ecosystems, costs for society might arise from the degradation of these ecosystems. These so-called “costs of degradation” correspond to a loss of welfare for society. The cost of degradation has been defined by the EC Working Group (WG) dealing with the Economic & Social Analysis (ESA) as “the reduction in the provision of ecosystem services compared to another state” of the marine ecosystem (WG ESA, 2010).

As shown in the diagram below, driving forces such as economic sectors or population increases lead to pressures (e.g. abstraction of water, polluted discharges, loss of permeable area, extraction of biomass...) on the environment. These pressures affect the functioning and state of the environment and its ability to provide services to human being (e.g. healthy fish stocks, good water quality etc.). Finally, the inadequate state and related negative impacts requires specific actions (policy responses) for restoring the state of the environment. And this Driver – Pressure – State – Impact – Response (DPSIR) framework helps identifying the cost of degradation and its origin(s), i.e. a change in the state of the environment that is due to human activities and that in return affects negatively (other) human activities and hence social welfare.

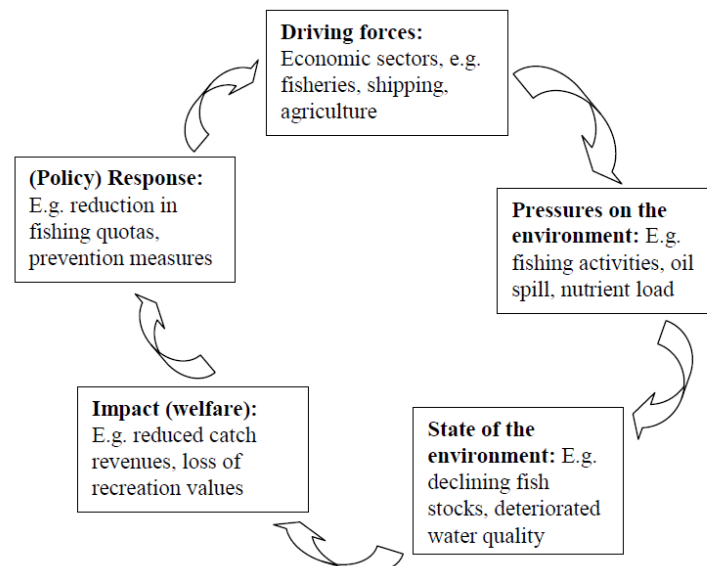


Figure 1 DPSIR Framework. Source: WG ESA, 2010.

To assess this loss of welfare (Sarraf *et al.*, 2004), different methods can be applied, assessing for example a benefit forgone for a given sector, a loss of profits, the increase in the costs of production that arise as a result of a poor state of the environment, or the costs of mitigation actions that are implemented to reduce/compensate for the negative impacts of poor environmental state.

Examples of the costs of degradation in a marine context are numerous and include:

- The loss of profits for fishermen following an unsustainable overfishing and a reduction in fish population;
- The loss of jobs in the tourism sector when the degradation of the coastal environmental and of its biodiversity results in a reduction in the number of tourists that visit a given site;
- The loss of welfare for inhabitants walking along the coast with highly eutrophic waters;
- A decrease in health, especially for children, if the water quality of marine ecosystems and bathing sites are too poor.

It is important to stress that the costs of degradation should be comprehended through a **marginal analysis** (i.e. the comparison of the welfare losses under two different ecosystem states) to guide the decision making process (Sarraf *et al.*, 2004). Indeed a change in the state of the environment will impact the costs borne by society.

The next section addresses in more details the different methodologies that can be mobilised for assessing the cost of degradation.

How to assess the costs of degradation?

Assessing the cost of degradation can be done qualitatively or quantitatively. Generally speaking the main steps followed for assessing the costs of degradation are the following (Sarraf *et al.*, 2004):

1. Identification and quantification of the environmental degradation observed in the ecosystem;
2. Quantification of the consequences of the observed degradation for different sectors/economic activities affected by the degradation of the ecosystem;
3. Monetary valuation of these consequences, building on a diversity of economic methods and tools.

In practice, such assessment can prove to be very difficult. Several challenges are generally encountered and need to be addressed, such as:

- **In comparison to what state** should the environmental degradation be defined? This “reference state” could be: the state defined as legal requirement in existing environmental protection legislation, pristine conditions with absence of any anthropogenic pressure, or some historical reference.
- What are the **consequences** of the degradation of the ecosystem **on human activities**? How can we assess these consequences, keeping in mind the complexity of causal relationships between the state of the ecosystem and economic activities, all uncertainties that might exist in these relationships, and the numerous factors other than the state of the ecosystem that affect directly or indirectly human activities?
- How possible, or relevant, is it to **quantify the costs of degradation**? Can we compare two different situations in terms of state of the ecosystem and economic activities benefiting from it – and then derive the potential impact that result from the degradation, with the challenge of identifying all factors apart from the state of the ecosystem that might explain changes in economic activities? How easy is it to put monetary values on these impacts, in particular for sectors that benefit from a healthy ecosystem but that do not operate on markets/have market values?

In order to guide the assessment of the cost of degradation in European countries in the context of the implementation of the Marine Strategy Framework Directive (MSFD), three main approaches were identified and illustrated in a dedicated Guidance document (WG ESA, 2010):

- The ecosystem service approach;
- The thematic approach;
- The cost-based approach.

The table below presents the main elements of each approach (WG ESA, 2010; UNEP, 2013a).

Key issues	The ecosystem service approach	The thematic approach	The cost-based approach
Way of addressing the cost of degradation	The cost of degradation is defined as the difference in values of ecosystem services provided in two different situations: the Good Environmental Status (GES) and a “Business as Usual” (BAU) Scenario.	The cost of degradation is analysed through costs, expenses and losses of benefits incurred by degradation themes arising from current environmental situation compared to a reference status characterized by GES achievement. .	The cost of degradation is analysed through current quantified spending for preventing further degradation in comparison to the current situation.
Objective	Communicate at an early stage on the potential lost benefits if an environmental policy is not implemented. Benefits of implementing the policy could also later on be compared with the costs of implementing it.	Assess current cost of degradation and compare them with a GES situation (extra-costs) Get an overview of current socio-economic impacts of environmental degradation Provide a knowledge base to assess costs and benefits of future measures	Get a quantified overview of current socio-economic impacts of environmental degradation Inform on the financing structure for more appropriate decisions regarding who should bear future costs
Main steps as defined in Guidance document (WG ESA, 2010)	<ol style="list-style-type: none"> 1. Define GES using the qualitative descriptors listed in the MSFD. 2. Assess the environmental status in a Business As Usual (BAU) scenario. 3. Describe in qualitative and, if possible, quantitative terms the difference between the GES and the environmental status in the BAU scenario, i.e. the degradation of the marine environment. 4. Describe the consequences to human well-being of degradation of the marine environment, either qualitatively, quantitatively or in monetary terms. 	<ol style="list-style-type: none"> 1. Define degradation themes, e.g. marine litter, chemical compounds etc. 2. Define a reference condition, for example a condition where targets for good environmental status are achieved 3. Describe in qualitative and, if possible, quantitative terms the difference between the reference condition and the present environmental status, i.e. the degradation of the marine environment, for all the degradation themes. 4. Describe the consequences to human well-being of degradation of the marine environment, either qualitatively, quantitatively or in monetary terms. 	<ol style="list-style-type: none"> 1. Identify all current legislation that is intended to improve the marine environment 2. Assess the costs of this legislation to the public and private sectors 3. Assess the proportion of this legislation that can be justified on the basis of its effect on the marine environment (as opposed for example to health or on-shore environmental effects) 4. Add together costs that are attributable to protecting the marine environment from all the different legislation you have assessed. Optionally, these costs could be allocated by themes, as for the Thematic approach.
Example of costs considered	If more fish were available in the sea, fishing quotas could be increased and fishermen could make X € more profits. Non-use values could also be increased.	Today X € are spent to mitigate the negative effects of water pollution on aquaculture.	Today X € are spent for less environmentally damaging anti-fouling materials and other technical measures built into ships to comply with the International Oil Pollution Compensation (IOPC) Fund
Strengths	<ul style="list-style-type: none"> -Attempts to describe the full cost of degradation and provides a detailed and exhaustive view of the cost of degradation -Relies on both quantitative and qualitative data -Builds directly upon the ecosystem approach to inform on relevant field of actions for future intervention -Informs on how the state of the ecosystems provides 	<ul style="list-style-type: none"> -Does not rely on the construction of a multi thematic uncertain scenario but on reference scenarios for each degradation theme. -Relies on both quantitative and qualitative data. - Uses a smaller range of quantitative data and data that is easily available on market valuation 	<ul style="list-style-type: none"> -Does not rely on a reference condition -Use a smaller range of quantitative data that is generally existing at a national level.

Key issues	The ecosystem service approach	The thematic approach	The cost-based approach
	valuable services and how to prioritise these services.		
Weaknesses	<ul style="list-style-type: none"> -Very demanding in data -Time-consuming -High uncertainty upon assumptions made for scenarios description -A small part of the costs actually quantified at the end in most studied cases. 	<ul style="list-style-type: none"> -Relies on an environmental reference status that needs to be expressed for each cost. -Leads to a more qualitative assessment due to a lack of data. -Uncertainty on the relevance of the knowledge base to assess measures in the future. 	<ul style="list-style-type: none"> -Considers only quantitative data that remain difficult to disaggregate at a local level -Underestimates the cost of degradation, as only actual cost induced by legislation are considered -Does neither assess benefits of future measures to achieve the GES, nor current total cost of degradation -Unclear how much of the costs that are not directly intended to protect the marine environment should be included (e.g agricultural measures contributing to reduce impacts on the marine environment).

Figure 2 Main approaches to analyse the cost of degradation. Source: WG ESA, 2010.

From a data perspective, the cost-based approach might be the simplest one to implement, whereas the ecosystem service approach appears as very demanding. The ecosystem service approach or the thematic approach might however be more appropriate to assess the potential benefits of future policies. These approaches can also **be combined** to better assess the different facets of the costs of degradation, and thus to better inform policy decision, but this may raise coherence issues in the gained results.

In order to implement these approaches, several methods might be necessary for assessing the different costs/lost benefits. Indeed, a wide range of these costs, that represent often negative externalities, do not correspond to goods and services that are sold on markets with a price. And this implies that their monetary value is estimated indirectly. The two main types of methods that are developed to assess environmental benefits or the monetary values of the costs of degradation include (Bolt *et al.*, 2005):

- **Methods based on dose-response functions** - these methods rely often on the construction of a function describing the technical link between the change in the environmental status and changes in human activities (in terms of change of practice, additional activities carried out, reduction in production, etc.). A unit price (e.g. the price per kg of lost production, or the cost per unit of water that needs to be treated as a result of the degradation of the environment) is then applied to estimate the changes in human activities in monetary terms;
- **Methods based on people’s behaviour** – these methods rely more heavily on markets and on individuals’ direct Willingness-To-Pay (WTP) for a change in the quality of their environment/an environmental good.

More specifically, the methods that exist under each type are numerous and can be used for different types of costs (Bolt *et al.*, 2005): changes in production (what decrease in profit for fishermen follows the degradation of fish population), changes in health (how fewer days do people live in a polluted area), the hedonic pricing method (how much more are people ready to pay to buy a house on a less crowded and polluted coast), travel cost method (how much more are people ready to pay to go snorkelling in an area with a healthier ecosystem). The figure below illustrates the diversity of methods that can be applied.

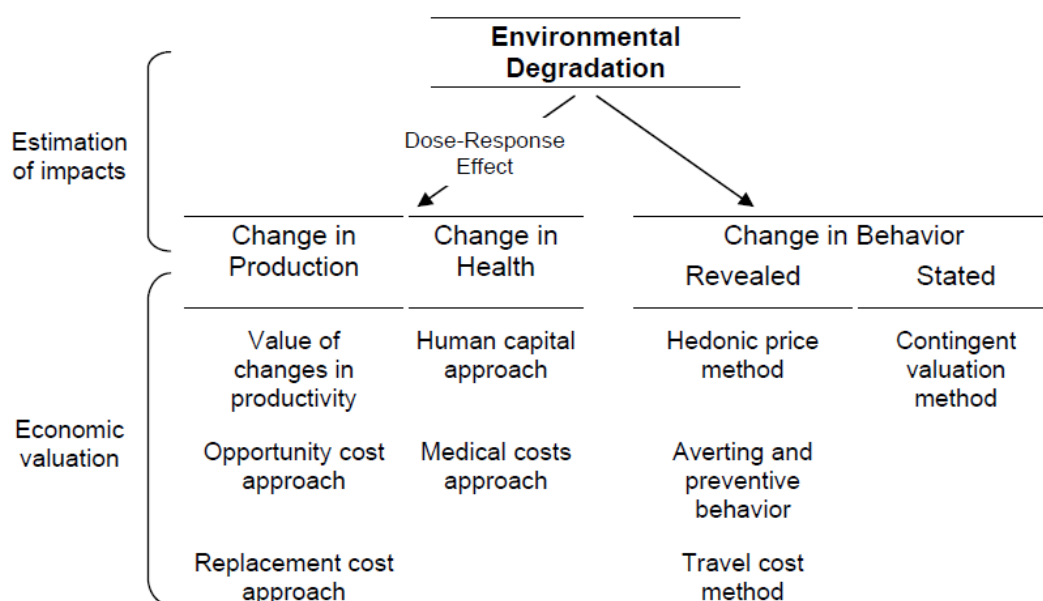


Figure 3 Valuation methods. Source: Bolt *et al.*, 2005

Some of these methods can be very costly and time consuming. When monetary information is absent in a given site, one might also use information from other sites via benefit transfer². Particular attention should then be attached to the relevance of transferability among sites. Whatever the method applied, it will have limitations. But it will allow for an estimation of the cost of degradation that can then inform decision making.

The next section illustrates the types of methods have been applied so far in the Mediterranean region including in the context of the implementation of the MSFD by the European Mediterranean countries.

² Benefit transfer consists in using the monetary values that are available for other case studies or sites, adapting these values to account for contextual differences (e.g. differences in household's average income).

How important can the costs of degradation be? Illustrations from different Mediterranean countries

Costs of degradation in the Mediterranean region are especially analysed for the last ten years (Sarraf *et al.*, 2004; Mangos *et al.*, 2010). Information on the cost of degradation in the Mediterranean context has largely increased with the implementation of the MSFD in the European countries (Levrel *et al.*, 2012; AEE consortium, 2012). However, several studies at a more local scale were also developed during this period (Loubersac *et al.*, 2007; Birdir, 2013).

EXISTING STUDIES

Different **World Bank (WB) reports** have been written on the costs of environmental degradation in the Mediterranean basin in general, including some attention to coastal and marine issues (Sarraf *et al.*, 2004; Croitoru and Sarraf, 2010).

The 2004 WB report presents an assessment of the cost of degradation for coastal zones and other land ecosystems in Lebanon and Tunisia. The methodology developed distinguishes damage cost from remediation cost. Damage cost is defined as “a measure of the lost welfare of a nation due to environmental degradation”. Remediation cost illustrates necessary resources to “at least partially avoid current environmental degradation”. The cost of degradation corresponds to the potential foregone benefits, whereas remediation costs illustrate costs of environmental improvements. Damage cost of coastal zones is estimated in 2000 at around 0.60-0.75% of GDP in Lebanon and at around 0.23-0.29% of GDP in Tunisia in 1999 (Sarraf *et al.*, 2004). Remediation cost is estimated at around 0.2% of GDP in Lebanon and 0.07% of GDP in Tunisia.

Box 2 Cost of coastal zone degradation in Lebanon (Sarraf *et al.*, 2004).

Damage cost from coastal zone degradation is estimated through impacts on domestic recreation and international tourism, and losses in ecological values and non-use values. Travel cost method applied in different coastal zones allows for estimating a monetary value for domestic recreation. Impacts on international tourism are assessed transferring data from a Tunisian study on the willingness-to-pay of international tourists to an unspoiled rather than a spoiled location. A study in the WTP of Lebanese to restore a beach in order to face the extinction of sea turtles gives an estimation of the losses of ecological and non-use values. Consequences of biodiversity degradation and of climate change have not been valued for technical reasons (lack of meaningful data).

<i>Coastal zones, cultural heritage</i>	<i>Percent of GDP</i>
Natural resources	
Domestic recreational losses	0.06
International tourism losses	0.42
Losses of ecological and non-use value	0.20
Fishery losses due to pollution	n.a.
Total	0.68

Figure 4 Coastal zones degradation – Annual damage cost, mean estimate, 2000. Source: Sarraf *et al.*, 2004.

Remediation costs are estimated through wastewater treatment cost for inhabitants of the Lebanese coastal zone. These costs are estimated at around 0.2% of GDP. This does neither include the costs of industrial wastewater treatment nor the costs of broader coastal zone protection programs. It is important to stress that data of damage costs and remediation costs are scarce, making any comparison between these costs challenging. Nevertheless, the estimates show the importance of protecting coastal zones in Lebanon.

This study allows for assessing coastal degradation at a national level, what can be helpful for a Mediterranean regional assessment. These estimates do however underestimate the cost of degradation (damage and remediation), given the limited number of dimensions considered in the definition of the

degradation. Moreover there are high uncertainties on the associated environmental status. And the results would need to be updated as some assessments use more than 15 year old data.

A more recent study, the 2010 WB report on the cost of degradation, focuses mainly on land issues (e.g. cost of land degradation in Morocco, cost of forest degradation in the Islamic Republic of Iran). Mediterranean marine degradation is addressed through the case study of the Jiyeh oil spill due to conflict (2006) in Lebanon. In order to assess the cost of degradation induced by the oil spill, foregone benefits (difference between expected and actual benefits from an activity) are analysed. Negative impacts are supposed to gradually decrease during the three years following the spill (2006-2008). Based on bibliographical references and on the saying of users, the authors assume that a given percentage of expected incomes of coastal activities were affected by the oil spill. This percentage is assumed to vary along time depending on the degradation considered. For example actual incomes of beach resort, chalet, public beach and events are assumed to be between 25 and 50% lower than expected benefits without the oil spill, during the first year following the oil spill, between 5 and 10% lower the second year, and between 0 and 5% lower the third year following the oil spill. The different types of degradation costs are presented in the table below.

<i>Type of cost</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Mean</i>	<i>% of total</i>
Damage costs				
Cost of oil fuel burned	39.1	39.1	39.1	19
Restaurants	19.5	31.1	25.3	12
Hotels and furnished apartments	22.8	59.6	41.2	20
Beach resorts, chalets, public beaches, events	13.2	34.8	24.0	12
Marinas' sports activities	4.0	4.2	4.1	2
Commercial fishing	3.0	5.9	4.4	2
Seashore fishing	0.3	0.5	0.4	0
Palm Islands Nature Reserve	0.7	1.2	1.0	1
Byblos World Heritage Site	0.1	0.1	0.1	0
Total damage costs	102.8	176.4	139.6	69
Oil spill cleanup				
Expenditures as of April 2007	14.9	14.9	14.9	7
Oiled waste	47.1	49.9	47.4	23
Monitoring expenses	1.5	1.5	1.5	1
Total cleanup costs	63.5	63.5	63.5	31
TOTAL COSTS OF OIL SPILL	166.3	239.9	203.1	100

Figure 5 Estimated costs of damage and cleanup due to the Jiyeh oil spill in Lebanon, in US\$ millions. Source: Croitoru and Sarraf, 2010.

This study illustrates however a very specific degradation of the marine ecosystem which cannot be easily transferred to other sites or environmental issues.

Other **studies performed by research institutes** on specific (often local) sites and sectors have also been developed (Rudloff *et al.*, 1997; Seguí-Amórtegui, 2004; Araña, 2001; Signorello, 1998; Birdir, 2013). More attention is then given to the costs imposed on the tourism sector as a result of the degradation of the marine and coastal ecosystem. The travel cost method, for example, has been used in the case of the Thau pond to assess the economic impact eutrophication has on leisure (e.g. swimming and fishing). These studies are, however, localized and do not present an overview at the regional Mediterranean scale.

A **Plan Bleu study** (Mangos *et al.*, 2010) assesses the economic benefits of the Mediterranean marine and coastal ecosystems and provides estimates of the benefits for key ecosystem services provided by the Mediterranean marine ecosystems (e.g. provision of amenities and recreational supports, climate regulation, protection against coastal erosion, water treatment etc.). These benefits can be used as basis for estimating the costs of degradation in areas where such services have been deteriorated. Services provided by 5 types of ecosystems are analysed. The value of these services was estimated through

their contribution to the value added (VA) of economic activities, through avoided expenditures or through prices observed on the market (e.g. CO₂ Quota prices for the climate regulation service). Values are estimated at the regional level. The value of services provided by the Mediterranean ecosystems is estimated over 26 billion Euros for 2005, representing around 0.41% of Mediterranean countries GDP³. Most of this value came from services providing amenities and recreation (computed through VA of hotels and restaurants, real estate, and tourism-related recreational activities). It should be kept in mind that this study focuses on the sustainable portion of benefits rendered by the Mediterranean Sea. It does therefore not inform on the potential for extra benefits that would be obtained as a result of improvements in the states of marine ecosystems.

Box 3 Benefits provided by Mediterranean ecosystems – selected examples at the national level.
Source: Mangos *et al.*, 2010

If benefits are computed at the regional scale, they are also estimated at the national level, **more meaningful for most decision-makers**. These national assessments illustrate how values can differ among countries, in their structure and their importance. Benefits in Greece in 2005 are estimated at 3 Billion Euros, i.e. 1.6% of its GNP, whereas benefits in Tunisia are estimated at over 520 million Euros, i.e. 2.3% of its GNP. The provision of amenities and recreational supports represents 66% of total benefits rendered by marine ecosystems in Greece, and only 49% of the benefits arising in Tunisia. Moreover the nature of these benefits differs between countries. The housing sector is the sector benefiting the most from amenities and recreational supports in Greece, whereas the hotel and restaurant activities get the largest benefits from this service in Tunisia. This kind of differences can limit the meaning of an analysis at the regional scale. However comparable data would allow for **analysing the distribution of benefits among countries**, i.e. identifying who benefits the most from the different ecosystem services provided by the Mediterranean Sea and who suffers the most from its degradation.

STUDIES CARRIED OUT AS PART OF THE MSFD IMPLEMENTATION PROCESS



On the Northern side of the Mediterranean Sea, European countries have used different approaches for assessing the cost of degradation as part of the implementation of the MSFD. The table below summarises the different methods used by each country, the ecosystem service and cost-based methods being the methods mostly used.

Tableau 1 Methods used in Mediterranean countries to assess the costs of degradation (Adapted from AEE Consortium, 2012)

Cost of degradation	Cyprus	Greece	France	Slovenia	Spain	Italy	Malta
Ecosystem services approach	X	X					X
Thematic approach							
Cost-based approach			X		X	X	X
Other				X			
Identifying and valuing current marine ecosystem GES				X			

³ <http://data.worldbank.org/indicator/NY.GDP.MKTP.CD?page=1>

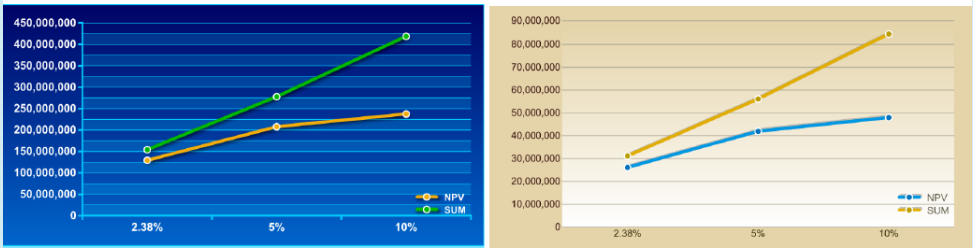
The following pages present illustrations on how France, Greece and Spain have assessed the cost of degradation of the marine ecosystem as part of the implementation of the MSFD, along with the main results that have been obtained from these assessments. These different assessments carried out at the national level illustrate the diversity of approaches chosen in terms of methodologies applied, sector disaggregation, indicators, etc. This makes any comparison between countries very difficult.

 FRANCE	Cost-based approach
Working process	An expert group of economists working closely with the environmental ministry and the French Agency of Marine Protected Areas has been charged with assessing the costs of degradation.
Approach and definition used	Cost-based approach by degradation themes. The total real expenditures necessary to at least maintain the current ecological status of marine waters for France are assessed.
Main justification for the choice of method	The Total Economic Value of benefits is difficult to assess and less robust economically (e.g. limitation of monetary valuation of non-use values). Management/maintenance costs method has been judged more operational.
Types of costs/pressures considered	<p>“Degradation problem areas” are defined based on the MSFD list of GES descriptors and the list of pressures and impacts of the initial assessment. Problem areas include: Marine litter, Chemical compounds, Microbial pathogens, Oil spills and illegal discharges, Eutrophication, Non-native invasive species, Biological degradation of natural resources exploited (aquaculture and fisheries), Loss of biodiversity, trophic changes, loss of integrity of marine substrates, Introduction of energy into the environment and changes in water regime.</p> <p>For each area, four types of costs are considered:</p> <ul style="list-style-type: none"> • Costs of monitoring and information, • Costs of positive action for protection of the marine environment, • Mitigation costs, • Residual costs (costs borne by private activities).
Methodology - Type of data used, approach for collecting data	<p>The analysis is only based on available data, both quantitative and qualitative one. Data collection took place in 2011 with 2010 as the year of reference. For each “degradation problem area”, three steps are undertaken:</p> <ul style="list-style-type: none"> • Experts interview, • Literature and report review, • Phone and email surveys to collect data from public and private organizations (more than 150 organisations contacted).
Scale of data	<p>The analysis is conducted on a sub-regional scale. 4 sub-regions have been defined: the Occidental Mediterranean Sea, the Channel-North Sea, the Bay of Biscay and the Celtic Sea. However data are often available at the national scale only. Data are then disaggregated as much as possible.</p> 
Main results	Costs of environmental degradation in French waters are estimated over 2.054 billion Euros in 2010 (representing 1.06% of 2010 national GDP). The highest costs are by far the ones of positive action (1.7 billion Euros), which are mainly arising for prevention against microbial pathogens, in the form of enforcement of

	water quality standards. Costs of chemical pollution have been estimated at 347 M€, the loss of biodiversity represents a cost of 148 M€, and the degradation of biological resources a cost of 133 M€.
Illustration	<p>The case of the cost of degradation of fish stocks illustrates the difficulty to get relevant data at the right scale. Following the global methodologies the different types of costs are assessed. The approach is to express the costs of policies aiming at a sustainable management of fisheries.</p> <ul style="list-style-type: none"> - Monitoring and information costs are assessed through the spending of public authorities for fisheries management (25.9 million €). This provides an overestimate, since it includes activities linked more globally to fisheries management. The budget allocated by NGOs to raise awareness about environmental issues of sustainable fisheries is also assessed (0.5 million €). - Costs of positive action are often integrated in the monitoring and information costs. - - Costs of incentive measure to reduce fishing capacities are estimated as additional costs of positive action (47.3 million €). - Mitigation costs are estimated through the costs of legal decisions to temporary stop some activities (6.8 million €). - Residual costs on other activities could not be quantified. <p>Results regarding the French Mediterranean coasts, the sum of the annual cost of degradation, all considered degradation themes being aggregated, has been assessed at 830 million € (40 % of the national total), broken down as follows:</p> <ul style="list-style-type: none"> - Monitoring and information costs: 72 million € (31%) - Costs of mitigation, including collection of marine litters: 31 million € (37%) - Cost of positive action for protection of the marine environment: 727 million € (42%)
Main challenges faced	The GES descriptors were not defined yet. The expert group used current legal norms, for each degradation area as substitute.
Key limitations of the approach/ key areas of uncertainty	<p>The assessment is helpful only if costs are compared with the effectiveness of environmental policies. Indicators could inform about the actual achievement of legal norms.</p> <p>Opportunity costs have not been integrated, the focus being on current flows of expenditures. Much information and data are incomplete. Data are especially missing for marine litter and invasive species.</p>
Sources	Levrel H., Jacob C., Bailly D., Charles M., Guyader O., Mongruel R., Aoubid S., Bas A., Cujus A., Frés and M., Girard S., Hay J., Laurans Y., Paillet J., Pérez J. (2012) [en ligne] « The costs of environmental degradation in the Marine Strategy Framework Directive: A case study from France », Amure Publications, Working Papers Series D-34-2012, 21p. Available: http://www.umr-amure.fr/electro_doc_amure/D_34_2012.pdf .



Ecosystem services approach

Working process	The Special Secretariat of MEECC has been assisted by a Technical Advisor, the Consortium “Advanced planning - Consulting SA ;University of the Aegean-Special account for research and Theodoros Vakkas” in order to develop, among other things, the assessment of the costs of degradation.																					
Approach and definition used	The ecosystem services approach has been used. The present value of the production value and the added value per sector is assessed in several scenarios.																					
Main justification for the choice of method	This method is used to overcome the absence of quantified data on the effects of environmental degradation on the economic sectors.																					
Types of costs/pressures /sectors considered	An analysis of drivers and pressures led to consider losses in six sectors: Fisheries, Aquaculture, Processing, Tourism, Beaches and Ports.																					
Methodology - Type of data used, approach for collecting data	The present value of the production value and the added value per sector is estimated in 3 scenarios of degradation. Cash flows are considered on the period 2008-2020 starting from the year with most recent data and ending the year where the GES should be achieved. The discount interest rate was set at 2.38%. Two more scenarios were analysed with higher discount rates (5 and 10%). Rates were applied on available data of sectors.																					
Scale of data	Data are expressed per sector at the national level only.																					
Main results	<p>Maximum cumulative losses in production value and added value were expressed in percentage of GDP. The table below summarises the results.</p> <table border="1" data-bbox="427 1155 1370 1435"> <thead> <tr> <th>Maximum cumulative losses in % of GDP</th> <th>Production value</th> <th>Added value</th> </tr> </thead> <tbody> <tr> <td>Fisheries</td> <td>0.07</td> <td>0.03</td> </tr> <tr> <td>Aquaculture</td> <td>0.07</td> <td>0.01</td> </tr> <tr> <td>Processing</td> <td>0.04</td> <td>0.03</td> </tr> <tr> <td>Tourism</td> <td>0.81</td> <td>0.15</td> </tr> <tr> <td>Beaches</td> <td>0.29</td> <td></td> </tr> <tr> <td>Ports</td> <td>0.002</td> <td></td> </tr> </tbody> </table> <p>Tourism is the sector the most impacted, far above the other impacts.</p>	Maximum cumulative losses in % of GDP	Production value	Added value	Fisheries	0.07	0.03	Aquaculture	0.07	0.01	Processing	0.04	0.03	Tourism	0.81	0.15	Beaches	0.29		Ports	0.002	
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Illustration	<p>The graph below presents the results for fisheries.</p>  <p>Scenarios based on production value (€)</p> <p>Scenarios based on added value (€)</p> <p>Figure 6 Net present value (NPV) cumulative losses (SUM) in production value and added value for fisheries in three different scenarios. Source: MEECC, 2012.</p>																					
Main challenges faced	The absence of official quantified data of the current effects of environmental degradation was the main challenge.																					

Key limitations of the approach/ key areas of uncertainty	Results do not explicit links between environmental degradation levels and economic sectors. It only presents some possible level of losses.
Sources	MEECC, 2012. Technical report for the preparation stage of Action Plan for Marine Strategies in Greece, for the Implementation of Marine Strategy Framework Directive 2008/56/EC.



SPAIN

Cost-based approach

Working process	The study was implemented by the General Coordination of the Ministry of agriculture, food and the environment.																																																			
Approach and definition used	Financial costs currently borne for reducing marine degradation are estimated. Efforts are made to distinguish costs related to the marine environment from the ones related to terrestrial areas. The time period of the costs and nature of institutions (public vs private sector) paying the costs are analysed. The focus was made on costs of national programmes of protection of the marine environment on the period from 2009 to 2011.																																																			
Main justification for the choice of method	This approach can be useful for future steps in the implementation of the MSFD, informing on the current structure of financial costs.																																																			
Types/categories of costs/pressures considered	Costs borne through national programmes, related to the protection of the marine environment are considered.																																																			
Methodology - Type of data used, approach for collecting data (only literature review, level of stakeholders involvement..)	7 programmes of 3 Ministries are related to marine protection. The objectives, actions and costs implemented under each programme were analysed.																																																			
Scale of data	Data are expressed at the national level and per programme of actions.																																																			
Main results	Costs of degradation are estimated at €1.3 Million on average per year from 2009 to 2011. The table below presents the costs per programme.																																																			
	<table border="1"> <thead> <tr> <th colspan="2" rowspan="2">Programme</th> <th colspan="3">Numbers in Millions of Euros</th> </tr> <tr> <th>2009</th> <th>2010</th> <th>2011</th> </tr> </thead> <tbody> <tr> <td>415A</td> <td>Protection of marine resources and sustainable development</td> <td>47.68</td> <td>52.10</td> <td>28.67</td> </tr> <tr> <td>415B</td> <td>Improvements in the fishing structure and markets</td> <td>125.11</td> <td>152.08</td> <td>93.34</td> </tr> <tr> <td>456A</td> <td>Water quality</td> <td>471.83</td> <td>584.98</td> <td>295.34</td> </tr> <tr> <td>456D</td> <td>Shoreline actions</td> <td>280.83</td> <td>301.20</td> <td>162.40</td> </tr> <tr> <td>456M</td> <td>Actions for the prevention of climate change</td> <td>121.19</td> <td>166.57</td> <td>101.51</td> </tr> <tr> <td>467E</td> <td>Oceanic and fishing research</td> <td>65.77</td> <td>61.28</td> <td>60.52</td> </tr> <tr> <td>454M</td> <td>Security of maritime traffic</td> <td>264.41</td> <td>219.10</td> <td>197.17</td> </tr> <tr> <td colspan="2" style="text-align: right;">Total</td> <td>1,376.82</td> <td>1,537.31</td> <td>938.95</td> </tr> </tbody> </table>				Programme		Numbers in Millions of Euros			2009	2010	2011	415A	Protection of marine resources and sustainable development	47.68	52.10	28.67	415B	Improvements in the fishing structure and markets	125.11	152.08	93.34	456A	Water quality	471.83	584.98	295.34	456D	Shoreline actions	280.83	301.20	162.40	456M	Actions for the prevention of climate change	121.19	166.57	101.51	467E	Oceanic and fishing research	65.77	61.28	60.52	454M	Security of maritime traffic	264.41	219.10	197.17	Total		1,376.82	1,537.31	938.95
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Illustration	The Spanish Institute of Oceanography is the only national institute whose activities are focusing on the marine environment. Its main goal is the improvement of the knowledge of the marine environment. Subjects like marine biodiversity, ecosystems and resources are investigated. Different actions are implemented like gathering fishing data, research operations in the seas etc. The budget of this institution has been estimated at €62.5 million/year.																																																			

	(Programme 467 E)
Main challenges faced	The difficulty lied in distinguishing what part of budgets was allocated to marine protection.
Key limitations of the approach/ key areas of uncertainty	This approach gave only an underestimation of the cost- of degradation.
Sources	MAGRAMA (2012) Estrategia Marina. Demarcación Levantino Balear. Evaluación Inicial. Parte III: Análisis Económico y Social. NIPO: 280-12-175-8. Ministerio de Agricultura, Alimentación y Medio Ambiente. Secretaría General Técnica. Centro de Publicaciones, Madrid.

WORK UNDER PROGRESS UNDER THE PARALEL REGOKO PROCESS

The costs of degradation are also assessed under the ReGoKo project (see section Introduction), the aim being to illustrate these costs applying different methodological approaches at national scale for south Mediterranean countries. The table below summarises the illustrations of costs of degradation of the marine and coastal ecosystems that are currently been assessed in the three countries, along with the methodology that is proposed for each individual illustration.

Table 2 Costs of degradation assessed in the case studies under the ReGoKo project.

Country	Activities bearing the cost of degradation	Method applied
Tunisia	Tourism	Computation of revenues lost due to environmental degradation
	Fisheries and aquaculture	Computation of revenues lost due to environmental degradation
Lebanon	Fisheries and aquaculture	Assessment of the total administrative costs of the Ministry of Agriculture services linked to fisheries and aquaculture as part of the total costs of protection/ enforcement/ conservation of the marine ecosystem.
Morocco	Fisheries	Assessment of the loss of revenues for fishermen due to overfishing of two species.
	Tourism	Estimation of potential additional revenues and employment on some touristic activities if the environmental state was improved.

Assessing the costs of degradation of the Mediterranean Sea: key issues and challenges for a regional approach

The examples presented above stress the differences that exist in terms of scope, data requirements and complexity of the assessments of the costs of degradation. Assessing the overall costs of degradation at a regional level such as the Mediterranean scale can therefore be quite challenging.

Developing a common thinking on economic and social issues at the scale of regional sea has been an initiative of the OSPAR Convention. A comparative analysis of the Economic and Social Analysis (ESA) developed by OSPAR European Member States in the context of the implementation of the MSFD (OSPAR Commission, 2013) has been carried out. Data and results available in the different possible ESA approaches were critically analysed and compared as a first step towards an analysis of socio-economic issues at the regional level. In the field of the costs of degradation, this comparative assessment met with several difficulties because of the diversity of approaches chosen to assess the costs of degradation in each OSPAR country⁴. Different types of data were used across countries hindering the comparability between data. Different reference years and scenarios were used, diminishing compatibility among data. Available data were summarised per country with a specific focus been made on marine litter. Available quantified data were not aggregated at the regional sea scale given the differences in approaches used. Given the difficulty to compare data, these results raised the question of their usefulness to guide marine policy implementation at the regional sea scale (OSPAR Commission, 2013).

Based on the various learnings presented different approaches has been identified, which could be followed in order to develop a useful assessment at the Mediterranean level. They are summarised in the following table.

⁴ Germany and Belgium used the thematic approach; the Netherlands, Denmark, Portugal, France and Spain the cost-based approach; whereas Ireland, Sweden, Greece and the UK used the ecosystem service approach.

Table 3 Potential options for moving ahead with the assessment of the Costs of Degradation for the Mediterranean sea

Option	Focus	Challenges	Advantages	Disadvantages
Option 1 - Assessing today's costs of protection	This option assesses the current costs of protecting coastal and marine ecosystems in the Mediterranean sea. These costs could be split by main descriptors thus providing the possibility to distinguish the costs of degradation of issues identified as priority by the COR ESA group (i.e. linked to disfunctioning urban wastewater treatments and to habitat/Posidonia destruction)	There are three main challenges: (1) collecting all costs of public organisations and programmes (that can be many in some countries) that are involved, directly or indirectly, in the protection of the coastal and marine environment; (2) assessing the share of these costs that are effectively dedicated to marine/coastal protection (as opposed to other objectives including economic development objectives); and (3) the difficulties in separating costs between descriptors (as protection measures might help targeting different descriptors at the same time).	These costs can be easily understood by all. The comparison between these costs and the integrated initial assessment of EcAp will help assessing if current protection efforts are coherent with the identified priority problems. Identification of measures inducing these costs could be built on the ongoing gap analysis of the current legislations contributing to achieve GES made under EcAp. The assessment can build on the application of a common data collection template at the national scale (+ for some international bodies that might have separate budgets for marine/coastal issues), data collected from each country being then "aggregated" to provide the costs of degradation for the entire Mediterranean sea.	These costs represent the current level of effort only, but do not capture what is required for improving the current health of coastal and marine ecosystems to their required level. This provides a underestimated value of the cost of degradation.
Option 2 - Illustrating the loss of economic activity that results from the current health of marine and coastal ecosystems	This option investigates the current loss of economic activity that results from the poor health of the ecosystem, building on available illustrations and case studies. Sector-specific illustrations can be developed: Economic impacts of fish stock over-exploitation	The main challenge results from the collation of case studies that represent some diversity (in terms of ecosystems, socio-economic development, institutions). For individual case studies, it requires information on the level of economic activity that would result from different levels of marine ecosystem health (actual versus optimal or healthy) – even if based on simple assumptions (e.g. tourism	The simple collation and synthesis of illustrations of specific sectors (e.g. fishing) from different Mediterranean countries could already help stressing the importance of impacts of poor ecosystem health on key economic sectors. The results are easy to understand – including for stakeholders/sector representatives.	It is unclear how the simple synthesis of results from "illustrative case studies" will be close to the "real" costs of degradation for specific sectors.

Option	Focus	Challenges	Advantages	Disadvantages
	<p>Economic impact of poor (chemical/microbial.) quality of bathing sites ...</p>	<p>activity in sites with and without pollution, or after a significant polluting event) or on modelling (e.g. modelling fish stocks under different pressures, so optimal fishing can be estimated), with clear challenges in how to address “site substitution” (i.e. the fact that tourists go to a different beach if their “regular” beach is of poor quality).</p>	<p>This approach directly builds on the overall “ecosystem service” approach. Thus, it is expected that it can complement in the medium term the work carried out elsewhere under the EcAp initiative.</p>	
<p>Option 3 - Assessing the loss of economic activity that results from the current health of marine and coastal ecosystem</p>	<p>This option investigates the current loss of economic activity that results from the poor health of the Mediterranean ecosystem. Similar to the option above, sector-specific illustrations can also be developed: Economic impacts of fish stock over-exploitation Economic impact of poor (chemical/microbial.) quality of bathing sites ...</p>	<p>This requires information on: (1) the current health/state of the coastal and marine ecosystems in the Mediterranean Sea (that would come from Step 3 of the EcAp road map); and (2) the level of economic activity that would result from different levels of marine ecosystem health (actual versus optimal or healthy) – even if based on simple assumptions (e.g. tourism activity in sites with and without pollution, or after a significant polluting event) or on modelling (e.g. modelling fish stocks under different pressures, so optimal fishing can be estimated). The challenge in how to address “site substitution” (i.e. the fact that tourists go to a different beach if their “regular” beach is of poor quality – be it in the Mediterranean Sea or elsewhere) is even more challenging than under Option 2. The overall assessment could build on the costs of degradation assessed with sufficient robustness for specific “sites” and then extrapolated to other sites for which no socio-economic information</p>	<p>These results would be seen as more robust in supporting coordinated action at the level of the Mediterranean Sea (as compared to the results that would be obtained from Option 2). The results are easy to understand – including for stakeholders/sector representatives. This approach directly builds on the overall “ecosystem service” approach. Thus, it is expected that it can complement in the medium term the work carried out elsewhere under the EcAp initiative</p>	<p>Because of the need to make assumptions (on changes in activity between different situations, on the use of substitute sites), the results can sometimes be questioned. Such an approach would then need rigour and clear transparency in assumptions made.</p>

Option	Focus	Challenges	Advantages	Disadvantages
Option 4 – Assessing the overall welfare loss that results from the current health of the marine and coastal ecosystem	This option investigates the overall welfare loss that inhabitants and citizens experience as a result of the current (poor) state of the marine and coastal ecosystems.	exist. To perform such assessment, one would need information on: (1) the current state of the marine and coastal ecosystems in the Mediterranean Sea; (2) the willingness to pay for improvements in the health of the Mediterranean sea and coastal ecosystems from all those that have an interest in the sea (inhabitants, tourists from different countries including non-med countries); (3) information on the current use of the marine and coastal ecosystem (who, when, how long, how often...) for different parts of the Mediterranean basin.	As compared to previous approaches that provide partial answers to the assessment of the costs of degradation, this approach provides an overall value of the foregone benefits because of the current poor health of marine and coastal ecosystems.	The notions of welfare and willingness to pay, along with the soundness of the methods developed for estimating them, are sometimes difficult to grasp and to accept (in particular from representatives of sectors). To carry out a specific “Mediterranean sea survey” (field survey) is likely to be too costly. Unfortunately, it is unlikely that sufficient (and relevant) information is available from existing (localised) surveys for being in a position to extrapolate existing surveys’ results to obtain Med sea results. .

Conclusion

This first preliminary report of the scoping study on the costs of degradation of the Mediterranean marine and coastal ecosystems presents the different methods that can be applied for assessing these costs. It illustrates how these costs have been assessed in some countries, identifying also additional illustrations that will be developed building in particular on case studies developed for Lebanon, Morocco and Tunisia as part of the parallel GeGoKo initiative.

The literature review shows that estimates of the costs of degradation are scarcer for the marine environment than in terrestrial areas. It illustrates the diversity of methods that are applied for different issues and thematic areas, and at different (mainly local) spatial scales. Furthermore, some assessments use rather old data that do not represent anymore the current state of the marine ecosystem and of the economy. As a result, it is very difficult to compare or to aggregate existing data. The current efforts made in the context of the MSFD implementation, however, stress the usefulness of the assessment of the cost of degradation at national scales, and the potential the results of such assessment might have to guide decision making.

The elements of a preliminary version of this report were presented and discussed at the second EcAp COR ESA meeting that took place 4 & 5 June, 2014.

There was an **overall agreement** among participants that **a more systematic assessment of the costs of degradation is useful/necessary** to support marine and coastal ecosystem protections. Indeed, presenting the direct economic (negative) impacts that the degradation of marine ecosystems have on economic sectors can strengthen awareness raising and more strongly support advocacy for the protection of the marine ecosystem;

The available experiences assessing the costs of degradation in the Mediterranean region are mostly focusing on **localised illustrations**. Attempts to obtain comprehensive national assessments are rare, although such assessments are becoming more common in particular for Mediterranean EU countries in response to the requirements of the EU MSFD;

However, the discussions did not reach a firm conclusion on the most appropriate way forward for undertaking such assessments within the EcAp process;

The exchanges stressed the need **to continue raising awareness** on the costs of degradation, in terms of definition, methods, and potential use of such results for supporting policy decision. In particular, it is important that sound assessments of the costs of degradation are carried out without mixing these assessments with socioeconomic impact assessments developed for supporting specific (economic) development projects.

Clearly, the illustrations of costs of degradation and the national workshops that will be organised in Lebanon, Tunisia and Morocco for discussing the results of the **ReGoKo initiative**, will bring additional thoughts on policy relevance, methods and way forward that will feed discussions at the Mediterranean level.

At this stage, it is important that **progress is made** with the development of knowledge on the costs of degradation for the Mediterranean sea. First, the **assessments of the current costs of protection of the coastal and marine environments** (Option 1 in table above) **appear as a necessary first step for “good government accounting”**. Such assessment effort would require that different government services in charge of statistics, of sector (fisheries, maritime transport) and of horizontal (land planning) policies work together in an operational manner. This would contribute to the emergence of a shared understanding and thinking on the marine and coastal system as a whole. And the application of a common methodology by all countries will bring collective lessons and recommendations on the assessments of these costs and on their robustness. Developed in a timely manner, it will help developing a common knowledge on the **costs of marine protection** that will be required for estimating the costs of new monitoring and additional protection measures to be identified in Step 6 (Revision of existing monitoring programmes for ongoing assessment and regular updating of targets) and Step 7 (Development and review of relevant action plans and programmes) of the EcAp road-map.

Also, the **assessment of the losses of economic activities** (option 3 in the table above) needs specific attention, as these losses foster debates, often passionate, based on “practical and real” (economic) arguments easily understood by policy makers. Furthermore, the assessment of current economic losses would be the basis for **assessing the benefits that can be expected from the development and review of relevant action plans and programmes** under Step 7 of the EcAp road-map. Because of the complexity of the relationships that might exist between economics sectors and marine ecosystems, it is suggested that **one sector** seen as priority for most of Mediterranean countries is selected as test case, with a common methodology between applied simultaneously in all Mediterranean countries.

Two good candidates emerge from a rapid review of economic and environmental issues and knowledge availability: (1) the costs of degradation imposed by and on the **tourism sector** as it is where most (local) studies assessing the cost of degradation exist today, and this sector is key to future sustainable development of the majority of Mediterranean countries; and (2) the costs of degradation imposed on the **fishery sector** (or on some types of fisheries), an area that requires a clear transnational approach. This second option might appear as more challenging as it would need bio-economic modeling of fish stocks at the Mediterranean scale that is still under development today.

The following diagram illustrates a possible road map that could be implemented at the scale of the Mediterranean region for (1) enhancing the knowledge base on the costs of degradation imposed by the current state of the marine and coastal ecosystem, and (2) complementing and supporting in a coherent manner the EcAp road map.

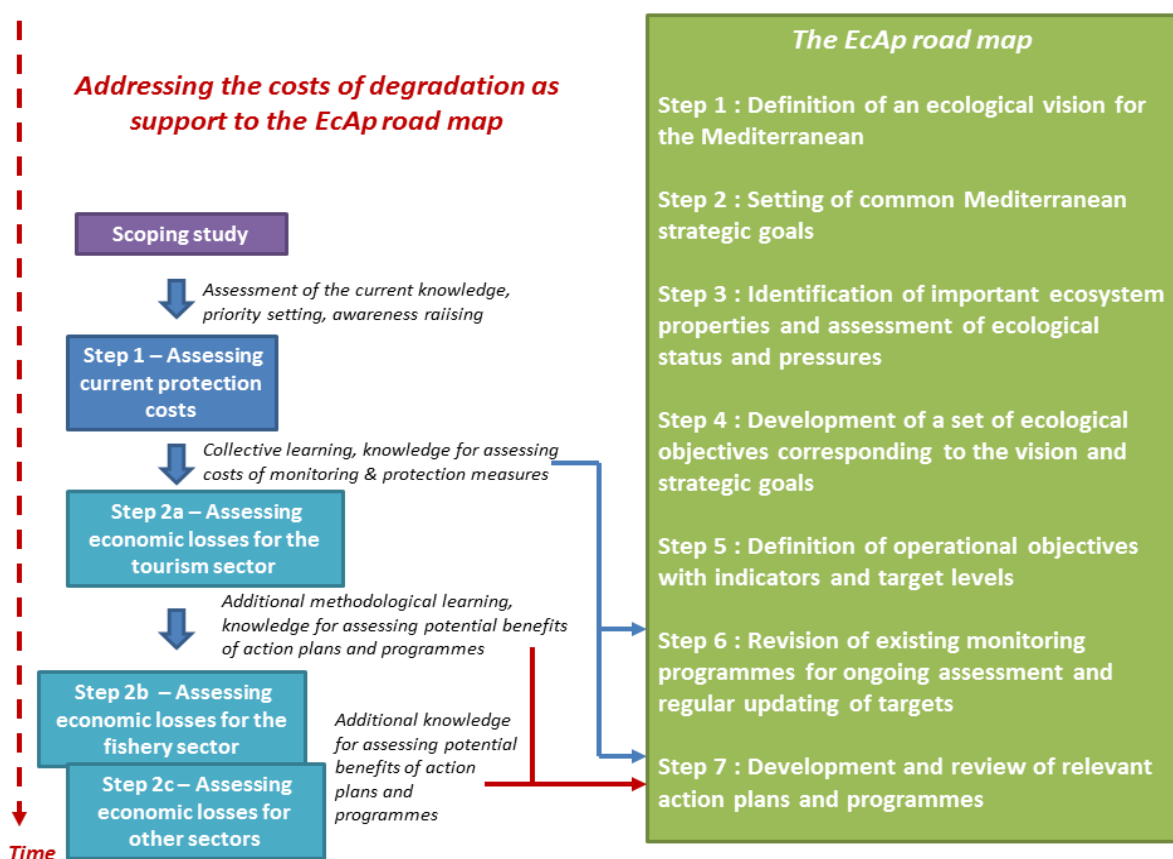


Figure 6 Possible follow-up steps for enhancing the knowledge on the costs of degradation in the Mediterranean sea as support to the EcAp process and road map

Clearly, this “way forward” will need to be presented and further discussed with representatives of the different Mediterranean countries. This will help adapting it so it is progressive, proportionate, owned and coherent with the EcAp process.

Bibliography

- AEE Consortium, 2012. Malta MSFD Initial Assessment, A report on the economic and social analysis of the use of the marine waters and of the costs of degradation of the marine Environment. Malta Environment and Planning Authority. Available online: <https://www.mepa.org.mt/water-msfd>
- Araña J., Melián A., León C., 2001. Valor de preservacion mediambiental en el sector turistico: consecuencias para la gestion, in: Proc. of XI Congress of Asociación Científica de Economía y Dirección de la Empresa (ACEDE), Zaragoza, 16–18 September 2001.
- Bolt K., Ruta G., Sarraf M., 2005. Estimating the cost of Environmental Degradation, A training Manual in English, French and Arabic. Environment Department Papers, The World Bank.
- Croituru L., Sarraf M., 2010. The Cost of Environmental Degradation, Case studies from the Middle East and North Africa, The World Bank, ISBN 978-0-8213-8318-6 — ISBN 978-0-8213-8396-4 (electronic).
- HM Government, 2012. Marine Strategy Part One: UK Initial Assessment and Good environmental Status.
- Levrel H., Jacob C., Bailly D., Charles M., Guyader O., Mongruel R., Aoubid S., Bas A., Cujus A., Frés and M., Girard S., Hay J., Laurans Y., Paillet J., Pérez J. (2012) « The costs of environmental degradation in the Marine Strategy Framework Directive: A case study from France», Amure Publications, Working Papers Series D-34-2012, 21p. Available: http://www.umr-amure.fr/electro_doc_amure/D_34_2012.pdf.
- Loubersac L., Do Chi T., Fiandrino A., Jouan M., Derolez V., Lemsanni A., Rey Valette H., Mathe S., Pagès S., Mocenni C., Casini M., Paoletti, S., Pranzo, M., Valette F., Serais O., Laugier, T., Mazouni N., Vincent C., Go P., Troussellie M., Aliaum C, 2007. Microbial contamination and management scenarios in a Mediterranean coastal lagoon (Etang de Thau, France): application of a Decision Support System within the Integrated Coastal Zone Management context. *Transitional Waters Monographs*, 107-127.
- M.A. Rudloff, Salles J.M., Boisson J. M., 1997. Evaluation monétaire du patrimoine naturel: pratiques et enjeux pour les espaces littoraux: application à l'étang de Thau, Master thesis, University of Montpellier.
- Mangos, A., Bassino, J-P., Sauzade, D. (2010). The economic value of sustainable benefits rendered by the Mediterranean marine ecosystems. Plan Bleu, Valbonne. (Plan Bleu Papers 8).
- MEECC, 2012. Technical report for the preparation stage of Action Plan for Marine Strategies in Greece, for the Implementation of Marine Strategy Framework Directive 2008/56/EC.
- OSPAR Convention, 2013. Strategic Support for the OSPAR Regional Economic and Social Analysis, Biodiversity series.
- Sarraf M., Larsen B., Owaygen M., 2004. Cost of Environmental Degradation – The case of Lebanon and Tunisia. Environmental Economics Series, Paper No 97, The World Bank.
- Seguí-Amórtégui L.A., 2004. Sistemas de regeneración y reutilización de aguas residuales. Metodología para el análisis técnico-económico y casos, Doctoral Thesis, Departamento de Ingeniería Agroalimentaria y Biotecnología, Universidad Politécnica de Cataluña.
- Sevda Birdir, Özlem Ünal, Kemal Birdir, and Allan T. Williams. 2013. Willingness to pay as an economic instrument for coastal tourism management: Cases from Mersin, Turkey. *Tourism Management* 36 (2013) 279-283.
- Signorello G., 1998. Valuing birdwatching in a Mediterranean wetland, in: *Environmental Resource Valuation: Applications of the Contingent Valuation Method in Italy*, Kluwer, Norwell, 1998.
- UNEP/MAP, 2012. Note on the ecosystems approach process in 2012-2013 biennium.
- Working Group on Economic and Social Assessment (WG ESA), 2010. Economic and Social Analysis for the initial assessment for the marine strategy framework directive: a Guidance Document, European Commission.