UNITED NATIONS

EP

UNEP(DEPI)/MED WG.404/6

UNITED NATIONS
ENVIRONMENT PROGRAMME
MEDITERRANEAN ACTION PLAN

18 November 2014
Original: English

Second MED POL Focal Points Meeting on NAP Update

Barcelona, 18-19 December 2014

Agenda item 4 (d): Review of technical annexes to the NAP update *Guidelines* (UNEP(DEPI)/MED WG. 393/10)

Draft guidelines on cost-effectiveness and cost-benefit analysis in selecting the programmes of pollution prevention and reduction measures in the NAP update process

For environmental and economic reasons, this document is printed in a limited number. Delegates are kindly requested to bring their copies to meetings and not to request additional copies.

Table of Contents

Introduction

Following the commitment of the Contracting Parties to the Barcelona Convention to update the National Action Plans (NAPs) adopted under Article 5 of the LBS Protocol of the Convention and endorsement of the NAP update Guidelines[1] (main body) at the MED POL Focal Points meeting held in Athens in March 2014, the Secretariat proceeded with the work on finalization of the technical annexes to the Guidelines including a first draft of the guidance on the use of cost-effectiveness and cost-benefit analysis for selection of the programme of pollution prevention and reduction measures.

The principal objective of the NAP update is to identify and prioritize national programme of measures to achieve Good Environmental Status (GES) with regard to pollution-related ecological objectives under the ecosystem approach (ECAP) in the framework of the LBS Protocol and the Regional Plans adopted in line with Article 15 of the LBS Protocol.

In preparing this first draft of the proposed guidance document, the work of the Secretariat was based in particular on the large number of reports and extensive experience gained in this field in the framework of the EU Marine Strategy Framework Directive (EU MSFD) implementation. Moreover, the draft guidance document is strongly rooted in the previous work carried out under the UNEP/MAP system. This especially refers to the Plan Bleu's technical reports on economic and social analysis of the uses of coastal and marine waters in the Mediterranean and on application of different tools and approaches (e.g. cost-benefit analysis, cost of degradation) to economic analysis, as well as to the UNEP/MAP Background paper on Marine Litter Regional Plan. A number of publications discussing methodological issues and practical application of different economic analysis tools that might be particularly useful to NAP update teams are provided in Annex 1 of this document.

The overall goal of the guidance document is to assist the NAP update thematic groups, stakeholders and experts to perform cost-effectiveness (CEA) and/ or cost-benefit (CBA) assessments (or, alternatively, multi-criteria analysis) in prioritizing and selecting the NAP measures/ programmes of measures to achieve GES for pollution related ecological objectives and meet Regional Plans targets. More specifically, the document aims to contribute to:

- sound analysis to underpin the NAP update process and facilitate decision making by providing attainable levels of information (quantitative and/ or qualitative) on effectiveness, costs and benefits of proposed NAP measures;
- overcoming of data gaps and other constraints;
- consistency in the approaches and outcomes of the NAP update in different Contracting Parties (by e.g. providing definitions, advices and guidance on various aspects and components of CEA and CBA) while allowing for specificities in different countries to be taken into account;
- dissemination of knowledge acquired and lessons learnt through the application of these (CEA and CBA) methodologies in related process, in particular through the work of the UNEP/ MAP Plan Bleu and in the EU MSFD implementation;
- capacity building in the NAP update countries.

[1] *Guidelines for Updating National Action Plans for the Implementation of the LBS Protocol and its Regional Plans in the Framework of the SAP-MED to Achieve Good Environmental Status for Pollution-Related ECAP Ecological Objectives* (UNEP(DEPI)/MED WG. 393/10)

The guidance document has three main sections. Section one proposes a number of definitions of terms related to socio-economic analysis. Section two describes at which stages of the NAP update process it is needed to compile, organise and analyse different socio-economic data. Finally, section three provides details on the possible ways of assessing cost-effectiveness, costs and benefits of NAP measures/ programme of measures, discussing particularly important and challenging aspects of the analysis, choices that need to be made and ways to address expected data gaps.

1 Section I: Definitions of the key terms and concepts

For the purpose of this guidance document and the NAP update economic analysis, the following definitions/ terms are used[2]:

Use of marine waters: Any human activity using or influencing the marine space and/ or ecosystem goods and services provided by marine waters.

Ecosystem services: Goods and services – benefits – that the ecosystem provides to human beings.

Degradation: Reduction in the provision of ecosystem services compared to another state.

Cost of degradation/ socio-economic losses: Foregone welfare, reflecting the reduction in the value of the ecosystem services provided compared to another state.

Socio-economic analysis: A socio-economic analysis aims to identify the impact on human welfare of a given policy. This includes economic as well as social aspects, and may include consideration of the distribution of these impacts across stakeholders. In light of this definition, an explicit distinction between „economic" and „social" analysis is not necessary[3].

Drivers: Factors (economic sectors and policy instruments) inducing the pressures (e.g. agriculture, fishing, subsidies, regulation).

Pressures: Forces that generate changes in the state of the ecosystem and thereby the provision of its services (e.g. nutrient load, salinity, fishing effort, oil spills, invasive species).

Impacts: Impacts are the consequences for human welfare caused by the drivers and pressures affecting the state of the marine environment.

DPSIR framework: a theoretical framework used for systematically analysing environmental problems on the one hand and identifying measures on the other hand. The DPSIR framework starts with a description of the Driving forces that cause environmental Pressures. These Pressures cause a change in the State of the environment. This may have Impacts on human wellbeing. If these Impacts are unwanted, policy-makers will Respond by taking actions aimed at the Driving forces to reduce their Pressures.

[2] Based on WG ESA Guidance document (2010), UNEP/MAP Plan Bleu's reports on economic and social analysis in the Mediterranean, costs of degradation, and methods and tools for socio-economic assessment of forest ecosystem goods and services (2014a, 2014b, 2014 c), Arcadis report (2014) and EC Impact Assessment Guidelines (2009).

[3] The NAP update process primarily uses the term 'economic' analysis, however the intention was not to exclude social aspects but rather to simplify the process and used terminology (whereas it is understood that social issues are a constituent part of the analysis).

The Driving forces are the activities, and the social factors driving these activities, that use the marine waters, either directly or indirectly, and consequently impact the marine environment. The use of marine waters puts Pressure on the marine environment in various ways. The pressures degrade the State of the environment, which Impact upon human health and the value of ecosystem goods and services. Society can decide to Respond by acting on the Driving forces, Pressures, State as well as the Impact of the problem by implementing measures and incentives (i.e. policy instruments).

Specific examples of what is in general understood under each element in the DPSIR sequence are provided below.

Driving forces	**Pressures**	**State** (of marine waters and ecosystems)	**Impacts**	**Responses**
Socio-economic activities (uses of marine waters) i.e. economic sectors such as tourism, industries, shipping, fisheries	Emissions/ pollution loads, extractions, disturbances	E.g. deteriorating bathing water quality, raised concentrations of contaminants, declining fish stocks, etc.	E.g. loss of recreation value, negative impacts on human health, reduced revenues from fishing etc.	Policies and measures aiming to reduce pressures and impacts (e.g. pollution standards, fishing quotas) and to reach set objectives (such as GES)

Use value: The use value captures the direct link between ecosystem services and human welfare.

- Direct use value includes the profits from direct use of marine environment ("economic" value) and wider benefits that are more difficult to measure, since they are not captured by market interactions, for example recreational activities such as swimming, fishing, scuba diving etc., as well as the importance to local coastal communities of maintaining their marine heritage ("social" value).
- Indirect use value includes the benefits we derive from the environment's provision of ecosystem services such as waste decomposition or carbon sequestration.

Non-use value: The non-use value describes, for example, the importance people attach to knowing that a healthy sea surrounds them and that this resource may be passed on to future generations.

Valuation: A set of steps/ methods performed in order to determine Total Economic Value (use and non-use values) of ecosystem goods and services that do not have a market price. Valuation can be applied to assess the overall value of ecosystem services or to assess economic value of changes in ecosystem services.

Costs: Costs of measures differ depending on their type[4]. In case of technical measures, additional costs of introducing new measures mainly consist of direct investment and operational costs. The costs associated with the policy instruments and their implementation are indirect costs and they include:

- *Administrative costs* for the regulator: research, information and meeting costs, enactment and lobbying costs, design and implementation costs and administration, monitoring and prosecution

[4] Definitions of the different types of measures are provided in the main body of the Guidelines.

costs. Most of these costs are costs of labour time for researchers, court staff, legislators, government staff etc.

- *Compliance costs* for the regulated: investment in abatement equipment or additional costs related to changed behaviour, administrative costs e.g. costs of applying for permits, monitoring costs;
- *External costs*: environmental and resource costs.

Benefits: The benefits from measures can be described by identifying use and non-use values. The use values can be separated into direct use values such as fishery production and recreation and indirect use values such as values of environmental functions or the effects on living conditions. Non-use values capture the less tangible values derived from the implementation of the measures (for example the values of preserving certain ecosystems for future generations).

Once identified, expected benefits (both environmental and socio-economic ones) associated with implementation of measures can be either fully monetised or (in cases large uncertainties are involved) given for illustrative purposes only. The monetization and/ or description of benefits normally requires to carry out a literature review of available studies in the area of the proposed policy and verify whether economic estimates can be adopted in that context. There are areas where economic benefits are easier to ascertain (for example financial savings associated with the proposal or recreational and tourism benefits) whereas for others it might be more challenging due to many scientific and economic uncertainties (e.g. ecosystem services valuation, health effects, etc.). It is good practice to explain at minimum in qualitative term what are the benefits associated with the measure in question.

Cost-effectiveness analysis (CEA): A decision support method which relates the costs of alternative ways of producing the same or similar outcomes to a measure of those resulting outcomes.

Cost-benefit analysis (CBA): A decision support method which aims to compare all relevant benefits and costs (in monetary terms) of an alternative (project, policy or programme), including impacts on environmental goods and services.

Multi-criteria analysis (MCA): A decision support method that can be used to evaluate and compare different alternatives according to their performance with regard to a selected set of evaluation criteria.

2 Section II: How does the economic analysis fit in the NAP update process?

The steps in the NAP update process have been recommended in the main body of the *Guidelines* (UNEP(DEPI)MED WG.393/10). Economic analysis, that is the compilation of data necessary to perform them and the very application of cost-effectiveness and cost-benefit assessments, will need to be carried out throughout the entire process, whereas the following NAP phases are particularly important:

- Step 1: assessment of the NAP midterm implementation benchmark;
- Step 4: prioritizing issues and identifying potential measures (based on *inter alia* socio-economic losses);
- Step 5: selection of the programme of pollution reduction measures (based on criteria that will include costs and benefits from their implementation, among others).

The role of the economic analysis and specific tasks that will need to be undertaken in each NAP update step are described below. The steps for which economic assessments are of major significance are paid special attention and elaborated in more detail. The economic analysis should be undertaken by the

appropriate specialists in the NAP update teams and tightly linked to the other analytical segments, drawing from them, supporting them and/ or serving as a basis for their development.

Step 1: Assessment of the NAP midterm implementation benchmark

Within the first step in the NAP update, measures implemented since the first NAP was adopted need to be described and the current baseline established. Following the establishment of midterm implementation benchmark, future trends in pressures and impacts also need to be described assuming the existing policies and measures.

In conducting this part of the analysis, the NAP update teams should also compile information on economic sectors and activities affecting marine environment and analyse them in a way as to establish what are the main uses of marine environment having in mind their significance in socio-economic and in terms of their environmental impacts. Two important tasks at this phase of the economic analysis are to: 1) identify and describe different uses of marine environment with related pressures and impacts; and 2) assess direct and indirect benefits from different uses. For both, description of current conditions and projection of trends is needed.

1. Identifying and describing different uses of marine environment; identifying and describing pressures from these uses and related impacts. The key questions that need to be answered are: what are the different human activities and their impacts on the coastal and marine environment? To the extent possible, all information should be quantified. Data on pressures and impacts should be acquired from thematic experts and consultants working on the analysis of policies, NBB preparation and other pollution related aspects of the assessment of NAP midterm implementation benchmark. Additional sources (such as national and regional statistics, analytical reports and studies) will be needed to compile information on specific socio-economic topics.

   At this stage the following information is recommended to be taken over from the baseline description, amended as appropriate and organised in order to enable further steps in economic analysis:
   - *number and size of settlements,*
   - *quantities of treated and untreated municipal wastewater discharged into the sea/ tributaries; municipal waste and principal disposal methods;*
   - *number, size and type of industries having an impact on marine environment,*
   - *quantities and type of industrial waste and wastewater generated (the disposal of which affects marine environment);*
   - *extent of agricultural activities in the coastal area,*
   - *fishing (e.g. size of the fishing fleet, total catches etc.) and aquaculture activities (areas used for aquaculture, production, etc.);*
   - *tourism data accompanied with pressures and impacts from tourism;*
   - *number and type of ports and related pressures;*
   - *use of marine waters for energy generation, if any; etc.*

   In addition to the description of existing conditions, a projection of pressures and impacts under the assumed continuation of existing policies and measures need to be made. The role of the economic analysis will be to provide a projection of expected changes in the uses of marine environment to allow for estimation of pressures and impacts. UNEP/ MAP Plan Bleu's report on economic and social analysis of the uses of marine waters in the Mediterranean (2014a) can be

used as a good example of how to structure and organize socio-economic data. The report is also relevant for the assessment of benefits (described in the following paragraphs).

2. Making an inventory of, and to the extent possible assessing direct and indirect benefits of different uses of marine environment. This entails collection of data on e.g. revenues, turnover, gross value added, employment, direct and indirect contribution to GDP, etc. from different economic activities[5]. In cases when adequately disaggregated (e.g. gross value added from coastal industries; employment in coastal agriculture etc.) and quantified data will not be readily available, the NAP update teams/ consultants should make an effort to come up with closest possible approximations and/ or qualitative description of benefits with the overall aim to have a clear picture of the magnitude and significance of different economic sectors.

   In addition to standard economic measures of benefits (such as figures on employment, revenues, etc.), it will be also necessary to consider less conventional measures of benefits provided by marine environment (such as goods and services provided by ecosystems). Since these do not necessarily have market value, there will be a need to carry out their valuation using some of the established techniques (discussed in more detail in section III of this document) or to rely on valuation studies, if existent, that have already assessed benefits provided by respective marine ecosystems. A growing number of such studies is available in different countries and they can serve as a valuable source to overcome data gaps and/ or avoid time and resource demanding assessments being carried within NAP update. In this phase of NAP update assessment, it will be necessary to identify and describe direct and indirect benefits and compile existing information from various sources, while as the valuation itself, when necessary and opted for, will be carried out at later stages of the analysis (e.g. for estimation of socio-economic losses and selection of measures under steps 4 and 5 of the NAP update).

In carrying out the two tasks (describing the human activities affecting the marine environment and the benefits deriving from it), it is recommended that the economic expert/s in NAP update teams follow the approach to determination of geographic scope[6] applied in the NBB preparation and use the related data from identification and classification of pollution sources (with related emissions). Due to the complexity of marine environment and expected lack of (disaggregated) data, the teams performing the analysis are likely to face difficulties particularly in their efforts to link certain impacts to relevant pressures and sources. Useful advices on the challenging task of establishing causal relationship between the state of ecosystems and economic activities can be found, amongst others, in the UNEP/MAP Plan Blue's report on setting the scope for assessment of costs of degradation.

[5] The indicators that are most commonly used to asses socio-economic benefits/ use values from different sectors are value added, production value, income and employment.

[6] The available guidance on MSFD implementation (e.g. WG ESA, 2010) highlights the importance of adequate definition of spatial, sectoral and temporal aspects. First of all, there is a need to define the size of the ecosystem, that is, to define the relevant borders of the ecosystem subject to the analysis. In the analysis one must also determine what economic sectors should be included in order to address the consequences of the problem as well as the policy responses. To include all sectors impacting on or being affected by the marine ecosystem services or all sectors affected by measures /policy instruments might not be practically possible or even justified. For practical reasons, focus might have to be restricted to capture the main sectors connected to the problem either as drivers or as those economic sectors affected by the impacts. The temporal aspect means addressing the following two questions: i) what are the dynamics of the system? and ii) how do drivers, pressures, and states change over time? The temporal scale of the socio-economic and environmental impacts of concern can be addressed through scenarios analysis. Understanding the dynamics of the ecosystem is vital in order to make scenarios as well as identify the appropriate policy responses.

Discussion of future trends in pressures and impacts, as well as discussion of effects these may have on the benefits from different uses of marine environment, in the first step of the NAP analysis will need to include information such as what pollution loads are expected over time if there is no change in current policies and measures and what will be the related impacts. Examples of the questions that need to be answered through integration of the economic and other segments of the analysis (if possible in a quantified manner) include:

- will the existing industries (as well as tourism, population, agriculture, etc.) grow or decline and to what extent/ at what pace;
- what will it mean in terms of quantities of the main pollutants reaching marine waters, direct or indirect uses of marine ecosystems;
- what impacts will it have on the state of marine ecosystems; and
- what will be the resulting impacts (gains or losses) for human wellbeing.

These projections will not be an exclusive or even predominant responsibility of the economic expert/s in the NAP update teams, however it is very important that close cooperation and coordination with experts working on pollution reduction is ensured and that all available data and knowledge are mobilized to arrive at the best possible projection of trends.

This is pivotal for determination of gaps (difference between baseline and set objectives), which make a starting point for identification of potential (new) measures that are needed to bridge the gaps. Omissions and mistakes in one phase of the analysis are likely to be carried over into the next one, thus affecting (in a negative way) accuracy and usefulness of the overall assessment. When quantification of future pressures and impacts (as well as of expected changes in benefits) will not be possible, qualitative assessments should be made to give as detailed as possible picture of the likely developments in human activities affecting marine environment over time.

Step 2: Definition of quantifiable objectives and operational targets

The definition of objectives and targets will primarily rely on the commitments stemming from the ECAP-GES and Regional Plans in the framework of SAP-MED as well as on the national priorities. Nevertheless, it is important to consider socio-economic conditions and have in mind possible specific concerns when setting up the environmental targets. A good baseline description of economic sectors (uses of marine waters) and related benefits, with projection of trends (resulting from the 2 economic analysis tasks performed in the NAP update step 1) will be of a great use for objectives and targets setting.

Step 3: Identification of gaps/ issues

Identification of gaps between midterm baseline and set objectives/ targets and assessment of the ability of existing measures to bridge the gap will also entail analysis of economic factors (including financial and/ or fiscal ones) and issues that prevent achievement of desired objectives. For example, barriers relating to wastewater management that are found in many countries are low levels of water tariffs, which slows down development of wastewater collection and treatment systems. Similarly, uptake of cleaner technologies in coastal industries is frequently hindered by the fact that there are no instruments (such as tax alleviations, pollution charges) to incentivise or dis-incentivise their introduction.

Step 4: Prioritization of issues and identification of potential measures

Prioritisation of issues and identification of measures is another step in the NAP update process where economic analysis will play a very important role, as one of the envisaged criteria for prioritisation of issues are socio-economic losses that will ensue if the set objectives are not met and if there is deterioration in the state of marine environment. The role of economic analysis at this stage of the NAP update is to provide as precise as possible data on the extent of losses that can be expected if appropriate measures are not introduced to close the gap between baseline and GES targets.

The main task under this step is to describe in qualitative and, if possible, in quantitative terms the costs that are expected to occur if the status of marine waters and ecosystems deteriorates. According to the UNEP/ MAP Plan Blue's report (2014 b), to cost of degradation corresponds to a loss of welfare and can be assessed in different ways, e.g. through a foregone benefit, a loss of profits, the increase in production costs or rise of mitigation costs. The main challenges highlighted in the report include definition of the reference against which the degradation will be assessed, establishment of causal relationships and assigning a monetary value on impacts that result from environmental change.

Various approaches – ecosystem, thematic and cost-based approach – to estimating the costs of degradation have been developed and used, mainly in the context of the EU MSFD implementation (the main elements of the three approaches are presented in table 2-1). Experiences are also gained in non-EU countries, for example as a part of the Regional Governance and Knowledge Generation (ReGoKo) project[7], and should be utilised to the greatest possible extent in the NAP update process.

Each of these approaches employs different valuation methods including qualitative, quantitative and monetary valuation. The assessments can be qualitative and quantitative in the sense that they can provide evidence of the types of ecosystem services that might be lost and the extent of that loss, without monetisation (e.g. assessment of a decline in fish stocks without assigning a value to the change).

Monetary valuation is a way of capturing people's valuation of the ecosystem services and is applied for services that are not traded and priced in any market. To be able to compute the economic value of environmental change influencing non-market ecosystem services, special valuation methods have been developed. Valuation methods fall broadly into two main categories: economic and non-economic. Each valuation technique has its advantages and disadvantages. Market data, cost-based data (including use of abatement costs) and the "production function approach" can elicit monetary values that have a strong foundation in robust data, but these methods cannot derive values that are not traded in any market. Choice modelling and contingent valuation can capture more of the total economic value of an ecosystem service (particularly non-use values), but the theoretical foundation for these analyses has been questioned. A summary table of the *pros* and *cons* of various valuation techniques is provided in the section III, preceded with a more detailed explanation of different valuation methods.

[7] Under the project, UNEP/MAP Plan Bleu supports activities on 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 selected Mediterranean countries.

2-1: Approaches to estimating the cost of degradation, UNEP/ MAP Plan Bleu (2014b)

Key issues	**The ecosystem services approach**	**The thematic approach**	**The cost-based approach**
Ways of addressing the costs	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 by WG ESA)	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.	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.	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 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.
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

Step 5: Selection of a programme of pollution reduction measures

Selection of a programme of pollution reduction measures is a crucial step in the NAP update where NAP teams will propose a set of the most needed and effective measures from the list of prioritised potential measures. The criteria of selection will include priority rank, ability to integrate with other measures, impact on marine environment, technical feasibility, implementation timetable as well as costs of implementation and cost-effectiveness/ cost-benefit ratios (or net present values). This is therefore the NAP update stage where CEA/ CBA will be used (to the applicable/ practicable extent). More details on why, how and when to apply CEA/ CBA (or use alternative tolls) are provided in Section III of this document.

Step 6: Development of NAP follow-up and reporting plan

A set of indicators that will be included in the NAP and the plan on how to follow-up and report on NAP implementation will also need to include data/ indicators from the economic analysis the countries will deem appropriate for monitoring and eventual updating of programme of measures. It is suggested that the NAP follow up plan includes recommendations on the main research needs and adjustments in the information and statistical systems to allow for better assessment of the effectiveness and sustainability of NAP measures.

Step 7: Drafting the NAP

The final step in the NAP update includes evaluation of the overall sustainability of the programme of measures and consultations, thus offering an opportunity to check rigorousness and consistency of the economic analysis once again. In the consultation phase in particular, principles and methods used in the economic analysis should be explained and results checked with a wide range of stakeholders. Any comments and suggestions regarding the estimation of costs and benefits (how realistic are they, have any significant omissions been made etc.) should be considered ad integrated to the greatest possible extent in the final version of the NAP in a concise manner. The results of the economic analysis will help decision makers to include in the final NAP an effective and sustainable set of measures to achieve ECAP GES and Regional Plans targets in the framework of SAP-MED.

3 Section III: Cost-effectiveness and cost-benefit analysis of measures/ programmes of measures

The aim of this section is to:

- provide brief explanation of the tools and outline their possible uses;
- recommend practical steps in potential application of the CEA/ CBA in the NAP update process and suggest alternative approaches in case full scale economic assessments will not be doable; and
- provide more information on methodologies and particularly challenging aspects of conducting the CEA/ CBA and point out possible ways for overcoming the challenges.

More detailed formation on the CEA and CBA (with references to different sources) can be found in Annex 3 to this document.

3.1 Cost-effectiveness analysis

The cost-effectiveness analysis has been widely applied in evaluating different policy options and specific measures/ projects and an extensive literature on both the theoretical underpinnings of the concept and on the practical experiences and *pros* and *cons* of its applications is available.

CEA is an analysis of the costs of alternative individual and/ or sets or programmes of measures designed to meet a well specified/ quantified objective. It is often interpreted as a tool that helps find the least-cost solution for meeting a prescribed target (for example, how to attain a set level of nitrogen in coastal waters at least costs). The cost-effectiveness is calculated by dividing the annualised costs of the assessed measures/ sets of measures by a quantified physical effect. Marginal costs of different assessed options can, for example, be defined as the increase in total abatement costs when pollution loads are decreased by 1 ton or 1 kilogram per year. As long as marginal costs are not equal, it is possible to obtain the same level of pollution reduction at lower costs by shifting emission reduction from high cost to lower cost measures. CEA is normally used when it is difficult or impossible to express benefits from different measures in monetary terms.

In the steps 1 – 4 of the NAP update process, baseline will be defined, specific environmental objectives/ operational targets (e.g. reduction in nutrient inputs, bringing concentrations of contaminants below the levels giving rise to pollution effects, etc.) will be determined and potential measures to bridge the gaps between the baseline and target situations identified. Provided that the data is available and the national NAP teams deem it appropriate (within the step 5 of the NAP update), it is recommended to conduct a CEA for specific measures/ sets of measures by carrying out the following tasks:

1. Assess the effectiveness of these measures in reaching the environmental objective;
2. Assess the costs of these measures;
3. Rank measures in terms of increasing unit costs;
4. Assess the least cost way to reach the environmental objective/ target.

In case sufficient data will not be available for monetary expression of costs of all measures, the experiences with the implementation of the EU MSFD show that the use of qualitative and semi-quantitative approaches is also possible and can give valuable results. Examples of several possible approaches are summarised in points a) to d) below (with more details provided in Annex 3).

a) Collecting opinion of experts, civil servants and scientists (through workshop and interviews) on the contribution of each measure to the GES indicators. This approach is useful in situations when physical effects of potential measures can be identified but not quantified. An illustration referring to marine litter is presented below.

Measures	Effect
Additional fishing for litter	Negative effect: decreased seafloor integrity
Additional beach cleaning on non-bathing beaches (once a year)	Less litter on the beach
Adding individually recognisable markers to fishing nets and wires	Reduce illegal or improper spill of nets (the first source of litter on the beach)

b) A scoring system can be applied to classify:

- expected reduction of different pressures for each measure, and
- the relation (and importance) of each pressure for each individual target (and indicator)

as low, moderate, high or very high, based on the set of pre-determined criteria. Multiplying the expected reduction in pressure with the importance of a pressure for a certain target gives the on-site effect for a certain measure (displayed on a scale 1 to 5). The pressures are then scored according to their geographic dimension using the same classes (low to very high). Multiplying the on-site effect and scale of the effect gives the overall effectiveness of the measure. The effectiveness scores are then compared with costs scores in a matrix form to allow for conclusion on the overall cost-effectiveness of measures. This approach is particularly useful to overcome the knowledge gaps regarding driver-effect-pressure relations.

c) Environmental effectiveness of measures can be evaluated and classified (as strong, potentially strong, or uncertain) and compared with categories of implementation costs (low, moderate and high). Based on such an analysis, four levels of cost-effectiveness can be defined:
   - cost-effective measures,
   - moderate cost-effective measures,
   - low cost-effective measures, and
   - non cost-effective measure.

d) A 'scale' („+++" to „---") system can be used to assess costs and effectiveness (and possibly other criteria including benefits, feasibility, etc.) of NAP measures when monetized assessments will not be possible.

It is recommended that NAP update teams consider using the approach of evaluating and comparing effectiveness and costs (example c) to categorise measures in terms of their overall cost-effectiveness. The advantage of the approach is its simplicity. On the other hand, its application leaves a large room for arbitrary assessments and efforts should be made in the NAP update process to reduce subjectivity (by e.g. conducting the assessment in a workshop setting and reaching an agreement of various stakeholders on the assigned categories, or by defining detailed criteria on how to evaluate effectiveness).

3.2 Cost-benefit analysis

CBA is a method for comparing policy measures against the baseline situation in terms of their advantages (benefits) and disadvantages (costs). This essentially involves estimating all of the negative and positive economic, social and environmental impacts. CBA can be done at various levels, depending on data availability. It can be either a full CBA when the most significant part of both costs and benefits can be monetised, or a partial CBA in cases when quantification/ monetisation will only be possible for a part of the costs and benefits. The results of this analysis can be interpreted as a benefit to cost (B-C) ratio (total benefits divided by total costs) where a ratio larger than one indicates that the policy measure is beneficial, or as a net present value (NPV - the present value of the net benefits) where a positive NPV indicates a welfare improvement.

When conducting a full CBA in the NAP update process will be deemed appropriate, the following steps are recommended (adapted from Turner et al, 2010):

1. Definition of the details of each measure/ set of measures subject to the analysis, including the 'do nothing' option (i.e. projection of trends in pressures and impacts without analysed intervention/s).
2. Determining the spatial and temporal scales of the analysis (i.e. over what population is it appropriate to sum the costs and benefits and over what time period do the costs and benefits arise?).
3. Identification of the costs and benefits and their monetary values. Monetary value may be based on the market value of a good or service or on its replacement cost (if that can be calculated), or, in the case of some environmental goods and services, by use of various valuation techniques. To enable valid comparisons, all monetary values must refer to a common point in time – the base year – to give 'present' values. A standard discount rate is applied so that costs and benefits of measures with varying time scales can be compared (some considerations to support the choice of discount rate are provided in sub-section 3.3.3).
4. Compare the economic efficiency of various options through comparison of their benefit-cost ratios or net present values.

If the resources would permit it, it is also recommended to carry out a sensitivity analysis to assess the impact (on the benefit cost ratio and/ or net present value) of changes in the values of central parameters, e.g. the value of costs and benefits or the discount rate. By examining the impact that increasing costs (or reduced benefits) may have on the net present value, the breakeven point can be determined whereby the assessed option would be no longer justifiable.

It is preferred that the costs and benefits are expressed in monetary terms, but this is not a requirement to call an analysis a cost-benefit analysis. In cases full monetisation will not be possible, a qualitative description of costs and benefits could be performed instead to meet the needs of the NAP update and aid the decision making process.

Specific examples of the application of cost-benefit analyses are available from the UNEP/MAP Plan Bleu's (2014c) and Arcadis (2014) reports. The Plan Bleu's report is particularly valuable as it describes in detail concrete steps and methods that need to be applied at each CBA stage with an illustration for a project-level analysis (example of CBA for an afforestation project is provided). A limited number of examples from applying CBA in the framework of the EU MSFD implementation is also available.

3.3 Assessment of costs, valuation and temporal aspects in CEA and CBA

Three very important and challenging aspects in conducting CEA and/or CBA are related to techniques and approaches used to assess the costs of measures, include values for non-market goods and services and to allow for comparison of costs and benefits that occur at different times. The following sub-sections provide more information and the main guidance points for each of these.

3.3.1 Costing of measures

The main question to be answered in costing of potential NAP measures (as an input for CEA/ CBA or criteria for prioritisation of measures) is how much the implementation of the given measure costs the society (in terms of public and private costs). To answer this question, nature of the given measure needs to be determined and its breakdown into basic components and/ or inputs needed for implementation provided. Different types of measures require different types of input to be implemented, and these inputs are fundamental for costing i.e. for estimation of costs.

- Technical measures: some benchmarks or indicators usually exist for concrete interventions with tangible results (covering investment and operational costs). For example, feasibility studies may have been carried out for WWTP in a given region of the country and unit costs per population equivalent can be derived and used for similar projects/ measures. Alternatively, some international costing methods could be applied[8], while for example using Purchasing Power Parities to adjust the costs to national circumstances. Waste management strategies can be also a useful source of information for the assessment of costs as they may include information on e.g. number of improper waste disposal sites in the coastal region the remediation of which is needed and a number of landfills to be constructed with estimation of costs. Other national plans may be a useful source of information on costs and contain e.g. information on number of industries in which technological changes are needed to address contaminants, scale of investments needed and similar. UNEP MAP Background document on marine litter regional plan (2013) and indicative costs provided therein on e.g. clean-up costs (per km of coast cleaned, per person to control litter, costs associated with fishing gear retrieval etc.) could be used for the assessment of costs of marine litter management measures.
- Legislative measures – the time needed to draft the laws and administer them are the main cost elements for this type of measures. Private costs (i.e. costs to entities to which the regulation applies) can be assessed by translating legal provisions into specific requirements needed to comply with the law and by estimating their costs.
- Policy instruments – tax breaks to stimulate introduction of cleaner technologies will have a clear cost for the national (regional and/ or local) budgets in terms of public revenues forgone. In addition to that, some indirect costs will incur relating to additional work of civil servants needed to administer the scheme. Introduction of economic instruments (e.g. pollution taxes and/ or charges, deposit-refund systems and similar) will also have a distinct cost linked to administration and enforcement (work of relevant tax and other public services, perhaps environmental funds, to collect the revenues, costs of monitoring the discharges, work of inspectorates to enforce the regulation etc.).
- Capacity building and awareness raising measures can be costed by e.g. determining how many people need to undergo training courses, take part in study visits and similar. Public campaigns costs can be assessed by breaking down the measures into type of communication materials, media time, work of specialized consultants etc.

A more difficult part of the analysis will be estimation of costs/ losses that would be incurred to the economy and society if the degradation is allowed (due to continuation of current measures and policies or under 'no measures' assumption) since these estimates include both use (direct and indirect) and non-use values.

As regards the benefits, the main questions are: How to quantify benefits? Is it always possible? How to provide for monetary expression of certain benefits that are expected to be generated by identified measures[9]? How do we value achievement of good ecological status yet make sure the estimates are not arbitrary? Answers to some of these questions can be found through the use of techniques and approaches that are not always straightforward, are somewhat sensitive and frequently disputed (such as valuation of non-market goods and services and discounting – briefly discussed in the following sub-sections).

[8] UfM report *Update priority investment projects for protecting the Mediterranean Sea from pollution: evaluation of NAP investment portfolio – regional analysis*, for example, assessed investment costs of priority wastewater projects by using cost functions developed by COWI under FEASIBLE model whereas an adjustment (reduction) of 80% was applied for Southern Mediterranean countries.

[9] For example, how much will BOD_5 emissions be reduced if certain measure is implemented and what benefit will it generate for the marine ecosystems and society.

3.3.2 Valuation of non-market goods and services

Costs of positive and negative changes in an ecosystem as well as benefits from implementing certain measures can be captured through valuation of ecosystem services and products. The UNEP/ MAP Plan Bleu report (2014c) is a useful source of information on valuation as it presents the basic concepts and describes selected valuation methods (market price, cost based, hedonic pricing, travel cost as well as stated preferences and other methods).

In order to understand the value of an ecosystem it is necessary to characterise and quantify the relationships between ecosystems and the provision of ecosystem services, and to identify the ways in which these impact on human welfare. Contributions to human welfare i.e. benefits from ecosystem services can be translated into economic value using economic valuation techniques. To arrive at economic value of changes in ecosystem services, the following steps are recommended (based on Defra, 2007):

1. Establish the environmental baseline;
2. Identify and provide qualitative assessment of the potential impacts of measures on ecosystem services;
3. Quantify the impacts of measures on specific ecosystem services;
4. Assess the effects on human welfare;
5. Value the changes in ecosystem services.

Valuation is the last stage of an often detailed assessment of the impacts on ecosystem services arising from a given measure/ set of measures or policies. As already mentioned, there are two types of valuation methods: economic, which is consistent with use in a cost-benefit analysis context, and non-economic (deliberative and participatory methods). The concept of total economic value (TEV) consisting from use and non-use values with different sub-categories is presented in figure 3-1 as it is important for understanding and comparing different valuation methods.

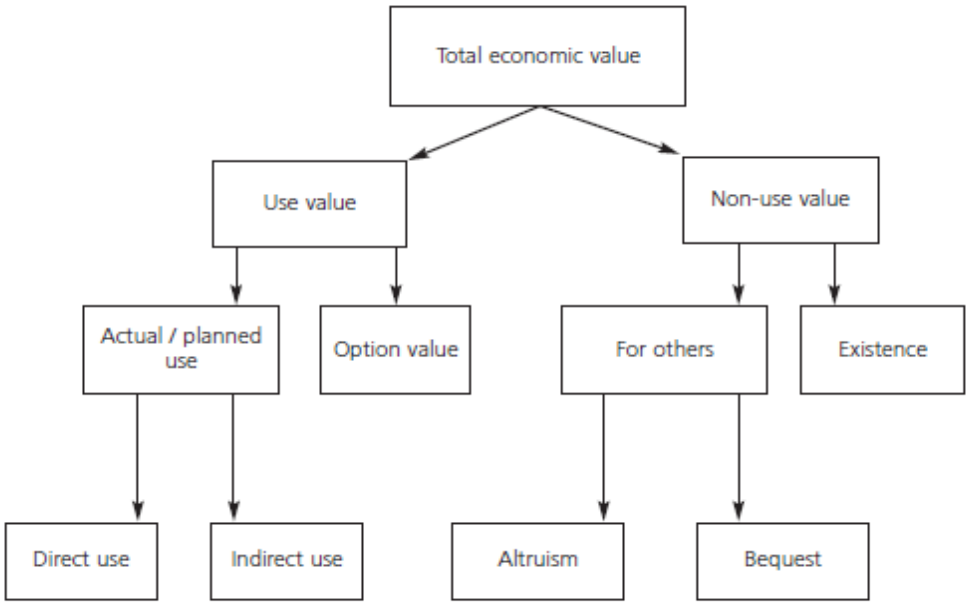


Figure 3-1: Total economic value framework, Defra, 2007

Economic valuation methods attempt to elicit public preferences for changes in the state of the environment in monetary terms. The main types of economic valuation methods available are Revealed Preference and Stated Preference methods.

Revealed Preference (RP) methods rely on data regarding individuals' preferences for a marketable good which includes environmental attributes. These techniques rely on actual markets. Specific techniques falling into this group are: market prices, averting behaviour, hedonic pricing, travel cost method, and random utility modelling. Market prices and averting behaviour can also be classified under pricing techniques[10].

Stated Preference (SP) methods use carefully structured questionnaires to elicit individuals' preferences for a given change in a natural resource or environmental attribute. In principle, SP methods can be applied in a wide range of contexts and are the only methods that can estimate non-use values which can be a significant component of overall TEV for some natural resources. Contingent valuation and choice modelling are the main SP techniques used.

An indicative applicability of these methods in the context of specific categories of ecosystem services is presented in the table 3-1 which at the same time provides information on benefits and limitations of different approaches.

Table 3-1: Choice of valuation methods, Defra, 2007

Valuation method	Element of TEV captured	Ecosystem service(s) valued	Benefits of approach	Limitations of approach
Market prices	Direct and indirect use	Those that contribute to marketed products e.g. timber, fish, genetic information	Market data readily available and robust	Limited to those ecosystem services for which a market exists
Cost-based approaches	Direct and indirect use	Depends on the existence of relevant markets for the ecosystem service in question. Examples include man-made defences being used as proxy for wetlands storm protection; expenditure on water filtration as proxy for value of water pollution damages	Market data readily available and robust	Can potentially overestimate actual value
Production function approach	Indirect use	Environmental services that serve as input to market products e.g. effects of air or water quality on agricultural production and forestry output	Market data readily available and robust	Data-intensive and data on changes in services and the impact on production often missing
Hedonic pricing	Direct and indirect use	Ecosystem services that contribute to air quality, visual amenity, landscape, quiet i.e. attributes that can be appreciated by potential buyers	Based on market data, so relatively robust figures	Very data-intensive and limited mainly to services related to property

[10] Pricing approaches use observed market prices either as direct measures of economic value of an ecosystem service (e.g. market prices, avertive expenditure, damage costs avoided) or as a proxy for the value (referred to as cost-based approaches). Cost-based approaches to valuing environmental goods and services consider the costs that arise in relation to the provision of environmental goods and services, which may be directly observed from markets such as: opportunity cost; cost of alternatives, and replacement costs. However, as these methods are based on costs, they do not strictly measure utility (and are therefore not included under the TEV framework), that is, they are non-demand curve methods and need to be used with care.

Travel cost	Direct and indirect use	All ecosystems services that contribute to recreational activities	Based on observed behaviour	Generally limited to recreational benefits. Difficulties arise when trips are made to multiple destinations.
Random utility	Direct and indirect use	All ecosystems services that contribute to recreational activities	Based on observed behaviour	Limited to use values
Contingent valuation	Use and non-use	All ecosystem services	Able to capture use and non-use values	Bias in responses, resource-intensive method, hypothetical nature of the market
Choice modelling	Use and non-use	All ecosystem services	Able to capture use and non-use values	Similar to contingent valuation above

Non-economic valuation – deliberative or participatory – approaches[11] tend to explore how opinions are formed or preferences expressed in units other than money. The decision on the choice of valuation methods does not need to be eliminatory (economic or non-economic). Instead (depending on the context) a combination of the two can be applied.

3.3.3 Discounting

Discounting is a method used to value at the same date economic flows and stocks which have originated in different points in time. Discount rate is the rate used for discounting future values to the present. In cost-benefit analysis, there is a distinction between a private and a social rate of discount. A private rate of discount reflects the time preference of private consumers; a social rate is based on the government's view, which can be more long-sighted as it attempts, in most cases, to take into account the welfare of future generations (WATECO, 2003).

The discount rate used may have a significant impact on the outcome of the analysis, as it affects the value of future costs and benefits. Since benefits usually occur quite some time after measures are taken the temporal weight of these, given by the discount rate, will have a significant effect on the benefit side in a cost-benefit analysis. Since present values of future benefits becomes less the further ahead in the future they occur, assuming a positive discount rate, a hyperbolic discount rate is used in some cases. A hyperbolic discount rate implies a discount rate that is decreasing between different time periods (an example used by WG ESA in their 2010 Guidance document is provided in the table below).

Time horizon	**Discount rate**
0-10 years	3 %
10-30 years	2 %
30-75 years	1 %
> 75 years	0.5%

By using a hyperbolic discount rate the benefits occurring far into the future are given a relatively larger weight, than if a constant discount rate had been used. This might be justified by the fact that uncertainty increases as the impacts of projects occur further into the future.

[11] Include qualitative semi-structured surveys, group deliberative discussions (such as focus groups or deliberative forums), citizens' juries, health-based approaches (such as quality-adjusted life years or health-year equivalents) and others.

Since any level of discount rate used will be questioned, a sensitivity analysis with regard to the discount is recommended to be applied in any assessment. It is also recommended to provide an explanation on the motivation behind the specific choice of discount rate.

3.4 CEA, CBA or alternative tools?

When evaluating different policy options, measures or projects, the economic analysis normally looks at two questions: i) is a given objective worth achieving, and ii) if yes, what is the most cost-effective way of achieving it. Cost-benefit analysis is used to address the first question while the second one can be answered by applying the cost-effectiveness analysis.

Another way of making the choice of using the CEA or CBA is to look at the nature of the question that is being analysed. If the task is meeting some environmental standard, complying with a law or achieving a target, then CEA is the appropriate course of action. If the question is one of choosing between a number of different possible policy or project options which do not involve compliance with standards or targets, then CBA is the most appropriate assessment tool.

Further questions to be considered in determining whether to undertake a CEA are:

- Have functional relationships between measures, pressures and impacts been described?
- Is the socio-economic data collected in the first step of the NAP update sufficient to allow a cost-effectiveness assessment?
- What are the gaps in information and what actions are needed to fill the gap?

While as CEA can help to prioritise measures, its limitation is that the estimation of costs for the application of this tool does not consider the full socio-economic and environmental impacts. The effectiveness assessment is based on the contribution of a measure to a specific target and not the full range of benefits. Another important limitation of CEA is to do with the assessment of the effectiveness of combination of measures.

CBA can provide a very useful and reliable input into the decision-making system, provided that it is carried out fully and impartially. However, translating all the costs and benefits of a project, policy or management scenario into monetary terms can be impractical or it may not give useful results. It should be remembered that CBA only provides an aid to decision making and that the option providing highest benefit per unit cost may not be the most appropriate on other grounds. In these situations multi-criteria analysis (MCA) can provide an alternative as it permits the inclusion of non-monetary criteria into the assessment and explicitly allows for stakeholder deliberations and dialogue.

Multi-criteria analysis (MCA) is a decision support method that can be used to evaluate different alternatives (e.g. different policy options) according to their performance against a selected set of evaluation criteria. These performances are presented in a so called performance matrix, or consequence table. MCA applies cost-benefit thinking to cases where it is necessary to deal with impacts that are a mixture of qualitative, quantitative and monetary data and where are varying degrees of certainty.

The main steps of MCA, as recommended in the UNEP/MAP Plan Bleu's report (2014 c), are:

Step 1: Establish the aims of the MCA, the decision makers and other stakeholders
Before starting the MCA, it is crucial to clearly define the objective of the MCA (why it is done) and to define who should be involved in the MCA process (e.g. decision makers and other stakeholders).

Step 2: Identify alternatives
After the objectives and the stakeholders are identified, the alternatives (e.g. alternative management approaches, measures or similar) to be evaluated should be listed.

Step 3: Define the criteria (and the corresponding objectives) that reflect the relevant consequences of each option
Defining the criteria is a crucial part of the MCA. The selected criteria should reflect all the important characteristics of the evaluated alternatives.

Step 4: Describe the performance of each alternative against the criteria in the performance matrix and determine the score matrix (scoring)
Before the scoring can be performed, all evaluated alternatives should be described, with regards to the selected criteria. These descriptions should be done in a neutral and objective way, not to influence the evaluation process.

Step 5: Assign weights to each of the criteria to reflect their relative importance (weighting).
This step introduces the relative importance of the criteria, and thus adds another dimension to the evaluation process. The users involved in a MCA may not only differ in their judgment of the performance on criteria, but also in the relative importance they attach to different criteria).

Step 6: Combine the weights and scores for each of the options to derive overall values.

Step 7: Analyse the results
Based on the obtained results, recommendations can be made regarding which alternative would be the best (overall) or which performs best on a single criterion.
The following strengths and weaknesses of multi-criteria analysis have been identified:

Strengths	Weaknesses
• Enables taking into account impacts that are not easily given monetary values. • Facilitates stakeholder involvement. • Makes the appraisal and decision-making process more transparent.	• No built-in standard value, as it applies values (criteria and weights) specific to the evaluated option. • Comparisons between studies with different valuation criteria and weights are very limited. • Requires well developed participation processes and strongly depends on stakeholder willingness to participate.

In case the countries will choose to apply MCA to support selection of the programme of measures, the analysis itself will be conducted in the step 5 of the NAP update. Some elements of the MCA will however need to be determined in earlier NAP phases (e.g. alternatives to be assessed will in fact be determined in the NAP step 4 when potential measures will be identified).

3.5 Data limitations, complexities and uncertainties

Complexities of marine environment[12] pose numerous difficulties for assessing the cause-effect relationships between pressures, impacts, state and related socio-economic losses or gains. This in turn makes the assessment of effectiveness and benefits of different measures more complicated. In a cost-

[12] Including for example the following facts: the seas are an open access resource; there are transboundary effects and mixing/ accumulation of pollutants and impacts; there are gaps in scientific knowledge on the dynamics of marine ecosystems and their reaction to external stresses; and similar.

effectiveness analysis, for example, effectiveness can be either assessed by looking at a pressure (tons of emissions reduced) or an impact (avoided damage or improvements in environmental quality). Which of the two is applicable depends on how the objectives (which the assessed measures are set to achieve) are defined. In practice, most assessments tend to focus on pressures, since they are less challenging to measure and since the causality between measures and effects is easier to establish.

Lack of data and uncertainties due to complexity of marine environment, insufficient monitoring and information systems in many of the countries that will perform NAP update as well as other factors are expected to affect significantly economic analysis and possible application of CEA and CBA. Nevertheless, these limitations should not be used as a justification not to conduct the analysis and every effort should be made to apply the logic and elements of cost-effectiveness and cost-benefit assessments in determining programmes of pollution reduction measures and to utilise to the greatest possible extent potential of these tools.

Available studies and reviews show that carrying out full scale CBA and monetising all the costs and benefits is a significant challenge but at the same they provide examples of good practices in overcoming such challenges. These can provide ideas and point out to useful practices for the development of the NAP economic analysis.

To address data gaps, the NAP update teams need to make sure that all the useful sources of information are identified in the beginning of the process including in particular any information on non-economic uses of marine waters, non-use values, correlations between drivers, pressures and state/ impacts. Available data should be used in the best possible way and a pragmatic approach should be employed, while setting the basis for more comprehensive analyses in the future. Usage of a mix of quantitative and qualitative data and expert judgments is strongly encouraged in all the cases when full quantification will not be possible.
The following simple recommendations drawn from the existing experiences with similar types of the analysis can be useful:

- Start preparations early;
- Identify all relevant national sources and studies; identify comparable regional/ international sources and examples;
- Know (agree upon) what role will the economic analysis have in the decision making process;
- Assess available data and decide on appropriate tools to be used;
- Organise data in the manner that will allow consequent steps in the analysis (e.g. develop a database of measures with uniform data on costs and effects of measures)
- Identify any areas where new assessments/ data collection is necessary having in mind time and resource limitations;
- Try to keep the analysis simple, focusing on the main pressures and impacts;
- When quantification is not possible, use qualitative approaches;
- Identify research needs and adjustments in the monitoring and statistical systems for the future.

It is also strongly recommended to the NAP update teams to note down any gaps in knowledge, lack of data, and uncertainties that will be faced in the process, to explain clearly assumptions and approximations made, and to discuss possible effects all of these may have on the deployed methodologies and obtained results.

Annex 1: Useful reports

European Commission DG ENV (2010). WG ESA: Economic and social analysis for the Initial assessment for the marine strategy framework directive: a guidance document *[Provides a comprehensive overview of issues relevant for the EU MSFD Implementation most of which are highly significant for the NAP update too. The most relevant topics covered include economic and social analysis of the use of marine waters; cost of degradation; and valuation methods]*

Plan Bleu (2014a), 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, Technical Report, Plan Bleu, Valbonne, available from: www.planbleu.org [*Report prepared in the context of implementation of the MAP Ecosystem Approach Initiative EcAp; it analyzes fisheries, aquaculture, tourism and recreational activities, maritime transport and offshore exploitation of oil and gas at the scale of the Mediterranean basin as well as at a sub-regional level. Production and socioeconomic indicators are presented for each sector]*

Plan Bleu, ACTeon (2014b), Scoping study for the assessment of the costs of degradation of the Mediterranean marine ecosystems, Technical Report, Plan Bleu, Valbonne [*Discusses the relevance of different assessment methods that can be applied for assessing the costs imposed on society by the current state of degradation of the Mediterranean marine & coastal ecosystems*]

Plan Blue, EFIMED and CTFC (2014c) Methods and tools for socio-economic assessment of goods and services provided by Mediterranean forest ecosystems, Technical Report, Plan Bleu, Valbonne *[Provides useful information on the theory behind valuation methods, cost-benefit and multi criteria analysis together with concrete examples on the application of these tools and methodologies]*

Arcadis (2014), Background document summarising experiences with respect to economic analysis to support member states with the development of their programme of measures for the Marine Strategy Framework Directive [*Prepared in the framework of WG ESA activities, contains discussion of the concepts and practices from different Member States (including ongoing work) on the role and approach of economic analysis in the EU MSFD PoM development*]

European Commission (2003). WATECO Guidance document n.o. 1. Economics and the environment [*Contains information on the methodological tools for undertaking the economic analysis and on preparations for conducting the cost-effectiveness analysis*]

Annex 2: List of references

1. Arcadis (2014). Background document summarising experiences with respect to economic analysis to support member states with the development of their programme of measures for the Marine Strategy Framework Directive. Report prepared for the EC DG Environment, Working group on economic and social assessment (WG ESA)

2. Defra (Department for Environment, Food and Rural Affairs) (2007). An Introductory Guide to Valuing Ecosystem Services. London: Department of Food and Rural Affairs.

3. European Commission (2003). Common Implementation Strategy for the Water Framework Directive (2000/60/EC). Guidance document n.o. 1. Economics and the environment. The implementation challenge of the Water Framework Directive. Available online: http://ec.europa.eu/environment/water/water-framework/economics/pdf/Guidance%201%20-%20Economics%20-%20WATECO.pdf

4. European Commission (2009). Impact assessment guidelines. Available online: http://ec.europa.eu/smart-regulation/impact/commission_guidelines/commission_guidelines_en.htm

5. European Commission (2014). Programmes of measures under MSFD; Recommendations for establishment / implementation and related reporting, Draft, 27 May 2014

6. European Commission DG ENV (2010). Working group on economic and social assessment (WG ESA): Economic and social analysis for the Initial assessment for the marine strategy framework directive: a guidance document

7. Goerlach, B. Interwies, E and Newcombe,J. (2006). How are we performing? The Role of ex-post Cost-Effectiveness-Analyses in European Environmental Policies. Paper presented at the 2006 Berlin Conference on the Human Dimensions of Global Environmental Change

8. Joint Research Centre of the European Commission (2013). *Research needs with regard to the socio-economic analysis under the Marine Strategy Framework Directive*; Report from the workshop held in October 2013 under STAGES (Science and Technology Advancing Governance of Good Environmental Status) project

9. Plan Bleu (2014a). 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, Technical Report, Plan Bleu, Valbonne

10. Plan Bleu, ACTeon (2014b). Scoping study for the assessment of the costs of degradation of the Mediterranean marine ecosystems, Technical Report, Plan Bleu, Valbonne

11. Plan Blue, EFIMED and CTFC (2014c). Methods and tools for socio-economic assessment of goods and services provided by Mediterranean forest ecosystems, Technical Report, Plan Bleu, Valbonne

12. Renda, A. Schrefler, L. Luchetta, Giacomo, L. Zavatta, R. (2013) Assessing the Costs and Benefits of Regulation, Study for the European Commission, Secretariat General; Final report

13. Turner, R. Hadley, D. Luisetti, T. Lam, V. and Cheung, W. (2010). Socio-economic assessment within a marine strategy framework. London: Department for Environment, Food and Rural Affairs. Available at: http://www.defra.gov.uk

14. UNEP/ MAP (2013), Background Document on Marine Litter Regional Plan Measures and Indicative Cost Estimation of Measures Implementation (UNEP(DEPI)/MED WG.387/Inf.13)

Annex 3: Further information on cost-effectiveness and cost-benefit analysis

Cost-effectiveness

Elaboration of the concept and possible application	Source
CEA is used to establish the "least cost solution" to achieve a certain predetermined output. A CEA is an analysis of the costs of alternative individual and/ or sets or programmes of measures designed to meet well specified objective (quantified in physical terms). It can be used to identify the highest level of a physical benefit given available resources (e.g. delivering the maximum reduction in risk exposure subject to a budget constraint), as well as the least-cost method of reaching a prescribed target (e.g. a given concentration level of nitrogen in coastal waters at least costs). CEA is used when measurement of benefits in monetary terms is difficult, or in any other case when any attempt to make a precise monetary measurement of benefits would be redundant due lack of scientific evidence and/ or open to considerable dispute, or where associated uncertainties are high. In the case of multiple objectives a more sophisticated weighted CEA is required, which gives weights to objectives to measure their priority scale. In a CEA, the focus lies in first instance on the direct costs[13] i.e. the cost of investment and operation associated with the implementation of measures. However if the measure is a policy instrument, an estimation would be necessary of the indirect costs as well. Typically a CEA mainly looks into the financial compliance costs; sometimes a rough estimation of (part of) the administrative costs is made but external costs are rarely known and usually not used.	Arcadis report, 2014
The purpose of a cost-effectiveness analysis is to find out how predetermined targets, e.g. threshold values for nutrients or other pollutant loads in a catchment/ coastal waters can be achieved at least cost. Theoretically speaking, the least cost allocation of pollution abatement strategies is found if the marginal costs of the proposed measures are equal. The marginal costs of these abatement measures can for example be defined as the increase in total abatement costs when pollution loads are decreased by 1 ton or 1 kilogram per year. As long as marginal costs are not equal, it is theoretically possible to obtain the same level of pollution reduction at lower costs by shifting emission reduction from high cost measures to lower cost measures.	Turner et al, 2010
A cost-effectiveness analysis seeks to find the best alternative activity, process, or intervention that minimises resource use to achieve a desired result. An *ex-ante* CEA is performed when the objectives of the public policy have been identified and an analyst or an agency has to find the least cost-option of achieving these objectives. The cost-effectiveness of a policy option is calculated by dividing the annualised costs of the option by a quantified measure of the physical effect, such as animal or plant species recovered, tons of emissions of a given pollutant reduced, kilometres of river length restored, and so	Goerlach et al, 2006

[13]The direct cost is the cost of investment and operation associated with the implementation of measures. Indirect costs are costs associated with the policy instruments and their implementation and the policy's impact on other environmental targets and on other sectors in the economy.

on. In this context, the effects of a policy can be both reduced pressures (for example, the least-cost option to reduce CO_2 emissions), or avoided impacts (for example, the cheapest way to keep global warming below 2°), where the latter is usually more difficult to assess. Different options that achieve/ have achieved the same effect are then compared based on their cost. CEA, therefore, does not ask, nor attempts to answer, the question whether the policy is justified, in the sense that its benefits to society will exceed its costs to society. CEA is sometimes used as a second-best option when a full-blown CBA would be desirable, but many effects cannot be captured in monetary form.	
An analysis of the costs of alternative programmes designed to meet a single objective. The programme which costs less will be the most effective.	WATECO, 2003

Examples of semi-quantitative and qualitative CEAs – EU MSFD implementation

Dutch CEA & CBA for the MSFD: qualitative assessment based on expert judgment

The Dutch Ministry of Infrastructure and the Environment has commissioned a study to elaborate a cost-effective set of measures and a preliminary CBA for all GES Descriptors. For the assessment of various potential measures, the opinion of experts, civil servants and scientists was collected during workshop settings and interviews. Within the Dutch CEA, the contribution of each measure to the GES indicators has been assessed based upon a description of the primary effect of the measure. The physical effects of potential measures could be identified but not quantified. An example of such a descriptive approach is illustrated in the following table (for GES 10 Marine litter):

Measures	Effect
Additional fishing for litter	Negative effect: decreased seafloor integrity
Additional beach cleaning on non-bathing beaches (once a year)	Less litter on the beach
Adding individually recognisable markers to fishing nets and wires	Reduce illegal or improper spill of nets (the first source of litter on the beach)

Link to report: http://edepot.wur.nl/199888

Netherlands and Belgium: semi-quantitative approach – expert judgment within classes (1 to 5)

The Netherlands has developed a useful semi-quantitative approach for the CEA of marine measures. This approach is particularly useful to overcome the knowledge gaps regarding driver-effect-pressure relations. The approach has also been applied for the current Belgian PoM CEA. Information is gathered through consultations with policy makers and scientists. A cost-effectiveness score in the Belgian CEA is obtained based on the table (see below) linking drivers-pressures-descriptors and measures.

Step 1: Effectiveness on site

For each measure, the expected reduction on different pressures has been estimated by means of the following classes:

1. Low = less than 5% intensity
2. Moderate = between 5 and 15% intensity

3. High = between 15 and 30% intensity
4. Very high = more than 30% intensity or recovery measures

The expected reduction of the pressure is based on (1) the importance of the use of the Belgian part of the North Sea by the drivers, (2) the link between driver and pressure and (3) the expected impact of the measure (e.g. prohibition versus awareness raising).

For each pressure, the relation (and importance) for each individual descriptor (and indicator) is given. For some descriptors, there is a one to one relation e.g. marine litter. However, other descriptors are linked to multiple pressures. The importance of a pressure becomes smaller when several pressures determine the condition of a descriptor. The following classes are determined for the importance of a pressure for a certain descriptor:

1. Low = descriptor linked to > 5 pressures
2. Moderate = descriptor linked to 4 or 5 pressures
3. High = descriptor linked to 2 of 3 pressures
4. Very high = one to one relation between pressure and descriptor

When a measure is linked to many descriptors, with different intensities for the pressure for each descriptor, the highest class is taken.

Multiplying the expected reduction in pressure with the importance of a pressure for a certain descriptor gives the on-site effect for a certain measure (displayed on a scale 1 to 5)

Step 2: Extrapolation to the Belgian part of the North Sea (scale)

The pressures are scored according to their geographic dimension, using the following classes:

1. Low = less than 35 km², around 1 % of the Belgian part of the North Sea (e.g. sand extraction, dredging and dumping activities)
2. Moderate = between 35 and 500 km², around 1 to 15 % of the Belgian part of the North Sea (e.g. offshore wind parks)
3. High = between 500 and 2.000 km², around 15 to 60 % of the Belgian part of the North Sea(e.g. Natura 2000-areas, underwater noise by navigation)
4. Very high = more than 2.000 km², around more than 60 % of the Belgian part of the North Sea (e.g. commercial fishery activities, measures in relation to water quality)

Multiplying the on-site effect (step 1) and scale of the effect (step 2) gives the effectiveness of the measure. The effectiveness is expressed in the following scores:

1. Very low = 1 to 5
2. Low = 5 to 10
3. Moderate = 10 to 20
4. High = 20 to 30
5. Very high = more than 30

Combining the semi-quantitative results for cost and effects leads to the following cost-effectiveness matrix:

		Effectiveness				
		5	4	3	2	1
Cost	1	3	3	2	1	1
	2	3	3	3	2	1
	3	4	4	3	2	2
	4	5	4	3	3	3
	5	5	5	4	3	3

France

For the analysis of the cost-effectiveness of the new measures proposed under the MSFD, four levels of cost-effectiveness are defined:

- cost-effective measures,
- moderate cost-effective measures,
- low cost-effective measures,
- non cost-effective measure.

This analysis is also based on three levels of evaluation of the environmental effectiveness (strong, potentially strong, uncertain) and three categories of implementation costs:

- low - less than € 100,000,
- moderate - between 100,000 and € 300,000,
- high - above € 300,000.

Semi-quantitative approach - expert judgment with scales („+++" to „---"), developed under the EU-level study *Economic assessment of policy measures for the implementation of the MSFD*

The approach employed in this study entails an inventory of possible measures, their assessment according to a set of criteria (e.g. cost, effectiveness, benefits, feasibility) and the identification of key success / limiting factors for each measure or group of measures. The approach includes two stages:

- a "quick scan" with an assessments of all 140 measures, and
- an in-depth analysis/assessment of 5 specific measures within case studies[14]

The database integrates information regarding the measure and its implementation status, the pressure and relation with GES and information on the effects. Within this quick scan of measures, impacts of measures on each Descriptor have been assessed via a scale from „+++" to „---", per GES indicator[15].

Link to the report and database: http://ec.europa.eu/environment/enveco/studies.htm#4

Cost-benefit analysis

Elaboration of the concept and possible application	Source
CBA is a method for comparing policy measures against the baseline situation in terms of their advantages (benefits) and disadvantages (costs). This essentially involves estimating all of the negative and positive economic, social and environmental impacts, including items for which the market does not provide an observable measure of value, accruing to all affected societal parties. According to the EC Impact Assessment Guidelines, a CBA can be done at various levels, depending on data availability. It can be either a full CBA when the most significant part of both costs and benefits can be monetised utilising economic values derived through various economic techniques (e.g. market, revealed and stated preference-based methods); or a partial CBA in cases where only a part of the costs and benefits can be quantified and/or monetised.	Arcadis report, 2014

[14] NOx-tax and NOx Fund (Norway), Aggregate tax / Levy (UK), No Special Fee system (Baltic Sea), Temporary / real time closures (Scotland), and MPAs (Medes Islands)

[15] Regarding the costs, quantitative evidences/illustrations are provided where available or they are described qualitatively.

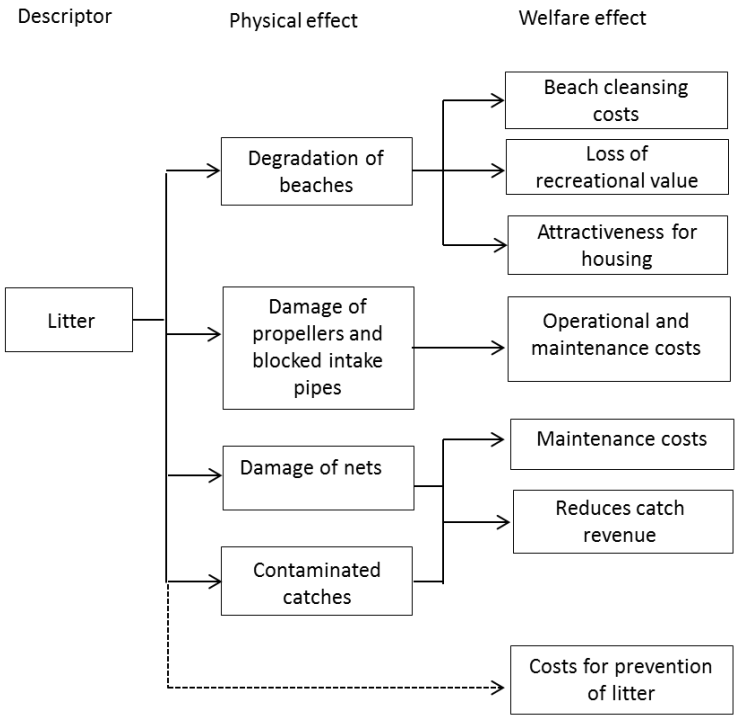
CBA is a means of project or policy appraisal. It involves identifying and measuring, in monetary terms, as many of the costs and benefits as possible that relate to a particular project or course of action. This helps to determine whether the project or policy will produce a net gain or loss in economic welfare for society as a whole. As a rule, a project (or policy option) is deemed to be efficient if total benefits exceed total costs. A CBA compares the costs and benefits in monetary terms. The results of this analysis can be interpreted as a benefit to cost (B-C) ratio, i.e. total benefits divided by total costs, where a ratio larger than one indicates that the policy measure is economically beneficial, or as a net present value (NPV), that is the present value of the net benefits where a positive NPV indicates a welfare improvement. Strictly speaking, only those costs and benefits are included in a CBA that can be quantified in monetary terms. However, it will hardly ever be possible to monetise all impacts all the time: those impacts that cannot be monetised are often left out of the analysis. Non-monetised impacts, if considered relevant, can nonetheless be included in a qualitative discussion accompanying the discussion of the CBA results.	Turner et al, 2010
Cost-benefit analysis (CBA) is a technique for the assessment of the relative desirability of competing alternatives (events, project, management or policy measures). The assessment involves the comparison of the current (*base case*) situation to one or more *alternatives* considering the differences between the base case and the alternatives. For example, to evaluate the impact of the application of thinning on the output of forest goods and services in a particular forest, the base case (without thinning) would be compared to the alternative scenario (with thinning). The analysis would focus on the differences in costs and benefits, in the situations with and without the management measure. The CBA compares the costs and benefits measured in monetary terms. The cost-benefit analysis can be conducted from different perspectives. *Private CBA* considers only those costs and benefits from the analysed alternative, which are imposed onto or accrue to a private agent (e.g. individual or firm). Thus, it also considers transfer payments (e.g., subsidies, taxes), which the private agent receives or pays to the administration. This type of CBA is also often called financial appraisal. *Social CBA* in turn attempts to assess the overall impact of an alternative on the welfare of the society as a whole.	UNEP/MAP Plan Bleu, 2014c
CBA is carried out in order to compare the economic efficiency implications of alternative actions. The benefits from an action are contrasted with the associated costs (including the opportunity costs) within a common analytical framework. To allow comparison of these costs and benefits measured in widely differing units, a common denominator is used: money. This is where most problems usually start since some resources, especially environmental resources, are difficult to evaluate in monetary terms. Many of the goods and services provided by ecosystems, such as amenity, clean air, biodiversity sustenance, are not traded on a market, hence, no market price is available which reflects their economic value. Such prices need to be estimated instead through the use of valuation studies, for example eliciting people's willingness to pay for a particular environmental good. By comparing costs and benefits in monetary terms, a CBA provides an assessment of whether a policy option (or a project) is worth implementing (that is whether the benefits outweigh the costs).	Goerlach et al, 2006
The evaluation of an investment project with a long-term perspective from the viewpoint of the economy as a whole by comparing the effects of undertaking the project with not doing so.	WATECO, 2003

Examples of CBA

A detailed explanation on the CBA process and methodological issues as well as an example of CBA application at project level is provided in the UNEP/MAP Plan Bleu (2014c).

The experiences in conducting the CBA in the MSFD implementation in the EU identified the lack of knowledge on the links between potential measures, improvement of marine ecosystems and corresponding economic and social values as the main issues. Specific examples provided in the Arcadis report (2014) summarizing experiences on economic analysis include Dutch and German approaches.

The effects resulting from a change in environmental status of the **Dutch part of the North Sea** have been calculated through a provisional societal cost-benefit analysis. The aim of this provisional CBA is to elaborate the CBA methodology for the MSFD and to get a grip on available data and the level of missing information. In this CBA, the relation between measures, physical effects and welfare changes have been described and summarised by Logical Diagrams of Impact (LDIs). For example, measures to reduce litter may lead to cleaner beaches and may enhance their recreational value. The physical effects of these measures may have various (and possibly conflicting) welfare effects. An example of the LDI for descriptor 10 (marine litter) is provided below.



Link to report: http://edepot.wur.nl/199888

The identification, scoping and further planning of measures for the i**mplementation of the MSFD in Germany** is an ongoing decision process where measures at different planning levels have been identified. Since the majority of measures have not yet reached a sufficient level of detailed planning for the application of economic valuation methods, a general socioeconomic valuation scheme (following the

idea of the procedural approach applied for WFD in Germany) is being developed. The scheme displays meta criteria for the collection of information and data for the performance of a CEA, an impact assessment and a CBA.