# Chapter 2
# Methodology for Integrated Socio-economic Assessment of Multi-use Offshore Platforms

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**Abstract** This chapter presents the methodology employed for the Integrated Socio-Economic Assessment (MISEA) of different designs of Multi-Use Offshore Platforms (MUOPs). The methodology allows for the identification, the valuation and the assessment of the potential impacts and their magnitude. The analysis considers a number of feasible designs of MUOP investments, and the likely responses of those impacted by the investment project. The approach provides decision-makers with a valuable tool to assess whether a MUOP project increases the overall social welfare and hence should be undertaken. This is performed under alternative specifications regarding platform design, the discount rate and the stream of net benefits, if a Cost-Benefit Analysis (CBA) is to be followed or a sensitivity analysis of selected criteria in a Multi-Criteria Decision Analysis (MCDA) framework. The

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methodology can support the implementation of policies aiming at achieving a good environmental status of the EU's marine waters and the protection of the resource base upon which marine-related economic and social activities depend.

**Keywords** Marine spatial planning • Multi use offshore platforms • Socio-economic assessment • Environment • Ecosystem services • Cost-benefit analysis • Multi-criteria decision analysis • Life cycle assessment • Risk analysis • Monte Carlo

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## 2.1 Introduction

MERMAID project developed concepts for a next generation offshore platforms for multi-use of ocean space for energy production, aquaculture and platform related transport. The project examined different concepts in design, such as a combination of structures or different uses on representative sites under different conditions. Under this scope the project combined, integrated and improved available technology in a way that it enhances economic feasibility, it reduces the environmental impact and it increases the optimal use of the available ocean space at specific sites.

Within this framework, an integrated socio-economic analysis has been performed with the aim to identify and quantify the impact of the related activities on human welfare. The analysis focusses on financial feasibility and also looks into the social and ecological aspects, including consideration of the distribution of all impacts across the different stakeholders. In this manner it is provided a comprehensive socio-economic analysis that adds in a useful manner by taking into consideration the social and cultural values within the ecosystem services frameworks.

The methodology can be used to facilitate the implementation of the EU water framework directive as defined in the guidance document of the Marine Strategy Framework Directive (MSFD-Directive 2008/56/EC). The MSFD was adopted in June 2008 and it aims at achieving good environmental status of the EU's marine waters by 2020 and at protecting the resource base upon which marine-related economic and social activities depend. In the MSFD, a thematic strategy for the protection and the conservation of the marine environment has been developed with the aim of promoting the sustainable use of the seas while protecting marine ecosystems.

In terms of energy, the European Commission's Renewable Energy Roadmap states a mandatory target of 20% share of renewable energy in the EU's energy mix by 2020. In relation to aquaculture, the Commission published in 2009 a communication to give new impetus to the sustainable development of European aquaculture sector. This strategy has three key elements: (a) help the sector become more competitive through strong support for research and development and better spatial planning in open sea areas and river basins, (b) ensure it remains sustainable by maintaining environmentally-friendly production methods and high standards of animal health and welfare and consumer protection and, (c) improve governance and ensure there is a business-friendly environment in place at all levels – local, national and EU – so the sector can accomplish its full potential.

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This chapter presents the methodology employed for the assessment of MUOPs in accordance to the MSFD. The methodology develops in steps as follows: First, it is undertaken the socio-economic characterization of the selected MERMAID sites (North Sea, Mediterranean Sea, Baltic Sea and the Atlantic Coast). Second, the production and demand structures of the proposed MUOPs are investigated. This is done by the identification and the quantification of the costs and the benefits of suggested MUOPs by using market and non-market methods in order to capture private, social/public and ecological effects. At a final stage, policy recommendations are based on economic tools such as Cost-Effectiveness Analysis (CEA), Cost-Benefit Analysis (CBA) and other approaches to socio-economic analysis such as Multi-Criteria Decision Analysis (MCDA).

The remainder of the chapter develops as follows: Sect. 2.2 discusses the assessment scooping. Baseline profiling and characterization of production and demand of MUOPs is presented in Sect. 2.3. Section 2.4 presents the data requirements and availability and Sect. 2.5 discusses the different tools and methodologies that can be used to assess the socio-economic impact of MUOPs. Section 2.6 discusses the risk analysis approaches employed. Section 2.7 discusses the life cycle assessment approach of MUOPs. Last section concludes.

## 2.2 Scoping the Assessment

The 'scoping' phase of the socio economic impact assessment (SEIA) establishes the goals and boundaries of the assessment and focuses the SEIA on key impacts. In this context, it is important to focus on the significant impacts in order of priority and to identify all the significant effects on all impacted groups.

### *2.2.1 Key Impacts of MUOPs*

The key impacts of the MUOPs are dependent on the nature of the designs (floating, offshore, large size, combined activities, etc.). Considering that the suggested methodology extends financial analysis to consider also social and ecological parameters, it is foreseen that impacts are related not only to private agents, firms and individuals but also to the society as a whole and to the environment.

The following potential risks associated with MUOPs have been identified:

- effects on the seabed
- properties of the water column
- faunal composition
- spread of invasive species and/or diseases

It is considered that the MUOPs have socio-economic and environmental impacts on commercial shipping and fishing, recreational fishing, yachting and boating and other water-based activities. They also have an impact on land-based activities, regional tourism, processing transport, regional employment (direct and indirect) and training opportunities (Social Sciences Program et al. 2005).

### 2.2.2 *Impacts on Environment and Ecosystem Services*

The ecosystem services approach (ESA) can be employed in order to perform the socio- economic analysis and to integrate environmental impacts. Ecosystem services are defined as services provided by the natural environment that benefit human welfare. As defined in the Guidance document of the MSFD the ESA starts by identifying the ecosystem service of the marine area, link them with human welfare and elicit their value. The ESA establishes an environmental baseline, identifies and provides a qualitative assessment of the potential impacts of policy options on ecosystem services and quantifies the impacts of policy options on specific ecosystem services. Finally, the ESA assesses the effects on human welfare and values the changes in ecosystem services (DEFRA 2007). When assessing the impact of ecosystem services on human welfare, it is critical to focus on the benefits generated by these services, as this is what affects human welfare directly. It is, therefore, the benefits rather than the services per se that are valued.

### 2.2.3 *Extent of Appropriate Information for Undertaking the Assessment*

Due to the multidimensional character of the impacts leading to welfare gains and sometimes losses, a range of different information is needed in order to assess them. Thus, market data, secondary data for the performance of simulations, survey based primary data, data provided from literature review, consultation with experts and stakeholders and information coming from environmental impact assessments are all deemed as important in the framework of integrated environmental and socio-economic assessment. The MISEA of the viability/sustainability of MUOPs is developed using a general framework of analysis and a method of analysis depending on whether the data is available or not. Under sufficient data availability all steps of MISEA can be fully applied. Under limited data availability a parsimonious, generic approach to multi-dimensional impact assessment can be employed.

## 2.3 Profiling Baseline Conditions and Characterization of Production and Demand of MUOPs

This part of the framework focuses on gathering information about the socio-economic environment and context of the proposed development with regard to energy production, aquaculture and maritime services. Hence, before achieving the evaluation of the socio- economic impact it is necessary to start with the baseline profiling of the case study areas in order to identify who is going to be impacted. Thus, this approach enables the identification of the production and demand functions of the MUOPs.

### *2.3.1 Description of Case Studies and Socio-economic Characterization*

The MERMAID project looked into four case studies, in four different natural environments, from deep water (north of Spain), to shallow water with high morphological activity (the Wadden/North Sea), and further to inner waters like the inner Danish/Baltic areas and the Mediterranean. The activities related to the socio-economic characterization regard gathering information on baseline conditions of the wind power production, aquaculture, transport maritime services and wave energy activities.

In order to assess the indirect and the induced impacts a regional profiling is necessary. The information typically gathered as part of a regional profile includes the population characteristics, the political and social resources, a description of historical factors, identification of the relationships with the biophysical environment, culture, attitudes and social-psychological conditions, the current status of operations (aquaculture, energy production, maritime services) and the identification of the people who will be impacted by the project (Social Sciences Program et al. 2005).

The initial (baseline) assessment includes economic and social analysis of the use of those waters under current use and future autonomous developments. This baseline assessment should include both market and non-market costs and benefits (Eftec and Enveco 2010). The scope is the profiling of all current uses and identifying businesses, households and individuals that may be impacted by the future installation of MUOPs. In addition, broader social and environmental issues related to current and future operations should be highlighted.

## 2.3.2 Production and Demand Structures of the Proposed MUOPs

In this step are identified the economic, environmental and social issues with regards to the level of employment, regional development and overall attitude of the population towards the technologies and specific options proposed. The production and demand analysis is based on economic data, environmental valuation surveys (if deemed necessary) and Benefit Transfer (BT) techniques. The production side analysis of the proposed MUOPs is based on the proposed financial costs of offshore structures as well as on the social and environmental costs.

### 2.3.2.1 Identification of Private/Financial Costs of Suggested MUOPs

The identification of the private costs of the suggested offshore structures with regard to aquaculture, energy and maritime services is the first step of the production-side analysis. This step considers the capital costs which are the upfront costs to construct, install the project hardware and major maintenance work that needs to be carried out during the lifetime of the platform beyond typical operating expenses.

Platform development costs may include: technical, legal and planning consultants' fees, and the developer's own time, in negotiations with legal and statutory bodies, financing and legal costs, including the costs of arranging finance and others. Running and operation and maintenance costs per year may include: fuel costs, if applicable, direct costs, staff costs, insurance fees, transport costs, annual fees for licenses and pollution control measures, general maintenance and operating costs, equipment, site, etc. Finally, training costs are expected to cover the training of people who will run the platforms with regard to the safety, financial and environmental implications of the project.

### 2.3.2.2 Identification of the Social and Environmental Costs of Suggested MUOPs

Since the scope of the developed methodology is to integrate private and social/environmental costs of the suggested MUOPs it is equally important to consider the latter in the suggested framework of analysis. It is considered that offshore renewable energy installations (e.g., wind farms, energy wave devices) all have local environmental impacts (e.g., to local submarine habitats and seabird populations). Especially in the case of wind farms a regional scale 'displacement' impact e.g., displacement of fishing by marine protected areas around wind turbine sites and consequent increase on the fishing pressure in 'unprotected' areas or a boost in jelly fish populations may be expected. Aquaculture is associated with local environmental consequences and potential impacts on the marine food web via fish food provision and accidental releases of fish with a low genetic diversity (Turner et al. 2010).

#### 2.3.2.3 Demand-Side Analysis of Potential Production of Goods and Services of Proposed MUOPs

The analysis here focuses on the estimated financial and social/environment benefits of the offshore structures. Private and financial benefits of the suggested MUOPs could result from the sale of energy, aquaculture products and maritime services. Additional benefits could be derived from saving in fuel consumption and reduction of energy expenditure or by product sales (or displaced costs), greater productivity (macro scale) and higher real disposable income (at a macro level). Direct and indirect employment is also part of the social benefits resulting from MUOPs.

Environmental benefits include: mitigated global warming, avoided emissions-compared to non-existent wind farms of current status, improved water quality near the coast or seabed life through less use of pharmaceuticals. The marine and coastal zone interventions and their benefits can be linked to four environmental impacts/effects categories (relevant for human welfare): direct and indirect productivity effects, human health effects, amenity effects (congestion), and existence effects such as loss of marine biodiversity and/or cultural assets.

## 2.4 Data Availability and Approaches for Socio-economic Impact Assessment of MUOPs

In order to proceed to the socio-economic impact of MUOPs it is important to construct a list of impact indicators as discussed above. The economic figures can be more easily identified while this is not the case with the information on the social and environmental impacts. Social and environmental indicators are associated to hidden impacts and may be viewed as positive or negative externalities. Table 2.1 summarizes the suggested impact indicators and relevant data that can be employed in the analysis.

## 2.5 Methods for the Quantification of the Costs and the Benefits

Considering the complex nature of the socio-economic and environmental impacts, different approaches are needed in order to quantify them. One theoretical approach of capturing and describing the benefits derived from the different ecosystem services is the Total Economic Value (TEV) framework. It provides a systematic tool for considering the full range of impacts the marine environment has on human welfare. TEV can be derived from the preferences of individuals.

For ecosystem services, preferences can be studied by stated preference methods and revealed preference methods (see Eftec 1999). Revealed preference methods rely on data regarding the preferences of individuals for a marketable good and

**Table 2.1** Indicative impact indicators

| Impact | Indicator |
|---|---|
| Financial | Capital cost |
| | Project development costs |
| | Running and operation and maintenance costs/Training costs |
| | Income |
| Social | Employment |
| | Education |
| | Self-reliance (energy and food security) |
| | Community benefits |
| | Financial return – this can be for the individual but also for the community for community based schemes |
| | Diversification of rural incomes |
| | Local employment |
| | Contribution towards environmental sustainability and potential for combining with Green Tourism |
| | Some degree of control over the scheme for the community (for community based schemes) |
| | Local hydrology |
| | Sense of satisfaction for those involved and building capacity |
| | Health hazards related to the operation of the platform and associated equipment |
| | Other interrelated factors, such as air quality |
| Environmental | Emissions-climate change |
| | Noise (compared to inshore constructions) |
| | Visual (compared to inshore constructions) |
| | Recreation |
| | Risk abatement |
| | Transport of fuel |
| | Local and global issues |
| | Navigation routes |
| | Decommissioning |
| | Product/by product disposal |
| | Effect on the marine ecosystem, erosion, local hydrology |

could be divided in market-based and surrogate markets related. Surrogate market related methods include travel cost method and hedonic pricing. Stated preference methods use structured questionnaires to elicit individuals' preferences for a given change in a natural resource or environmental attribute.

In this category, the contingent valuation method (CVM) and choice experiment (CE) are included. The CVM is based on the development of a hypothetical market or scenario in which the respondents to a survey are given the opportunity to state their Willingness-to-Pay (WTP) or Willingness-to-Accept (WTA). Different elicitation methods are used to derive the WTP/WTA amounts and because these values are contingent on the hypothetical market the method is called CVM.

CE is another stated preference method. In a CE framework, the good in question is broken down into its component attributes, which are presented to respondents normally as a set of combinations of the attributes. Respondents are then presented with a sequence of choice sets differentiated by attributes and levels (Bennett and Adamowicz 2001; Birol and Koundouri 2008).

The fact that gathering primary site-specific data is costly has made the Benefit Transfer (BT) method a popular alternative for the valuation of ecosystem goods and services. BT is about applying existing economic value estimates from one location where data are collected to another similar site in another location with little or no data (Rosenberger and Loomis 2000). Bergland et al. (1995) discuss three main approaches to BT: (i) the transfer of the mean household WTP, (ii) the transfer of an adjusted mean household WTP, (iii) the transfer of the demand function.

### *2.5.1 A Maximum Data Approach for Socio-economic Impact Assessment*

An important goal of the SEIA is to identify the socio-economic impact of MUOPs by adopting an integrated approach. In the framework of a maximum data approach the CBA, CEA as well as MCDA emerge as useful means to achieve the goals of SEIA. While the CBA evaluates the social profitability of the relevant programs, CEA evaluates the programs against predetermined objectives.

MCDA takes into account project impacts that are not easily given monetary values. It involves a structured approach to differentiating between a range of options, based on a set of objectives or criteria, against which each option is assessed. As argued in Turner et al. (2010, p.33): "*The choice between CBA and CEA is determined by the nature of the policy problem under scrutiny. If the problem is one of meeting some environmental standard, complying with a law or achieving a target then finding the least cost way of achieving this by completing a CEA is the appropriate action. If the problem 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. If the situation is one where monetary valuation is not possible then CEA and CBA should be replaced with a multi-criteria assessment process.*" The following subsections present the different versions (CEA, CBA, and MCDA) of the full data approach which depends on specific data availability.

### 2.5.2 Cost-Effectiveness Analysis (CEA)

CEA is a type of economic evaluation that compares the cost of the investment to its effectiveness. Hence, CEA is a form of economic analysis that enables comparison between different kinds of interventions with similar effects (outcomes) on the basis of the cost per unit achieved. CEA is distinct from CBA, which assigns a monetary value to the measure of effect. Hence, this approach may be deemed more practical for selecting between investment options when the budgets are fixed and/or the benefits are hard to monetize while it only requires marginal economic data on costs.

### 2.5.3 Cost-Benefit Analysis (CBA)

CBA is a technique that assesses the monetary social costs and benefits of an investment project over a time period as compared to a well-defined baseline alternative. In this way, the costs and the benefits of MUOPs are evaluated and compared and the long-run economic efficiency of implementing the project of MUOPs is assessed. In a CBA framework, the estimated economic values accrued by the involved stakeholder groups are aggregated over their relevant populations and added to capture the TEV generated by the investment project. A project is deemed to be profitable if the total benefits exceed total costs. Due to the project's expected long-run impacts on the local economy and ecology, its sustainability is to be tested using a long-run CBA, and the net present value (NPV) of the project is to be estimated with the use of different discount rate schemes (Birol et al. 2010).

The NPV results reveal whether the net benefit generated by the investment project of MUOPs is positive and significant well into the future. A general calculation of the NPV is formulated as follows:

$$NPV = -\sum_{t=0}^{N} \frac{K_t}{(1+r)^t} + \sum_{t=0}^{N} \frac{B_t - C_t}{(1+r)^t}$$

where $K_t$ is the construction cost, $B_t$ is the stream of benefits, $C_t$ is the stream of maintenance costs and r is the discount rate.

The Internal Rate of Return (IRR) is another important aspect of a CBA. It is the discount rate for which the NPV is zero. Since a CBA of long-term investments is enormously sensitive to the discount rate, the use of the classical NPV in the long term is problematic. Recent economic literature (Koundouri 2009; Gollier et al. 2008) proposes the use of a Declining Discount Rate (DDR). The use of DDR in long–run cost–benefit analysis can replace traditionally employed constant discount rates. The policy implications aligned with the project's nature and EU's policy aspirations, are that it implies that the policy-maker will put relatively more effort into improving social welfare in the far distant future than in the short term.

### *2.5.4 Multi-Criteria Decision Analysis (MCDA)*

MCDA is a method for preparing structured and transparent support to decisions, when there is a large amount of complex information. MCDA can be used for different purposes, e.g.: (1) to identify a most preferred alternative, (2) to rank alternatives against each other, (3) to short-list a set of alternatives or (4) to distinguish the acceptable alternative from the unacceptable. A full MCDA includes, apart from identifying the decision alternatives and the relevant criteria to be assessed, scoring, weighting and finally the combination of these into an overall value for each alternative (Communities and Local Government 2009).

In order to apply an MCDA for a sustainability evaluation of MUOPs it is necessary to define a set of economic, social and ecological criteria which focus on the nature of MUOPs. However, it should be clear that as a method for economic analysis, MCDA is considered inadequate to deliver information required by the MSFD when it "does not present comparisons of costs and benefits that provides a CBA of potential measures or informs whether their costs are disproportionate, and therefore would not comply with the minimum requirements of the Directive" (Eftec and Enveco 2010, p.33).

### *2.5.5 A Limited Data Approach for Socio-economic Impact Assessment*

The "minimum-data Trade-off Analysis" (TOA-MD) is well-suited to address the uncertainty in impact assessments. This approach relies on a form of a generic TOA-MD model that can be employed to assess impacts in agricultural, social and economic data populations (Antle and Valdivia 2010). The TOA-MD model is a prominent simulation tool that employs a statistical description of a heterogeneous population of decision making units (DMUs) to simulate the proportion of DMUs that utilizes a baseline system and the proportion of DMUs that would adopt an alternative system within defined strata of the population. The critical decision for adopting limiting data approach is made in terms of acquiring the most robust and informative results under the constraint of available list of data for each case study.

## 2.6 Risk Analysis Approach

It should be clear that all results should be subjected to a rigorous uncertainty/sensitivity analysis since uncertainty is present at all stages of the assessment process. A way to explore uncertainty is through sensitivity analysis. This approach can be used to identify the parameters of the system which are particularly subject to uncertainty and have a significant impact on the outcome of the assessment. A sensitivity analysis can be included in the CBA, to assess the impact on the benefit cost ratio and/or net present value of changes in the values of central parameters (Turner et al. 2010). In a CBA framework it may be relevant to perform an uncertainty analysis rather than just sensitivity analysis, e.g. by assigning parameter uncertainty in the CBA and performing Monte Carlo simulations as described next.

**Risk Analysis**

Risk analysis or risk assessment aims to address uncertainty associated with the future cash flows of a project. For the specific project that analyses the viability/sustainability of MUOPs, costs and benefits associated with offshore wind farms and aquaculture are expected to embody considerable uncertainties. The risks associated with the project could be classified as: (i) economic, (ii) natural – environmental, and (iii) technological. These risks affect the cash flows of the project and consequently the net present value (NPV), the IRR, and the benefit cost ratio (B/C) of the project. The NPV, IRR or B/C are the main objects in carrying out risk analysis. Within the context of the project, two types of risk assessment are studied: (i) Sensitivity analysis, and (ii) Monte Carlo simulations.

**Sensitivity Analysis**

Sensitivity analysis is a technique that determines the values for the NPV or the IRR which correspond to proportional deviations of variables that affect the cash flow of the project from a base case.

Sensitivity analysis involves the following steps:

1. Definition of a base-case or benchmark estimation of the NPV and the IRR, which is developed using the expected values for each variable involved in the cash flow.
2. Identification of sensitive or critical variables. These are cash flow variables (e.g., unit labour cost, average wind velocity, fish output, fish price) with the property that a small deviation of their values from the benchmark value will change the NPV or the IRR a lot.
3. Construction of a sensitivity diagram that relates proportional changes in the critical variable to NPV or IRR values.
4. Identification of switching values for important cash flow variables. A switching value is the value of the variable at which the NPV becomes zero or falls below a cut-off level.

**Monte Carlo Method**

The Monte Carlo method is a computational algorithm which is based on random sampling. To use the method the analyst needs to assign specific subjective probability distributions to important cash flow variables. The method proceeds in the following steps:

1. A value for a variable of interest is selected from its assumed distribution using a random number generator.
2. A vector of specific values is defined for these variables (e.g. unit labour cost, average wind velocity, fish output, fish price), and these values are used to calculate an NPV and an IRR.

3. After a large number of replications a frequency distribution is estimated for the NPV and/or the IRR.
4. Making the normality assumption the estimated distribution can be used to construct confidence intervals and perform hypothesis testing. The purpose of performing a Monte Carlo simulation of the uncertainty in a NPV of a CBA is to see how big the uncertainty in the NPV is.

**Application**

The purpose of risk analysis for the specific project is to apply sensitivity analysis – and potentially, depending on the availability of disaggregated data that will allow the meaningful approximation of probability distributions for important variables, Monte Carlo simulations in order to assess the stand alone risk of the project. The methodology is applied to provide a risk assessment of the economic viability/sustainability of MUOPs in the specific areas. To perform an adequate risk analysis the cash flow of the project should be provided in a suitably disaggregated form so that critical variables and their uncertainty in terms of probability distributions can be determined.

## 2.7 Life Cycle Assessment of Multi-use Offshore Platforms

Life Cycle Assessment (LCA) aims at determining the environmental effects of a product/function of a product based on a "from cradle to grave" view. LCA can be used to make a "strengths and weaknesses" analysis, product improvement and product comparison. It may contribute to remedies in design stage and provide environmental and economic benefits. LCA developed in the stages that include: (i) identifying and quantifying the environmental loads involved (energy and raw materials used, emissions, wastes), (ii) assessing and evaluating potential environmental impacts of the loads, and (iii) assessing the opportunities available to bring about environmental improvements (UNEP 1996). This stage continues to the end of the study because LCA is an iterative process. In the assessment of the MUOPs LCA will be used as a comparison tool between single use and multi-use so as to evaluate the feasibility of MUOPs by means of environmental impacts.

## 2.8 Concluding Remarks

The methodological approach discussed here can provide decision-makers with valuable alternatives and insights regarding different aspects of the recommended novel constructions. The results from the adoption of this methodology as discussed in the following chapters, suggest whether the projects in question should be undertaken under alternative specifications regarding the discount rate, and the stream of benefits if a CBA is to be followed or sensitivity analysis of selected criteria in an MCDA framework.

The outcome of these efforts provides support to policy makers for the project appraisal and evidence on whether MUOPs will result in an increase of the overall social welfare. In addition, the SEIA provides insight on the determinants of the public attitudes toward MUOPs that national and European policy makers should take into consideration when selecting policy responses for efficient energy management.

Another important contribution of the MISEA derives from the increase in the transparency of decisions that emerges from a visible analysis of benefits gained by some agents; costs borne by others and the limits on transfers justified by the projects.

Overall results assess the viability of the novel constructions that optimize marine space allocation for different marine activities and provide evidence of their potential to provide us with environmentally–friendly and cost–efficient energy, food supply and maritime services. In a European context, the results of the MISEA directly contribute to the adopted EU Green Paper on Energy (COM 2006) which develops a European strategy to ensure energy security, stable economic conditions and effective action against climate change. They also ensure accordance with the EU Marine Strategy Framework Directive demonstrating in this way a sustainable use of the marine environment.

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