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Phoebe Koundouri *Editor*

# The Ocean of Tomorrow

Investment Assessment of Multi-Use  
Offshore Platforms: Methodology and  
Applications - Volume 1

 Springer

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Investment Assessment of Multi-Use  
Offshore Platforms: Methodology  
and Applications - Volume 1

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**Example of a MERMAID project offshore platform**

Denis Lacroix, Ifremer and Malo Lacroix (Source: Lacroix and Pioch 2011, p. 133). Lacroix, D., & Pioch, S. (2011). The multi-use in wind farm projects: More conflicts or a winwin opportunity? *Aquatic Living Resources*, 24, 129–135.

*As always, this book is dedicated to Nikitas,  
my inspiration and resilience; Chrysilia,  
Billie and our newborn, my happiness.*

# Foreword

The ocean is a vital resource to many people on the planet. Nearly 3 billion people rely on fish as a major source of protein, and fisheries and aquaculture assure the livelihoods of 10–12% of the world’s population. It is also important in economic terms. By one estimate, the bounty of the ocean produces \$2.5 trillion in gross marine product per year, a roughly 10% return on its asset value of \$23 trillion.

In recent years, there has been a growing interest in these values and how they can be enhanced in a sustainable way, without damaging the sources from which they are derived. The marine economy and its potential are now commonly referred to as the blue economy and “blue growth”. Critical to this interpretation of blue growth is an understanding of both the potential for using marine ecosystems to generate new services and possible damages to the natural capital from these services. It is important to have information on the costs of different methods of exploiting the marine environment, so that it can be done sustainably. Areas where new or increased use of the marine environment is taking place include multi-use offshore platforms, which are the topic of this book.

These structures offer a major role in promoting the blue economy, but it is critical that such a role is carried out with care for the natural environment. This book, based on interdisciplinary research carried out under the MERMAID EU-funded project, offers an excellent analysis of the ways in which the physical and natural structures interrelate and how design features have to reflect the very different types of local conditions we find across the different seas around the European continent. All such enterprises face risks, but as the book shows, they can be managed if they



are recognized and addressed from the outset of the project. The book should provide useful material to researchers and practitioners alike in dealing with this exciting and challenging new field.

DP. Anil Markandya | *Distinguished Ikerbasque Professor*



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# Preface

The aim of this book is to provide an integrated socio-economic assessment of multi-use offshore platforms (MUOPs) in selected EU sites in the North Sea, the Baltic Sea and the Mediterranean and the Atlantic coast. The assessment results from the interdisciplinary research carried out in the MERMAID Project (Innovative Multi-purpose Off-Shore Platforms: Planning, Design and Operation) funded under the EU FP7 call *OCEAN.2011-1: Multi-Use Offshore Platforms*. The book provides a first-time integrated assessment of the MUOPs and the relevant technology associated with the implementation of the Marine Strategy Framework Directive and the sustainable marine spatial planning. The socio-economic assessment uses the results from the natural and engineering sciences as inputs, boundaries and constraints. The analysis employs an interdisciplinary approach that combines expertise in hydraulics, wind engineering, aquaculture, renewable energy, marine environment, project management, socio-economics and governance.

The first chapter of the book introduces the reader to the MERMAID Project, the drivers and the needs for the development of the MUOPs in the EU waters and the importance of developing a sound integrated socio-economic assessment in terms of methodology and results obtained.

Chapter 2 presents the methodology used for the integrated socio-economic assessment of different designs of the MUOPs. The methodology employed allows for the identification, the valuation and the assessment of the potential impacts and their magnitude, considering a number of feasible designs of MUOP investments and the likely responses of those impacted by the investment project. The methodology is implemented for the assessment of the different sites and the results are summarized in Chaps. 3, 4, 5 and 6.

Chapter 3 presents the results of the integrated assessment with regard to the MUOP in the Baltic Sea, in the area of the Kriegers Flak in which an offshore wind farm of 600 MW is planned to be fully operational in 2022. The analysis investigates the combination of wind turbines and offshore aquaculture. Constrained by data availability, the analysis combined with expert views shows that the multi-use platform scenario may be expected to be economically viable in the long run.

Chapter 4 provides an integrated socio-economic assessment of a MUOP in the North Sea in the Netherlands Exclusive Economic Zone, the Gemini site where wind power generation can be combined with mussel and seaweed cultivation. The analysis shows that there exists political willingness to back up the development; nevertheless, a number of regulatory obstacles are also identified. The financial and economic assessment and the cost-benefit analysis indicate that adding mussel cultivation to the wind farm is likely to be both financially and socio-economically viable.

Chapter 5 presents the results obtained from the analysis of the multi-use design for the Cantabria offshore site in the Atlantic coast. The analysis identifies that the profitability potentials of a MUOP site remain uncertain, while ocean energy industry has not yet gained the necessary social acceptance in the region.

Chapter 6 presents the results from the integrated assessment of a MUOP site in the area offshore Venice with potential combination of fish farming and wind energy production. Limited financial data on wind energy suggest a negative net present value, whereas proper financial data on fish farming produce a slightly positive NPV. The effects are significant and positive in terms of the monetized effects of reduced CO<sub>2</sub> emissions. The results show that in the short run the MUOP might not be profitable or gain social acceptance but these results may be subject to change in the long run.

Chapter 7 undertakes a risk analysis and a sensitivity analysis of the application of the methodology for integrated socio-economic assessment with regard to the different proposed designs of the MUOPs. The chapter integrates the results of the assessment discussed in the previous chapters and presents and compares the sensitivity analysis and Monte Carlo simulation results.

The last chapter concludes with the discussion of the challenges and obstacles to the MUOP development and of the recommendations that future decision making on blue growth should consider.

Athens, Greece  
London, UK

Phoebe Koundouri

# Acknowledgements

The assistant editor of this book is Dr. Stella Tsani. Without her excellent editorial work and dedication, this book would not have been completed.

My gratitude goes to all the world-class contributing authors of this book for their devotion to the completion of their chapters and for putting up with my, seemingly endless, suggestions for revisions.

I am also personally in debt to Prof. Barbara Zanuttigh, my colleague and friend, who introduced me to MERMAID (Innovative Multi-purpose Off-Shore Platforms: Planning, Design and Operation) FP7 Integrated Project consortium. Moreover, I am grateful to Prof. Erik Damgaard Christensen, the coordinator of the MERMAID Project, and the whole of the MERMAID consortium, who gave me a leading research role in it, as well as suggested me as the socio-economic research coordinator of the three projects funded under the call OCEAN.2011-1: Multi-Use Offshore Platforms, namely, MERMAID (Innovative Multi-purpose Off-Shore Platforms: Planning, Design and Operation), TROPOS (Modular Multi-use Deep Water Offshore Platform Harnessing and Servicing Mediterranean, Subtropical and Tropical Marine and Maritime Resources) and H2OCEAN (Development of a Wind-Wave Power Open-Sea Platform Equipped for Hydrogen Generation with Support for Multiple Users of Energy). The Ocean of Tomorrow projects have been a continuous source of inspiration for my research.

My overwhelming debt goes to my colleagues at the Athens University of Economics and Business, especially those involved in the ReSEES (Research tEam on Socio-Economic and Environmental Sustainability) Laboratory that I direct, as well as my colleagues at the London School of Economics, Grantham Research Institute on Climate Change and the Environment.

Last but not least, I am in debt to my colleagues at ICRE8 (International Centre for Research on the Environment and the Economy) that I also direct. They are my “research island”!

Phoebe Koundouri

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