The overall aim of MARBEFES is to determine the links between biodiversity, ecosystem functioning and the resulting ecosystem services and societal goods and benefits and to achieve ecological and socio-economic valuation through a validated set of innovative tools in a distributed toolbox to enhance policy and governance for the marine environment to secure its benefits for current and future generations. We will progress substantially beyond the current state-of-the-art understanding of the causes and consequences of biodiversity decline, and the loss and gain of ecological and economic value and the repercussions for marine management and governance across European seas.

The objectives of MARBEFES are to:

- Characterise marine biodiversity in selected areas in Europe and understand the links between ecological structure and functioning across biological organisation levels from the molecular, individual and population to the community and ecosystem;
- Establish biodiversity-ecosystem functioning-ecosystem service links for focal habitats and selected important or iconic species in a range of ecological and socio-economic contexts;
- Capture ecological value related to the fragility, connectivity, uniqueness, irreplaceability and vulnerability of selected genes, species, habitats and ecosystems;
- Demonstrate how different European coastal ecosystems provide services, and societal goods and benefits, including cultural value, and clarify how this provision is dependent on healthy biodiversity;
- Use natural capital accounting to determine the value of ecosystem services, societal goods and benefits;
- Recommend how management interventions should be directed and addressed to maximise the ecological value and optimise the economic value of the marine system;
- Inform action to meet the major global and European societal and marine management and governance demands;
- Foster biodiversity and human well-being by creating a toolbox for biodiversity and ecosystem valuation to support international and EU-level policy and decision making.

The project innovatively combines perspectives from a range of scales and dimensions: Firstly, for policy/management from the global (e.g. IPBES) to local communities by co-development with stakeholders; secondly at the ecological/natural science levels of biological organisation from the cell (molecular and genetic techniques) and individuals to populations, communities and ecosystems. Thirdly, on spatial changes from the coast and transitional waters, across the shelf; Finally, on temporal changes in biodiversity, function and their production of ecosystem services thereby covering seasonal, annual and long term with climate change (with built in long-term scenario testing).

These latter two have to be combined to give spatio-temporal scales of variability and within this the scenarios of ecosystem structure and functioning change in relation to the ecosystem services and societal goods and benefits. Lastly, we will jointly assess the scales of environmental and anthropogenic (including socio-economic variables and scenarios) variability.

MARBEFES has an underlying conceptual basis related to a healthy ecosystem for both nature and society, and which we define as being fit-for-purpose of maintaining and promoting nature conservation while at the same time delivering ecosystem services from which we obtain societal goods and benefits3.

In essence, the assurance and delivery of human welfare and economic wellbeing relies on the environment, whether air, land or sea, being able to provide societal goods and benefits, particularly basic human needs such as food, clean water, shelter, employment, recreational potential.

MARBEFES defines diversity and biodiversity at its widest in relation to the state of the natural environmental and the delivery of societal gains and outcomes. This involves societal diversity and environmental economic diversity before moving to the ecological features of habitat diversity, functional community biodiversity, structural (taxonomic) community biodiversity. Those communities are then composed of population biodiversity, individual physiological biodiversity and genetic biodiversity.

Each of these types can be valued in monetary and non-monetary terms but this has not previously been achieved at the scales proposed here. MARBEFES has a high relevance to global initiatives such as IPBES, World Oceans Assessment II, G7 Future of Oceans & Seas Initiative, Decades of Ocean Science for Sustainability and of Ecosystem Restoration, SDGs (SDG14 and others), UNEP GEMS Oceans, Global Taxonomic Initiative and others. Regionally it will help to fulfil the aims of key European governance and management initiatives, particularly the European Green Deal, Biodiversity Strategy for 2030 and the MSFD.

Participants will input into these through a common membership. Most importantly, it uses a multi-actor approach and co-development with stakeholders to define the policy, management and governance questions requiring the ecological and socio-economic questions.

In particular, MARBEFES uses sound science and a solid conceptual and theoretical background in the natural and social sciences supplemented by field and model testing of the following primary and innovative research questions:

- Are there direct correlations between the complexity and amount of ecological structure and functioning with the monetary and non-monetary value of ecosystem services and societal goods and benefits?
- Which level of biological organisation is primarily responsible for which ecosystem service and hence the dominant factor in ecological and economic valuation, monetary and non-monetary terms?
- How valid and accurate is the valuation of ecosystem services using habitat size and population size as proxies and can ecological valuation be linked to socio-economic valuation?
- To what extent can ecosystem services be translated into societal goods and benefits relevant to stakeholders and end-users?

Ambition

MARBEFES Consortium brings six innovative concepts, methods and products, which have been applied in certain areas but never combined and implemented at wider scales (see table below). The project combines achievements from many disciplines and domains (see next section), the outputs of which will break the current barriers between them. As a project of this scale, it bears also a degree of ambition which in turn propels MARBEFES to reach levels beyond the current state-of-the-art and produces innovation. In terms of R&I, MARBEFES is currently positioned at the TRL of 2- and it is expected that after its implementation this will level off at TRL 6 (see table below).

Table 1 MARBEFES Ambition and Innovation

Current State of the Art	***Beyond state of the art in MARBEFES***	**Innovation potential**
Biodiversity defined mainly according to ecological structure	*Biodiversity defined according to ecological functioning*	A holistic approach to assessing and valuing biodiversity
Biodiversity data are catalogued according to the designated habitats under the Habitats Directives and as Descriptor 1 for GES under MSFD	*Biodiversity to be catalogued allowing greater analysis and interrogation linked to ecological and economic valuation*	A greater understanding and quantification of the European natural capital
Biodiversity defined predominantly at macrofauna and macroflora levels	*Biodiversity defined according to biological levels from the cell to the ecosystem*	The determination of novel and field-validated methods from eDNA to community ecology
Valuation predominantly in economic terms	*Valuation in ecological terms based on a validated typology*	Comparison of ecological and economic valuation in monetary and non-monetary terms
Disparate tools not validated to international standards nor linked into a coherent toolbox	*Creation of a validated and linked set of tools supported by a publicly available handbook designed with stakeholders to meet policy needs*	Potential adoption as a European Standard (CEN) for wider use
Only data FAIR-compliant	*Analytical services FAIR-compliant*	Comparison of results from different disciplines and domains fully comparable

Created by:	IO PAN

Created at:	04.02.2023
Published by:	Logonet Spółka z o. o.
Published at:	04.02.2023 17:22
Last edited by:	Paulina Pakszys
Last edited at:	16.02.2023 21:20
Number of views:	3394