PLAYING AN ECO-GAME TO ASSESS THE QUALITY OF SCIENTIFIC KNOWLEDGE FOR EVIDENCE-BASED DECISION MAKING

BONUS MARES – Policy Brief 2 • 2020

The Challenge of Science Integration

The specialisation of science has historically produced high levels of very specific knowledge. However, the goal of sustainable human development suffers from the isolation of academic schools in their disciplinary silos. The lack of integration and cooperation between science, policy and society fails to capture the whole picture of interactions and complexity of ecological and human systems.

However, the 17 Sustainable Development Goals (SDGs) of Agenda 2030 are considered indivisible, multidisciplinary and integrated. Therefore, advancing sustainable human development requires a more integrated scientific approach.

The existence of possible trade-offs between the SDGs is well known. However, the SDGs express goals that are mostly non-negotiable because they refer to basic human needs and environmental protection. This is why there is a need to understand the most relevant knowledge for their pursuit.

The systematic literature analysis performed in BONUS MARES -project revealed limited availability of integrated scientific evidence. The participatory events organised by the project demonstrated that the cultural and academic views of natural versus economic sciences are strongly discrepant, and the interface they generate for decision making purposes remains weak. This lack of science integration leaves room for increasing uncertainty and political interests, based on assuptions that are often far from scientific evidence, which remains partially unknown.

All this makes it harder to walk the way towards sustainable human development, which is urgent. Therefore, science integration is also urgent for the achievement of SDGs.

The BONUS MARES Eco-GAME framework supports decision making towards SDGs

To face this challenge, MARES applied the Eco-GAME (TABLE 1) as a framework that represents the multi-dimensionality and indivisibility of SDGs, to initiate a participatory and trans-disciplinary process of social learning among economists and ecologists for strengthening science-policy interaction. The Eco-GAME is a participatory and evidence-based appraisal of existing knowledge: a number of attributes can be selected to assess the characteristics of scientific methods or their combinations.

TABLE 1. Eco-GAME framework for the appraisal of the relevance of metrics for SDGs (slightly modified from Sajeva et al. 2020)[1]

Eco-GAME levels of science relevance for SDGs-based decision-making			
Level of knowledge relevance		**Example**	**Score**
Human-nature system integration: analysis effectiveness for policy purposes according to SDGs	The analysis produces metrics to practically and effectively assess performances related to UN Sustainable Development Goals (SDGs)	The analysis can effectively provide metrics of local employment, gender equality, health, well-being or environmental health deriving from fisheries activities, directly referred to SDGs	7
Dynamic multi-dimensional interaction	The analysis assesses systemic impacts of ecosystem services across economic, human, social and natural dimensions (please, check the dimensions concerned)	The analysis can assess the revenue generated by fish markets and the improvements in population health, security or well-being (measurable impact).	6
Forecasting	The analysis forecasts future systemic impacts of ecosystem services	The analysis can forecast the state of health of the ecosystem in terms of fish population and/or the generated well-being (e.g. increased employment) in the long run	5
Dynamic uni-dimensional interaction	The analysis assesses interactions between parts of the ecosystem/service within one dimension	The analysis can assess the revenue generated in the fish market.	4
Static quantitative	The analysis assesses quantitative aspects of ecosystem services	The analysis can tell us quantity of fish or give fish a value, for instance through price	3
Static qualitative	The analysis provides qualitative assessment of ecosystem services	The analysis is suitable to discover the species of fishes or provides uncountable valuations (high or low value)	2
Discovering knowledge	The analysis allows to discover knowledge	A method reveals the presence of fish	1
Not applicable	The methodology is unsuitable to the purpose	A method is not suitable for telling us whether there are fishes or not in the sea	0

1 Forum for the Future (2020) The Five Capitals Model – a framework for Sustainability https://www.forumforthefuture.org/the-five-capitals accessed 30.3.2020

The Eco-GAME assesses the adequacy of scientific knowledge and methods for the different purposes indicated by the attributes, by aggregating the four dimensions of capitals: Natural, Human, Social and Economic (TABLE 2). The Eco-GAME does not aim to find compromises but promotes a combination of different methods that are adequate to reflect SDGs, thereby generating a holistic perspective based on the idea of uniqueness of science.

TABLE 2. Capital dimensions, elaboration from the Forum for the Future (2020[2]); field of science involved; and aims.

Dimensions of capital	Fields of science involved/experts/actors	Aim
NATURAL	Natural science, biology, ecology, environmental accounting, Life Cycle Assessment (LCA)	Natural systems' sustainability, knowledge transfer about ecosystems and their functions
HUMAN	Sociology, anthropology, security, food science, food security, health science, psychology, occupational health, equality and gender studies, labour and civil rights (representatives of citizens and workers, unions), third sector e.g. non-profit health or human rights organizations	Meeting the most important human needs and capabilities
SOCIAL	Administrators and rulers, representing and interpreting societal and political aims	Representation of societal aims by formal and informal institutions
ECONOMIC	Ecosystem services valuation, integrated multi-dimensional sustainability assessments	Translating knowledge on human needs and ecosystem-related information for the use of decision-makers

2 SAJEVA, M., M. LEMON and A. MITCHELL (2020). Making 'Soft' Economics a 'Hard Science': Planning Governance for Sustainable Development Through a Sustainability Compass. In: Mattas K., Kievit H., van Dijk G., Baourakis G., Zopounidis C. (eds) *Sustainable Food Chains and Ecosystems. Cooperative Management.* Springer, Cham

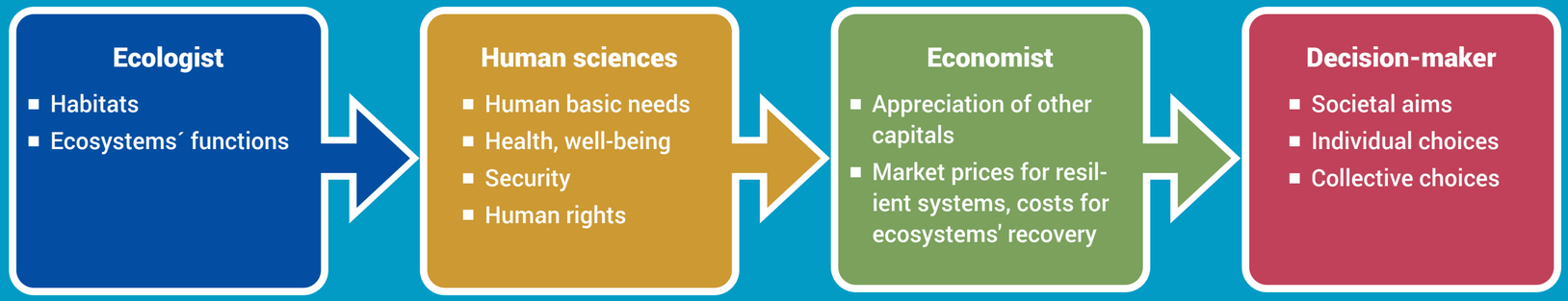
The application of the Eco-GAME

BONUS MARES and the Eco-GAME follow a bottom-up approach, aiming to inform decision makers about the quality of scientific knwoledge for the purpose of natural and human systems' sustainability, represented by SDGs. In this way, it creates the link, which was missing, filling the gap between ecology, human well-being, and societal choices.

In MARES the Eco-GAME framework has been applied in two ways:

- **First**, to perform a systematic analysis of existing knowledge on the benefits the Baltic Sea provides — the so-called ecosystem services — related to the specific habitats of mussel reefs, seagrass beds and macroalgae. See the results in the MARES geospatial toolkit and the two other BONUS MARES Policy Briefs: 1/2020 and 3/2020.
- **Second**, it was used in two participatory events, in order to appraise the qualitative characteristics of different methods and to hypothesise possible combinations/integration of these for a more complete representation of systems' complexity.

The testing of the Eco-GAME by a MARES Simulation Laboratory (SimLab)



In the following phase, the Eco-GAME was applied to the process of matching these ecosystem services with appropriate evaluation and valuation methods, in order to appraise their quality and to figure out possibilities for their combination.

In order to test the application of the Eco-GAME, a Simulation Laboratory (Figure 2) initiated a process of social learning and building of evidence for decision making support by grouping participants along the four capitals as representatives of key actors having a role in the society:

- **NATURAL:** ecologists and representatives of ecosystems, communicating knowledge on ecosystem functions and requirements for their sustainable use
- **HUMAN:** representatives of workers, entrepreneurs or the civil society, aiming at meeting human needs. Additionally, anthropology, human health and well-being sciences should also participate.
- **SOCIAL:** decision makers, administrators and rulers, representing and interpreting societal aims
- **ECONOMIC:** economists, translating knowledge on human needs and ecosystems for individual or collective decision-making purposes

The SimLab was applied to three cases of building a harbour, realising a wind park and maintaining biodiversity. The participatory exercise allowed to understand the gaps inherent in the current methods for appreciating natural resources and the benefits these deliver, and propose their possible combinations and/or integrations, which would represent all the dimensions involved.

Results and recommendations

Scientific literature reports how within a system and between systems, the interaction between the parts is much more important than the single parts. The isolation of scientific disciplines may miss to capture these interactions and neglect more objective and complete evidence. The results of an isolated laboratory may reveal to be inapplicable when inserted in the real world, which is characterised by complex interactions between different systems.

The Eco-GAME functions as an interface between science, policy and society. Thereby it facilitates the processes of co-creation of knowledge for a more informed and evidence-based decision making. Its application suggests some recommendations for different purposes.

Scientific community:

The application of the Eco-GAME has highlighted the need for breaking the isolation between science communities and developing more holistic and integrated approaches which work as interfaces between policy and society. For the science community, this means coming out from the laboratories, integrating results and cooperating in a systemic approach with other disciplines.

For instance, the participatory events demonstrated that the choice of the method for ecosystem services valuation can produce very different outcomes: a clear example is the valuation by market prices or reconstruction cost. Market prices, resulting only from the isolated approach of equilibrium between supply and demand, were indicated as good methods when the ecological perspective of maintaining the habitats that produce the services is not concerned. The reconstruction cost allows taking habitats and ecosystem functions into account and integrating the assessment with ecological considerations.

Decision makers:

The increase of understanding of systems' functioning through more complete and objective scientific results supports choices of decision makers as well as individual citizens in pursuit of SDGs or any other goal of social communities, for their well-being and sustainable development. The provision of clearer evidence facilitates indeed the decrease of social conflict, which is a result of non-supported and subjective interests.

Funding Agencies:

In the light of the previous outcomes, MARES promotes funding to research that enhances science integration and interaction with policy and society.

More detailed results of the application of the Eco-GAME will be published later.

Let's play the Eco-GAME!

To enable easy access and on-line participation, the Eco-GAME has been embedded in the interactive MARES toolkit.

LET'S PLAY!

For further information, see the BONUS MARES Policy Brief 3/2020.

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Multi-method Assessment for Resilient Ecosystem Services and Human Nature System Integration

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Full links to the toolkit:

http://www.sea.ee/esq/review/main
http://www.sea.ee/esq/participatory/tool

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