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An indicator framework for assessing ecosystem services in support of the EU Biodiversity Strategy to 2020

Joachim Maes [a,*], Camino Liquete [a], Anne Teller [b,*], Markus Erhard [c,*], Maria Luisa Paracchini [a], José I. Barredo [a], Bruna Grizzetti [a], Ana Cardoso [a], Francesca Somma [a], Jan-Erik Petersen [c], Andrus Meiner [c], Eva Royo Gelabert [c], Nihat Zal [c], Peter Kristensen [c], Annemarie Bastrup-Birk [c], Katarzyna Biala [c], Chiara Piroddi [a,1], Benis Egoh [a,2], Patrick Degeorges [d], Christel Fiorina [d], Fernando Santos-Martín [e], Vytautas Naruševičius [f], Jan Verboven [g], Henrique M. Pereira [h], Jan Bengtsson [i], Kremena Gocheva [j], Cristina Marta-Pedroso [k], Tord Snäll [l], Christine Estreguil [a], Jesus San-Miguel-Ayanz [a], Marta Pérez-Soba [m], Adrienne Grêt-Regamey [n], Ana I. Lillebø [o], Dania Abdul Malak [p], Sophie Condé [q], Jon Moen [r], Bálint Czúcz [s], Evangelia G. Drakou [a,3], Grazia Zulian [a], Carlo Lavalle [a]

[a] European Commission—Joint Research Centre, Institute for Environment and Sustainability, Via E. Fermi 2749, 21027 Ispra, VA, Italy
[b] European Commission—DG Environment, Brussels, Belgium
[c] European Environment Agency, Copenhagen, Denmark
[d] Ministry of Ecology, Sustainable Development and Energy, Paris, France
[e] Autonomous University of Madrid, Madrid, Spain
[f] Environmental Protection Agency, Vilnius, Lithuania
[g] Flemish Land Agency, Ghent, Belgium
[h] German Centre for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig, Germany
[i] Department of Ecology, Swedish University of Agricultural Sciences, Uppsala, Sweden
[j] Ministry of Environment and Water, Sofia, Bulgaria
[k] MARETEC - Marine, Environment and Technology Centre, Instituto Superior Técnico, University of Lisbon, Portugal
[l] Swedish Species Information Centre, Swedish University of Agricultural Sciences, Uppsala, Sweden
[m] Alterra, Wageningen, The Netherlands
[n] Institute for Spatial and Landscape Development, ETH Zürich, Switzerland
[o] Department of Biology and CESAM, University of Aveiro, Portugal
[p] European Topic Centre on Urban, Land, and Soil Systems, Malaga, Spain
[q] European Topic Centre for Biodiversity, Paris, France
[r] Department of Ecology and Environmental Sciences, Umeå University, Umeå, Sweden
[s] Hungarian Academy of Sciences, Centre for Ecological Research, Vácrátót, Hungary

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ABSTRACT

In the EU, the mapping and assessment of ecosystems and their services, abbreviated to MAES, is seen as a key action for the advancement of biodiversity objectives, and also to inform the development and implementation of related policies on water, climate, agriculture, forest, marine and regional planning. In this study, we present the development of an analytical framework which ensures that consistent approaches are used throughout the EU. It is framed by a broad set of key policy questions and structured around a conceptual framework that links human societies and their well-being with the environment. Next, this framework is tested through four thematic pilot studies, including stakeholders and experts working at different scales and governance levels, which contributed indicators to assess the state of ecosystem services. Indicators were scored according to different criteria and assorted per ecosystem type and ecosystem services using the common international classification of ecosystem services (CICES) as typology. We concluded that there is potential to

* Corresponding authors.
E-mail address: Joachim.maes@jrc.ec.europa.eu (J. Maes).
[1] Institute of Marine Science (ICM-CSIC), Barcelona, Spain.
[2] Present address: Natural Resources and Environment, CSIR, Stellenbosch, South Africa.
[3] Present address: Université de Brest, Brest, France.

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develop a first EU wide ecosystem assessment on the basis of existing data if they are combined in a creative way. However, substantial data gaps remain to be filled before a fully integrated and complete ecosystem assessment can be carried out.

1. Introduction

In 2011 countries which are party to the Convention of Biological Diversity (CBD) adopted a new strategic plan until 2020. This plan includes the so called Aichi biodiversity targets, 20 ambitious objectives to stop biodiversity loss and to ensure healthy ecosystems providing essential services to people. Following the adoption of this global strategic plan, the European Union (EU), which also signed the CBD, proposed a European Biodiversity Strategy to 2020 (European Commission, 2011). This strategy includes six targets. They cover the full implementation of the EU nature legislation, a better protection of ecosystems and the services they provide, more sustainable agriculture and forestry, better management of fish stocks, tighter controls on invasive alien species, and a bigger EU contribution to averting global biodiversity loss. Target 2, in particular, aims to maintain and enhance ecosystems and their services by establishing green infrastructure and restoring at least 15% of degraded ecosystems. To meet the targets the Biodiversity Strategy sets 20 actions. Three concrete actions are proposed to achieve target 2. Action 5 improves the knowledge base on ecosystems and ecosystem services; Action 6 sets priorities to restore ecosystems and promote the use of green infrastructure; Action 7 launches an initiative to ensure the no net loss of biodiversity and ecosystem services.

Under Action 5 the Member States of the EU are committed to map and assess the ecosystems and their services on their national territory. 'Mapping' stands for the spatial delineation of ecosystems as well as the quantification of their condition and the services they supply. Ecosystems are spatially explicit and so, too, are the pressures and impacts upon them. As a result the condition of ecosystems and the supply of ecosystem services are expected to be spatially heterogeneous as well, requiring the use of spatial data and indicators (Maes et al., 2012). 'Assessing' refers to the translation of this predominantly scientific evidence into information that is understandable for policy and decision making, e.g. through maps, indicators, narratives and graphs.

The commitment of Action 5, together with other commitments formulated in the Biodiversity Strategy, was formally adopted by the Council of the EU and endorsed by the European Parliament, two institutions that share decision power. This gives the European Commission, which is the executive arm of the EU, a strong mandate to implement Action 5. In practice, the implementation of the mapping and assessment of ecosystems and their services (MAES) is in the hands of an expert working group. The working group MAES consists of official representatives of EU Member States, experts affiliated to different European Commission services and of the European Environment Agency, as well as independent scientists. The MAES working group has been set up within the Common Implementation Framework of the Biodiversity Strategy and it reports back to the Co-ordination Group for Biodiversity and Nature (CGBN), which oversees the implementation of biodiversity policy in the EU. The working group meets two or three times per year with the aim to provide the best available guidance to Member States on how to map ecosystems, and assess their state and the services they provide.

The essential challenge of Action 5 and of the working group is thus to make the best use of and to operationalize the information and scientific knowledge currently available on ecosystems and their services in Europe. Consequently, Action 5 and MAES build strongly on the outcomes of the Millennium Ecosystem Assessment (MA, 2005) and The Economics of Ecosystems and Biodiversity (TEEB, 2010) studies. Importantly, some countries in Europe have started or recently finished a national ecosystem assessment or national TEEB studies, for example the United Kingdom (UKNEA, 2011) and Spain (Santos-Martín et al., 2013).

This paper aims to describe the policy process and the technical results attained so far in the development of an indicator framework for ecosystem assessment in the EU (under Action 5 of the Biodiversity Strategy). It is the result of a collaborative effort from stakeholders working at different scales. This paper describes the working process and summarized the most relevant initial outcomes: (i) a conceptual framework linking biodiversity, ecosystem state and ecosystem services to human well-being; (ii) a typology for ecosystems in Europe; and (iii) a typology for ecosystem services. In a second phase, the typologies were tested through four thematic pilot studies (Maes et al., 2014). These pilot studies considered Europe's main ecosystem types: croplands, grasslands, forests, rivers and lakes, wetlands, and four marine ecosystems. Also ground waters were included in one of the thematic pilots. Finally, we summarized the results of the pilot studies into a single set of indicators which can be seen as a first European-wide agreed indicator frame for mapping ecosystems and their services.

2. A conceptual framework for ecosystem assessment in the EU

Driven by a set of policy questions, which are listed in the supplementary material of this paper (Supplement 1), the working group MAES developed a conceptual framework with the aim to provide support to future assessments by EU Member States. The first versions of the conceptual model were rooted in the ecosystem services cascade model (Haines-Young et al., 2012; Haines-Young and Potschin, 2010), the TEEB framework (de Groot et al., 2010), and the UK National Ecosystem Assessment (UKNEA, 2011). It also contained elements of the DPSIR framework (Drivers-Pressures-State-Impact-Response) linked to the cascade model (Kandziora et al., 2013). The DPSIR approach has traditionally been used in the conception and implementation of environmental legislation in Europe (Niemeijer and de Groot, 2008). The cascade model and its revised version adopted by the TEEB study connect ecosystem structure and ecosystem functioning to human well-being through the flow of ecosystem services (de Groot et al., 2010). However, further modifications to the conceptual framework were needed due to the particular European governance context. The Biodiversity Strategy is a non-binding communication and cannot be enforced as for instance a directive. It follows that finding consensus among the different Member States of the EU is crucial to achieve desired policy outcomes. Some Member States preferred that a conceptual model emphasized the supply side of ecosystem services. They insisted focusing particularly on the proper functioning of ecosystems and the role of biodiversity in underpinning ecosystem services. Others states preferred a more profound emphasis on the demand site of ecosystem services with