



9 HOW CAN WE INITIATE A TRANSITION TOWARD SOCIO-ECOLOGICAL SUSTAINABILITY IN SPAIN?

From applied science to the application of science

KEY FINDINGS

- The SNEA shows that there is still sufficient critical natural capital in Spain to provide this and future generations a positive environment that contributes to the wellbeing of its inhabitants. However, we also warn that unless we take urgent steps to halt and reverse the degradation of ecosystems and loss of biodiversity, we will approach a new threshold of change that, once exceeded, may cause us to enter into an unpredictable and undesirable situation of socio-ecological unsustainability.
- The territory should be conceptualized as a social-ecological system in which complex biophysical and human interrelations exist at different spatial and temporal scales, where the sustainability science could provide a new context for managing these territories and relationships.
- The mapping of ecosystem services constitutes one of the most promising tools for socio-ecological planning, as it allows us to go beyond administrative limits and characterize the degree of coupling or uncoupling that occurs between the biophysical basis of ecosystems and the social system it sustains.
- The fact that ecosystem services are generated at local to global scales implies that the management of social-ecological systems should be carried out by multilevel institutional systems, where each local operating unit enjoys independence to create and strengthen local rules and regulations, while at higher organizational scales, institutions should ensure the rights and duties of local institutions and the transmission of information between organizational levels and between institutions at the same level.

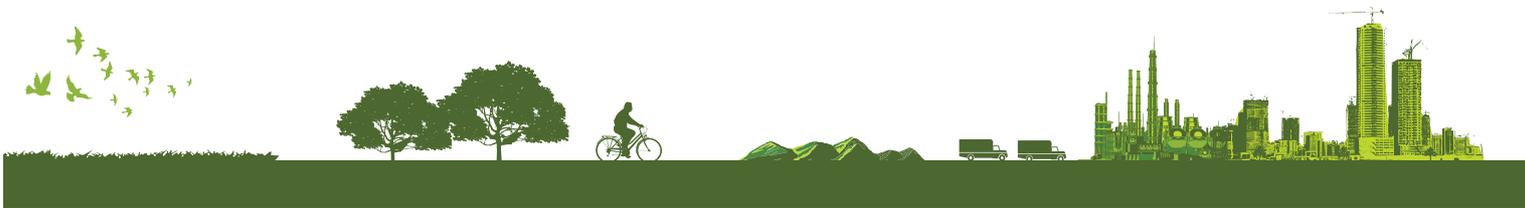
The failure to meet the 2010 biodiversity targets [CDB, 2010] stimulated a set of new targets for 2020 (the Aichi targets), and in conjunction, governments have been negotiating the establishment of a new assessment body, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). At the national scale, the Strategic Plan on Natural Heritage and Biodiversity (MARMM, 2011) recognizes the social role of ecosystems and its biodiversity due to their influence on human health and quality of life but also based on their contribution to social and economic development through the supply of essential ecosystem services. It emphasizes the social and economic value of ecosystem services and the importance of their inclusion in policies.

However, significant efforts in both the science and policy domains need to be made in the next several years if the Aichi targets are to be met (Cardinale 2012). As highlighted by Perrings et al. (2010), the first strategic goal to meet the 2020 targets is to “address underlying causes of biodiversity loss by mainstreaming biodiversity across government and society”. The SNEA has shown that there is no clear institutional response to address these underlying causes (indirect drivers of change) in Spain, and we believe that responses are necessary to fill this political gap and to

meet the 2020 targets. To meet these targets, further structural changes are required that recognize biodiversity as a global public service as well as integrating biodiversity conservation into policies and decision frameworks for resource production and consumption and focusing on wider institutional and societal changes to enable more effective implementation of policies [Rands et al, 2010]. Additionally, sustainability demands cultural changes in society as a whole and in individual human behavior.

The SNEA proposes a basic “toolbox” to enable the transition from the current model of development towards social-ecological sustainability in Spain (Figure 9.1). The instruments that this “toolbox” proposes to stop the degradation of ecosystems and loss of biodiversity are classified into three major groups, each of which exhibits advantages and limitations: (i) environmental legislation applicable to the conservation of biodiversity and ecosystems, (ii) economic incentives and market-based strategies, and (iii) adaptive governance strategies based on community and education strategies for sustainability (Figure 9.1). The set of response options is integrated into three levels of action, to be addressed in an integrated manner to facilitate a genuine transition toward a new model of living based on sustainability.





The first level of action is aimed at developing the main principles of a new paradigm of sustainability to correct management actions of the past that have been proven to be inappropriate and offer new insights into the development of a legal framework that respects the role that ecosystems play in human wellbeing. The SNEA serves as a step forward in responding to this policy demand and can be used to reach agreements on biodiversity and ecosystem services at national, EU and global levels. For instance, the EU Biodiversity strategy calls on member States to map and assess the state of ecosystems and their services in the national territory [EU, 2011]. Maps are useful for spatially explicit prioritization and identification of problems, especially in relation to the synergies and trade-offs among different ecosystem services and between ecosystem services and biodiversity. Furthermore, maps can be used as a communication tool to initiate discussions with stakeholders, visualizing the locations where valuable ecosystem services are produced or enjoyed and explaining the

relevance of ecosystem services to the public in their territory. Maps can, and to some extent already do, contribute to the planning and management of biodiversity protection areas and, implicitly, of their ecosystem services at a sub-national level (Box 9.1). The political-institutional model in Spain is far from the proposed multi-level governance model by the MA. Thus, the model proposed by the SNEA presents practical problems difficult to solve because the way institutions are functioning in Spain. However, pointing necessary and realistic goals in the sense of strengthening the coordination mechanisms between the different levels of government and the involvement of different actors in the management and implementation of public policies, could be a way forward from present situation.

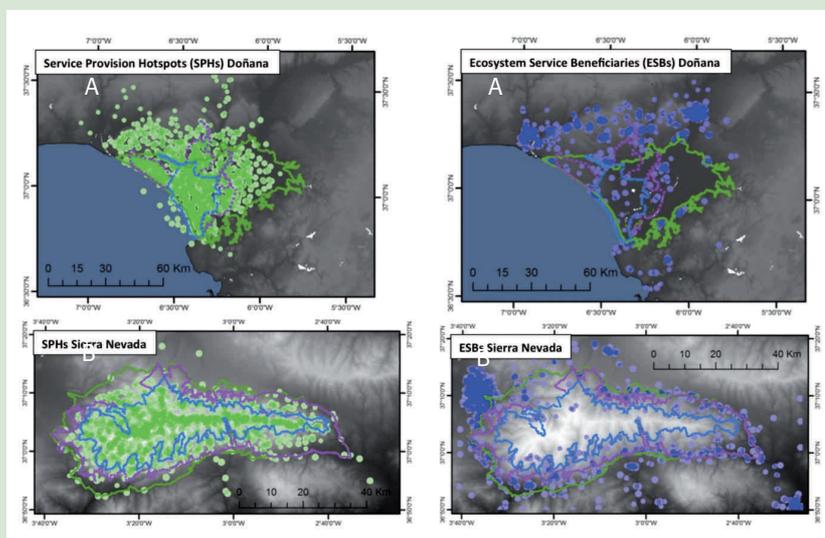
The second level refers to fundamental market-based instruments for building a framework or governance institutional architecture that is suitable for sustainability. The interactions between human society and ecosystems must be modulated by large-scale rules consistent with values, social attitudes and the role

Box 9.1 Mapping the demand side of ecosystem services

The success of the ecosystem service mapping has recently been fostered through several participative approaches (Burkhard et al., 2012), and the variety of ecosystem service mapping approaches has led to the proposal of a blueprint for ecosystem service mapping (Crossman et al., 2013).

Here, we present a deliberative mapping approach that attempts to fill the main current gap in ecosystem service mapping: mapping demand. To this end, as the evaluation of ecosystem services should be “inspired by” and “useful to” users, the authors organized a deliberative workshop involving researchers and policy-makers to map ecosystem service flows in Doñana and Sierra Nevada. During the workshop, several ecosystem services were mapped, allowing further examination of ecosystem service trade-offs and bundle analysis, in which the spatial mismatch between ecosystem services supply and demand was highlighted.

As Sierra Nevada and Doñana are both National Parks, the ecosystem service flow maps highlight the different benefits provided by the ecosystems covered by the protected areas, which will foster support for the conservation of these areas. These maps also provide insights to establish priority areas for conservation and show how protected areas, rather than being isolated entities, are connected in many ways to society and ecosystem service beneficiaries. (Palomo et al, 2013 for full details).



Spatial representation of Service Provision Hotspots (green) and Ecosystem Service Beneficiaries (blue) in Doñana (A) and Sierra Nevada (B). The figure highlights the spatial mismatch between the two entities.



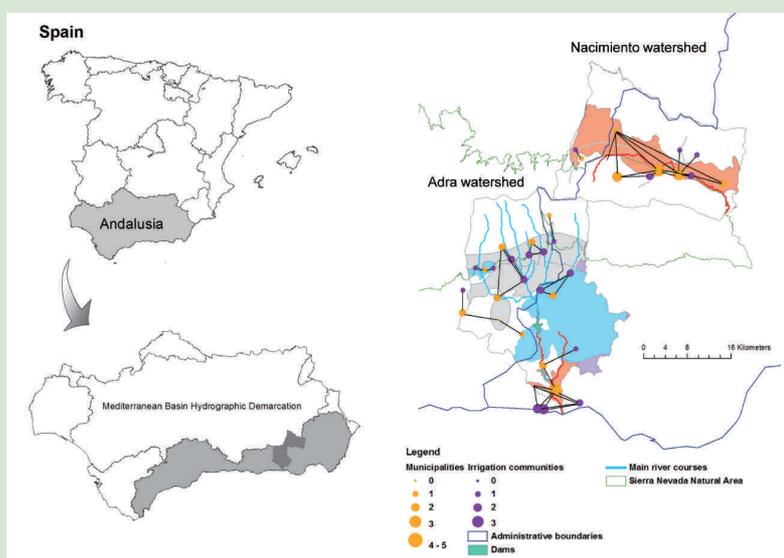


Box 9.2 Strengthening mechanisms of collective action through the study of collaboration networks to improve the governance of two semi-arid watersheds.

Social network analysis (SNA) is being increasingly used as a heuristic tool for modeling social-ecological systems. One of the recent applications of SNA is to natural resource governance, understanding governance as the management of natural resources as well as the structures and processes that provide the social and institutional environment in which management can occur (Bodin & Crona 2009). Within the governance process, multiple actors (i.e., individuals, communities or organizations) are involved.

Here, SNA has been applied in a case study of two semi-arid watersheds in the SE of Spain to investigate the factors underlying collective action in water and agriculture management and how collective action can be promoted. The Adra and Nacimiento watersheds are two social-ecological systems where traditional irrigation systems and modern intensive agriculture are interlinked. This setting results in a complex scenario where different organizations, ranging from local user associations to local municipalities, have to coordinate with different regional organizations to achieve sustainable watershed management. The figure shows the different collaboration networks among local user organizations (in purple) and local municipalities (in orange) involved in the management of irrigation projects. The size of each dot shows the indegree (the number of times that an actor has been nominated by others) that has been received. The main river courses and aquifers are shown in the image in blue or red, depending on whether their ecological state is good or bad, respectively, according to the European Water Framework Directive.

The results show the current state of collaboration networks and how they relate to the state of the main rivers and aquifers in both areas. Collaboration networks show many different patterns; one general characteristic is that there is a lack of a general network. It can be observed that the social actors in the upper areas show lower levels of connection than the social actors in the lower areas. Therefore, the results indicate key players for establishing a strategy to promote collective action in both areas.



Collaboration networks established among local user associations (irrigation communities) (purple dots) and local municipalities (orange dots) during the development of water management and agricultural projects in the Adra and Nacimiento watersheds. Source: Irene Iniesta-Arandia, unpublished data.

of the economy in a socially fair development model that is ecologically sustainable.

It is assumed that ecosystem management is extremely complex and therefore requires institutional complexity. In general, Spanish institutions have approached the conservation of biodiversity and ecosystems either indirectly or directly using market strategies and planned conservation and restoration strategies. However, this process is much more complex, and to complete the institutionalization of the conservation of ecosystems and its biodiversity, multilevel coordinated institutional organization will be required.

In any case, it should be noted that this set of tools only make sense when applied together at different spatial and temporal scales, and never when considering each individual

tool as an end in itself. Ultimately, greening sectorial policies with a territorial impact are required to build an adaptive governance model based on the coupling between human and ecological systems.

The third level refers to the importance of non-formal institutions, which have been and are currently a key aspect in the conservation of ecosystems and its biodiversity in Spain. Maintaining local social capital generates and contributes to empowering traditional ecological knowledge and maintaining a workforce of rural people. We propose a multi-level governance model defined by a number of features related to the relationships between formal and non-formal institutions and the public and private actors. The fundamental objective is to achieve good



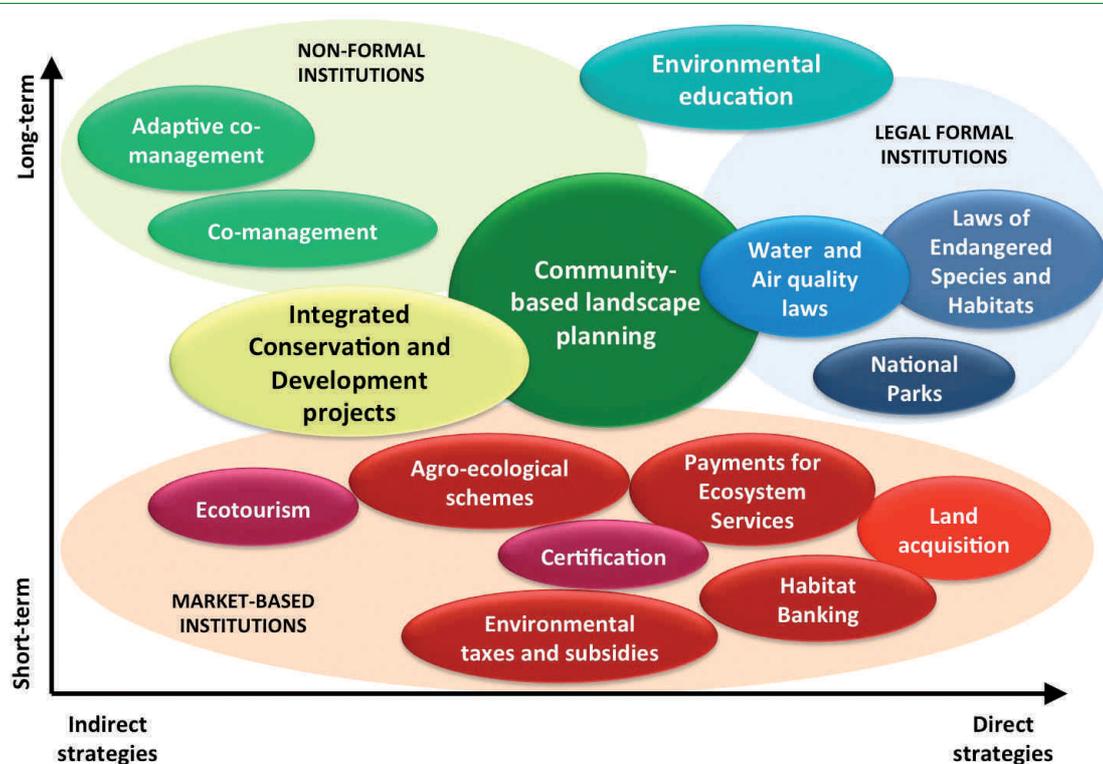


Figure 9.1 In the context of conserving biodiversity and ecosystem SNEA develop a "toolbox" of response options on three levels, based on institutional diversity that includes non-formal and formal institutions (legal and market-based). These "toolbox" was developed specially for managers and thus breaking the decoupling between meeting the long term needs of community-based management and short-term needs of the population that impacts on ecosystems and affects decision making.

environmental policy coordination between both central and regional European administrations through advisory bodies to obtain good articulation of the different policies for ecosystem management and biodiversity conservation.

Currently, the political-institutional model in Spain is far from the multi-level governance model proposed by the MA. The SNEA proposes not only integration of the different levels of government but also that the decision process should respond to the complexity of ecosystem management. Thus, the model proposed by the SNEA presents practical problems that are difficult to solve because of the way institutions function in Spain. However, indicating necessary and realistic goals in the context of strengthening the coordination mechanisms between the different levels of governance and the involvement of different actors in the management and implementation of public policies could be a way forward from the present situation (Box 9.2).

Designing a governance system encourages reflection on current management strategies and the conservation of biodiversity and ecosystems in combination as well as the need

to move towards strategies designed based on an inclusive (including both formal and non-formal institutions) and polycentric (incorporating different organizational levels) governance model.

The SNEA proposes different management tools with short-, medium- and long-term effects applied at different scales. Finally, the "toolbox" incorporates an interconnected component for communication, education and participation for achieving sustainability, which is considered a cornerstone of the three levels of performance (Figure 9.1)

In summary, the SNEA considers the conservation of ecosystems and its biodiversity in Spain not as a luxury of developed societies or a desire of the elite sector of society associated with scientific or conservation organizations but as a pressing need to secure the wellbeing of the entire population. The debate on the conservation of ecosystems and biodiversity cannot be separated from the social debate. Under the framework of uncertainty and unpredictability created by Global Change, the future of the natural capital of Spain should become a matter addressed by the state.

