



ASSESSMENT AND GOVERNANCE OF ECOSYSTEM SERVICES: FIRST INSIGHTS FROM LIFE+ MAKING GOOD NATURA PROJECT

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ABSTRACT – The Natura 2000 network is the cornerstone of EU Biodiversity Strategy aiming at halting the loss of biodiversity and ecosystem services (ES) provided by natural and semi-natural ecosystems to human populations. Member States are mainly responsible to implement conservation strategies through management plans or conservation measures, but in many cases the level of development and execution of these instruments is very low and management effectiveness is rarely achieved. The project LIFE+ “Making Good Natura” aims to provide a governance tool for an efficient management of Natura 2000 sites based on the qualitative and quantitative valuation of ES and innovative models of self-financing by Payments for Ecosystem Services (PES) or other mechanisms. A qualitative assessment of ES was obtained through maps and stakeholder perceptions. These first insights are the basis for integrating the ES approach within conservation strategies of Natura 2000 sites.

KEYWORDS: NATURA 2000 NETWORK, ECOSYSTEM SERVICES, PES, LOCAL COMMUNITIES, GOVERNANCE, MANAGEMENT, NATURAL RESOURCES, PROTECTED AREA

INTRODUCTION

EU Biodiversity Strategy relies on thousands of Natura 2000 sites which are classified as Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) according to the Habitat (CD 92/43/EEC) and Birds (CD 79/409/EEC) Directives respectively. The Natura 2000 network has a fundamental role in halting the loss of biodiversity and conserving habitats and species, but its success highly depends on the level of funding for the establishment, maintenance and management of sites (Bird International, 2009). Natura 2000 management costs are up to the Member States, based on the principle of subsidiarity, but the Habitats

Directive Article 8 also provides the possibility of Community co-financing where needed. During the programming period 2007-2013, support from the EU budget to Natura 2000 network has been accommodated within seven existing EU funding instruments such as the European Agricultural Fund for Rural Development (EAFRD), European Fisheries Fund (EFF), the Structural Funds, EU fund for Environment (LIFE+) and the 7th Framework Programme for Research and Development (FP7). However apart from the LIFE+ fund there is no ring-fencing for nature conservation and biodiversity in the other EU funds

and each Member States can decide how to spend and what type of funding to use in support of Natura 2000 at a national level (Gantioler, 2010). Although almost all Member States decided to develop Management Plans, it has been noted that in many cases the level of development and execution is very low due to delays, unclear strategies and shortage of staff and funding (Kruk et al., 2010).

Comparing benefits and costs associated with Natura 2000, the former mostly exceed the latter; according to Gantioler (2010), the overall cost for implementing Natura 2000 in the EU-27 is estimated of €5.8 billion per year even though the actual European budget for biodiversity conservation is around 4 times lower. Furthermore, it has been shown that the value of benefits provided by Natura 2000 network is around 200-300 billion per year and greatly exceeds management costs (European Commission, 2013). In fact, Natura 2000 sites offer a wide range of ecosystem services (ES) which are defined as the benefits offered from natural ecosystems to humans (MEA, 2005; TEEB, 2010). However, the Natura 2000 network was rarely in the focus of ES assessments and the role of specific habitats or species was barely examined (Kettunen et al., 2009; Bastian, 2013).

Within this context, the project LIFE+ Making Good Natura (LIFE+ MGN) seeks to develop innovative approaches of environmental governance for an efficient management of Natura 2000 sites based on the qualitative and quantitative valuation of ES and innovative approaches for financing. The main purpose of the project is to encourage local communities and stakeholders to adopt sustainable environmental practices in order to protect habitats and species and offer them new sources of income through innovative financing schemes. Considerably effort is set to 1) evaluate the ES qualitatively and quantitatively; 2) to assess the management efficiency; and 3) to define Payments for Ecosystem Services (PES) and other types of self-financing. This paper presents and discusses first insights from the project LIFE+ MGN.

MATERIALS AND METHODS

In order to achieve the project objectives, some preparatory actions were carried out. In particular in this first phase a deep analysis (both qualitative and quantitative) was necessary to select main ES and stakeholders involved in ES governance for each study site through cartographic and socio-economic territorial data, questionnaires to sites' management authorities and information from meetings with local stakeholders.

Study sites

The project LIFE+ MGN includes 21 study sites (Table 1). The study sites were selected across different biogeographical regions and by diverse management approaches allowing to develop a general tool applicable to the major typologies of Natura 2000 sites in Italy. The study sites are mostly interested by agriculture and forest ecosystems and management is demanded to local authorities: most of them are managed by protected areas (national or regional parks), others by national, regional and local authorities.

Analysis of study sites

First of all, the characteristics of the study sites were assessed using ecological and socio-economic descriptors. Based on an analysis of international literature, ecosystems and their services were identified with particular focus on different habitats of the Natura 2000 study sites. Then special focus was given to the identification of different site's management strategies through an accurate analysis of sites' Management Plans. At the end of this preparatory phase (December 2012), a questionnaire was elaborated and sent by email to each study site management authority to examine current management approaches and gather information about environmental, social and economic aspects. The questionnaire consisted of five sections regarding general information for identification of Natura 2000 sites and respondents, overall description of sites from an ecological, administrative and managerial point of view, economic and financial framework, social and economic aspects and ES provided by sites.

Mapping ecosystem services

At the current stage of the project LIFE+ MGN, the ES by Natura 2000 sites were assessed qualitatively relying on the definitions of potential ES supply according to expert knowledge (Bastian et al., 2012; Burkhard et al., 2012; Bastian, 2013). In such valuation an ordinal score (3-high, 2-medium, 1-low, 0-not significant) was attached to the Natura 2000 habitats and CORINE land cover classes, by considering specific ecological functions, potential distance of ES demand, and intrinsic biodiversity (further details in Schirpke et al. 2013a). Mapping of ES was performed by relating the scores to habitat and land cover maps. Subsequently, an area-weighted mean value was calculated for each ES (Table 2). To identify the most five important ES at each study site, the services were ranked using habitat as well as CORINE data, since habitat maps did not cover the whole area of the Natura 2000 sites (Figure 2).

Table 1. Study sites of the project LIFE+ MGN.

N.	Type	Code	Name	Region	Bioregion	Extent [km ²]
1	ZPS	IT2040401	Parco Regionale Orobic Valtellinesi	Lombardy	Alpine	228.2
2	ZPS	IT20A0402	Riserva Regionale Lanca di Gerole	Lombardy	Continental	11.8
3	ZPS	IT20B0501	Viadana, Portiolo, San Benedetto Po e Ostiglia	Lombardy	Continental	72.2
4	ZPS	IT2020301	Triangolo Lariano	Lombardy	Alpine	5.9
5	SIC	IT2020002	Sasso Malascarpa	Lombardy	Continental	3.3
6	SIC	IT2070022	Corno della Marogna	Lombardy	Alpine	35.7
7	SIC	IT2070021	Valvestino	Lombardy	Alpine	64.7
8	ZPS	IT2070303	Val Grigna	Lombardy	Alpine	28.7
9	ZPS	IT2040601	Bagni di Masino - Pizzo Badile - Val di Mello - Val Torrone - Piano di Preda Rossa	Lombardy	Alpine	96.4
10	SIC	IT2040019	Bagni di Masino - Pizzo Badile	Lombardy	Alpine	27.6
11	SIC	IT2040020	Val di Mello - Piano di Preda Rossa	Lombardy	Alpine	57.9
12	ZPS	IT2070402	Alto Garda Bresciano	Lombardy	Alpine	215.3
13	SIC	ITA020007	Boschi Ficuzza e Cappelliere, Vallone Cerasa, Castagneti Mezzojuso	Sicily	Mediterranean	41.0
14	SIC	ITA020008	Rocca Busambra e Rocche di Rao	Sicily	Mediterranean	62.4
15	SIC	ITA060006	Monte Sambughetti, Monte Campanito	Sicily	Mediterranean	31.9
16	SIC/ZPS	IT8050055	Monti Alburni	Campania	Mediterranean	253.7
17	SIC	IT8050025	Monte della Stella	Campania	Mediterranean	11.8
18	SIC	IT8050006	Balze di Teggiano	Campania	Mediterranean	12.0
19	SIC	IT9310014	Fagosa – Timpa dell’Orso	Calabria	Mediterranean	61.7
20	SIC	IT9310008	La Petrosa	Calabria	Mediterranean	3.5
21	ZPS	IT4090006	Versanti occidentali del Monte Carpegna, Torrente Messa, Poggio di Miratoio	Emilia-Romagna	Continental	21.4

Stakeholder meetings

Based on the information from the questionnaires, first meetings with main local stakeholders groups were organized; first of all institutional and public bodies (Municipality, Protected Areas, Mountain Communities, Counties Administration, other local institutions) and secondly local private sector operators such as farmers, forest owners, breeders, fishermen, restaurants and hotels, nature and tour guides, tour operators, watershed authorities, power plants companies, etc. were defined and invited to participate to the first public presentations of the project. In each local meetings, debate among participants and project partners was encouraged to analyse stakeholders’ perception of Natura 2000 sites, gather opinions about local strengths and weaknesses and define the ES they recognize as the most important and the potential supplier and buyers for implementing a PES.

RESULTS

Ecosystem services maps and potentials

For all study sites, the ES were mapped and area-weighted mean values calculated indicating that regulation services (in particular, habitat for biodiversity, erosion regulation, water regulation) and cultural services are most important (Table 2).

Figure 1 shows three examples of ES valuation based on habitat maps:

- The site “Alto Garda Bresciano” (IT2070402) has a high potential for raw material (F3), principally related to the Illyrian *Fagus sylvatica* forests habitats (91k0), Tilio-Acerion forests and *Quercus ilex* (9180) and *Quercus rotundifolia* forests (9340);

- The erosion regulation (R5) was ranked highest in the site “Versanti occidentali del Monte Carpegna, Torrente Messa, Poggio di Miratoio” (IT4090006) according to habitat (2.27 on 3). This is due to the large Illyrian oak-hornbeam forests and Apennine beech forests with *Taxus* and *Ilex* (respectively 91L0, 9210);
- The cultural service recreation (C2) is one of the main services provided by the site “Monte Alburni” (IT8050055), with a ranking of 2.56 out of 3. In particular, the higher values (from moderately to very important) are mostly due to Apennine beech forests with *Taxus* and *Ilex* (9210), *Castanea sativa* woods (9260), and forests of *Quercus ilex* and *Quercus rotundifolia* (9340).

Table 2. Mean ES values for the LIFE+ MGN study sites. The analyzed ES are forage/pasture (F1), game/fish (F2), raw materials (F3), wild food (F4), medicinal resources (F5), genetic resources (F6), freshwater (F7), carbon sequestration (R1), climate regulation/air purification (R2), water regulation (aquifer recharge) (R3), water purification (R4), erosion regulation (R5), flood mitigation (R6), pollination (R7), biological control (R8), habitat for biodiversity (R9), aesthetic value (C1), recreation (C2), spiritual/religious/ethical values (C3).

	F1	F2	F3	F4	F5	F6	F7	R1	R2	R3	R4	R5	R6	R7	R8	R9	C1	C2	C3
IT2040401	1,27	2,02	1,58	2	1,86	1,86	0,49	2,02	1,9	2,11	2,23	2,35	1,5	2,36	2,11	2,55	2,52	2,44	2,41
IT20A0402	1,25	1,49	1,3	1,3	1,28	1,28	0,75	1,71	1,81	2,08	1,51	1,3	1,96	1,71	1,3	1,67	2,18	1,76	1,61
IT20B0501	1,03	1,7	1,54	1,55	1,31	1,31	1,06	1,78	1,97	2,37	1,92	1,58	2,08	1,82	1,58	2,22	2,49	2,21	2,02
IT2020002	1,1	2,66	2,84	2,95	2,66	2,66	0,95	2,95	2,9	2,95	3	3	2,79	3	2,95	3	3	3	3
IT2020301	1,11	2,61	2,83	2,94	2,61	2,61	0,94	2,94	2,89	2,94	3	3	2,83	3	2,94	3	3	3	3
IT2070021	1,13	2,6	2,69	2,81	2,55	2,55	0,89	2,81	2,76	2,82	2,85	2,92	2,8	2,94	2,85	2,98	2,93	2,89	2,91
IT2070022	2,83	2,83	2,83	2,81	2,8	2,79	2,77	2,76	2,76	2,72	2,69	2,38	2,33	2,33	1,03	0,89	2,91	2,88	2,84
IT2070303	1,62	2,68	1,72	2,35	2,63	2,63	0,52	2,37	2,07	2,38	2,71	2,82	2,06	2,82	2,48	2,98	2,83	2,72	2,8
IT2040601	0,59	1,11	0,76	0,92	0,89	0,89	0,21	0,98	1	1,08	1,12	1,14	0,8	1,14	1	1,37	1,71	1,7	1,55
IT2040019	0,87	1,37	0,55	0,95	1,04	1,04	0,13	1,07	0,95	1,15	1,4	1,29	0,79	1,29	0,97	1,52	1,81	1,92	1,61
IT2040020	0,37	0,91	0,86	0,86	0,7	0,7	0,25	0,9	1,03	1,04	0,95	0,98	0,75	0,98	0,94	1,23	1,62	1,58	1,45
IT2070402	1,11	2,35	2,6	2,67	2,22	2,22	0,85	2,69	2,68	2,7	2,66	2,79	2,7	2,83	2,73	2,87	2,83	2,76	2,76
ITA020007	1,2	1,94	2,25	2,34	2,01	2,01	0,61	2,36	2,31	2,27	2,3	2,63	2,21	2,65	2,58	2,86	2,64	2,3	2,37
ITA020008	2,08	1,88	0,58	1,26	1,95	1,95	0,14	1,64	1,3	1,62	1,59	1,73	1,32	2,11	1,39	1,85	2,11	1,59	1,63
ITA060006	1,37	2,4	2,13	2,39	2,42	2,42	0,58	2,39	2,26	2,29	2,41	2,7	2,18	2,7	2,57	2,88	2,7	2,41	2,47
IT9310014	1,29	1,02	0,72	0,73	1,58	1,58	0,05	1,06	1,06	1,06	0,73	1,3	1,05	1,63	1,3	1,87	1,63	0,73	0,74
IT9310008	1,06	2,19	2,87	2,92	2,18	2,18	0,95	2,92	2,9	2,91	2,93	2,95	2,89	2,96	2,93	2,96	2,96	2,94	2,94
IT8050055	1,3	1,97	2,14	2,3	1,92	1,92	0,63	2,39	2,28	2,37	2,43	2,6	2,33	2,64	2,41	2,66	2,68	2,56	2,58
IT8050025	1,24	2,06	2,63	2,79	2	2	0,82	2,79	2,71	2,72	2,79	2,9	2,63	2,9	2,81	2,91	2,89	2,8	2,79
IT8050006	1,4	1,96	1,15	1,69	1,95	1,95	0,28	1,69	1,42	1,68	1,95	2,24	1,69	2,24	1,97	2,52	2,4	2,11	2,38
IT4090006	1,46	2,01	1,78	1,98	1,72	1,72	0,52	2,13	2,07	2,08	1,9	2,27	2,1	2,5	2,12	2,4	2,41	2,09	2,14

First insights from stakeholder meetings

During the meetings with local stakeholders, discussion started former analysis of different site's habitats and species and CORINE land cover information and from a first review of the results from the questionnaires. In general, participants' opinion was very helpful to focus on the issues they perceived as the most important and to confirm preliminary

ES evaluation for the area fostering a discussion about potential suppliers or buyers of ES.

After the local meetings, main ES have been defined also on the basis of socio-economic and environmental characteristics of the sites considering critical issues and opportunities for the development of the territory. In Figure 2, the most important ES have been identified and distinguished by three different categories for each study site:

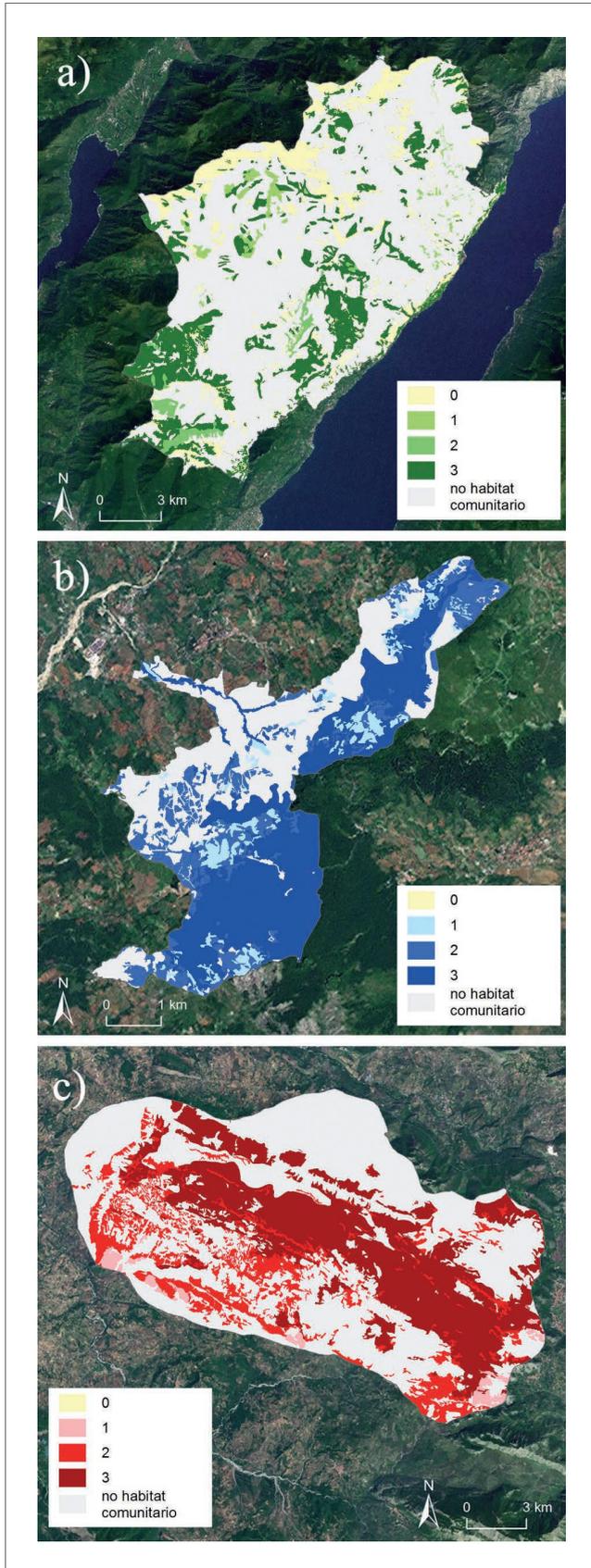


Figure 1. ES potentials based on habitat maps (3-high, 2-medium, 1-low, 0-not significant). A) raw material (F3): Alto Garda Bresciano - ZPS IT2070402, b) erosion regulation (R5): Versanti occidentali del Monte Carpegna, Torrente Messa, Poggio di Miratoio - ZPS IT4090006 and c) recreation (C2): Monti Alburni - SIC/ZPS IT8050055.

the green colour indicates where Habitat cover is important for that specific ES; the yellow colour represents the link between CORINE land cover and that specific ES; the light blue colour identifies the most important ES chosen by the sites’ managers on the questionnaire (P means “Priority” because in the questionnaire respondents could put a priority on one of the three main ES selected). Finally after the local meetings the main ES for each site have been chosen (red colour). Recreation (C2) seems to be the most important ecosystem service for 13 study sites; other main ES are carbon sequestration (R1) and water regulation (R3) within regulating services category (respectively for 9 and 5 study sites), freshwater (F7) and forage/pasture (F1) within provisioning services category (respectively for 6 and 5 study sites).

	F1	F2	F3	F4	F5	F6	F7	R1	R2	R3	R4	R5	R6	R7	R8	R9	C1	C2	C3
ZPS IT2040401	P																P	P	
ZPS IT20A0402						P											P	P	
ZPS IT20B0501																	P	P	P
SIC IT2020002										P		P						P	
ZPS IT2020301										P		P						P	
ZPS IT2070303	P																P		P
SIC IT2070021										P	P						P	P	
SIC IT2070022										P	P						P	P	
ZPS IT2070402										P	P						P	P	
ZPS IT2040601										P							P	P	
SIC IT2040019										P							P	P	
SIC IT2040020										P							P	P	
SIC ITA020007	P																P	P	
SIC ITA020008	P																P	P	
SIC ITA060006	P																P	P	
SIC IT9310014										P							P	P	
SIC IT9310008	P																P	P	
SIC/ZPS IT8050055										P							P	P	
SIC IT8050025																	P	P	
SIC IT8050006																	P	P	
ZPS IT4090006										P							P	P	

Figure 2. Identification and selection of ES for each study site through the analysis of habitats (green), CORINE land cover (yellow), questionnaires (light blue with P for priority) and meetings with stakeholders (red). For nomination of ES see Table 2.

DISCUSSION

Valuation of ecosystem services

The proposed qualitative assessment of ES relied on few data available for whole Italy; this makes the approach easily applicable to all other Natura 2000 sites. This desired fact limited the information detail of the assessment, resulting in a simple ordinal classification or ranking. Measuring and assessing fluxes of ES may require much more data and modelling effort for each site (Bagstad et al., 2013). Relatively more sophisticated methods are identified to be applied in the next phase of LIFE+ MGN project (Schirpke et al., 2013b). Nonetheless, such simplicity has the positive aspect of making the valuation easily understood by site managers and stakeholders. In decision making, the provided ranking can hold enough information for better discussion and definition of management alternatives or policy (De Groot et al., 2010).

The multiple approaches used in the valuation (habitat-based, CORINE-based, survey-based) reveals two perspectives: one of the territory (consisting of habitats and land covers with potentials for ES provision) and the other of the managers and stakeholder (related to social demand or expectation for ES). The two perspectives, in some cases, lead to different results, even opposite; such divergence may provide useful insights on potential conflicts or limitations to natural resource uses. For example, the high expectation for water supply by a relatively scarcely producing area might reveal an important issue for the region: high demand for a particular ES and scarce supply potential. Such interpretation, obviously, has to be considered only as an indicator to be verified by data and grounded by further surveys. Concluding, at the best case, the proposed assessments can support better informed decisions; at the worst, these can guide further research efforts towards the most relevant issues for the site or the context.

Conclusions from meetings with stakeholders

The involvement of different public and private stakeholders during the meetings was very important for two reasons: firstly, for communicating project's objectives to all potential beneficiaries or suppliers of ES, and secondly, for defining a shared working framework among project's partners. It has to be noted that local stakeholders are generally aware of the value of ecosystems they manage or they rely on. However, since the majority of study sites are agro-forest landscapes, especially farmers perceive protected areas and their conservation measures only as a limitation and not as an opportunity for their business. This is due to the complexity of the regulatory framework and to the lack of sources of

incomes in these rural areas. The main consequence is the land abandonment that is likely to produce negative effects on natural and semi-natural ecosystems' biodiversity (especially in agro-forest landscapes) and on the services they provide.

Since the shortage of funds is one of the major management issues that affect Natura 2000 sites it is necessary to implement innovative governance approaches through collaborative participation of local communities and greater awareness of the importance and economic value of their activities (Kettunen et al., 2011). During the first phase of the project LIFE+ MGN, a framework for developing local ES governance schemes has been defined. Next steps will allow to create different local working groups among project's staff and local stakeholders focusing on specific ES.

At the end of this process, it is expected to define a financing scheme (a public-private payment schemes and/or a self-financing model) that involves buyers and suppliers of ES and that can be potentially implemented in the site's area. This is crucial to increase both the cost-effectiveness of management and the availability of funds for Natura 2000 network and to reduce land abandonment, a major threat for habitats and species conservation (Falucci et al., 2007).

It is worth highlighting that the main ES are quite independent by habitat type and land cover, but they are often linked to socio-economic background; furthermore it has been noted a different approach between site managers and local communities for selecting the most important ES. Site managers, for example, have often chosen the habitat for biodiversity service (R9) as a priority, but without any consideration of hypothetical PES or PES-like schemes to implement with local stakeholders. Nevertheless, to date the participatory phase has given some interesting results in terms of ES identification and choice that will allow to deepen our analysis with local communities and stakeholders to define and implement a sustainable financing (or self-financing) scheme.

Arranging payments for the benefits provided by natural ecosystems is a way to recognize their value and ensure these benefits in the future. PES and PES-like schemes can encourage the maintenance of natural ecosystems through environmentally friendly practices that preserve natural resource also improving wellbeing in rural areas (Wunder et al., 2008). Next phases of the project intend to deal with the application of financing or self-financing schemes to the study sites to implement an effective management through a model of local governance for supporting policy makers and achieving EU Biodiversity Strategy targets.

CONCLUSIONS

The qualitative assessment of ES (habitat-based, CORINE-based, survey-based) indicates that Natura 2000 sites provide many different ES, especially regulating and cultural services. Local communities and stakeholders are generally aware of the value of ecosystems, but they have to confront with shortage of funding and of sources of income. Thus, in order to create new opportunities for local development a new governance approach is needed.

Focusing on ecosystem services provided by natural and semi-natural ecosystems is a way to recognize the value of Natural Capital and to promote economic activities in the context of sustainability. Along with mapping and assessing ES it is also crucial to solve governance problems since sustainable ES provision and management often involve complex multi-level and multi-actor backgrounds. Innovative policy instruments based on new forms of relationship between national and regional institutions and local actors, such as PES or PES-like schemes (Wunder, 2005), can be powerful tools to reduce bureaucratic burden and transaction costs and support socio-economic development, while still achieving biodiversity conservation goals.

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