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Full Research Article

Assessment and governance of Ecosystem Services for improving management effectiveness of Natura 2000 sites

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Abstract. The Natura 2000 network is the cornerstone of the EU Biodiversity Strategy aimed at halting the loss of biodiversity and ecosystem services. Yet in many EU Member States the level of development and execution of management plans and conservation measures of Natura 2000 sites is often very low due to scarce financial resources; for this reason management effectiveness is rarely achieved. This paper presents initial insights from the Life+ MGN project and highlights the costs and benefits associated with 2 out of 21 Natura 2000 study sites in Italy in order to present a new governance approach relying on the qualitative and quantitative valuation of Ecosystem Services (ES). Preliminary results suggest that the quantification of costs and benefits related to the Natura 2000 network is crucial for reaching Natura 2000 conservation objectives and measuring management effectiveness.

Keywords. Natura 2000, Ecosystem Services, PES, governance, local communities.

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1. Introduction

1.1 Costs and benefits associated with the Natura 2000 network

The EU's biodiversity conservation policy framework follows EU Environmental Action Programmes, as well as international initiatives such as the Convention on Biological Diversity (CBD) and the Bern Convention. The main legal umbrella for the protection of nature and biodiversity in the EU consists of the Habitats Directive (92/43/EEC) and the Birds Directive (79/409/EEC), under which the European Natura 2000 network of protected areas was established. The main purpose of the Natura 2000 network is to

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ensure the long-term protection of Europe's most valuable and threatened species and habitats. According to the European Natura 2000 Barometer, the Natura 2000 network currently includes 5,315 special protection area (SPA) sites encompassing 593,486 km^2, and 22,529 sites of community importance (SCI) (719,015 km^2) covering around 18% of the EU land area (European Commission, 2011; Hoyos *et al.* 2012). EU Member States are responsible for the management of Natura 2000 sites through the implementation of conservation measures and the development of specific management plans. Although the latter are not mandatory, they are a major instrument for reaching conservation goals and clearly define allowed and forbidden activities, roles and responsibilities of authorities and other stakeholders potentially involved in managing Natura 2000 sites (Kruk *et al.*, 2010).

On the basis of the principle of subsidiarity, Member States are responsible for determining management costs, but the Habitats Directive Article 8 also allows for European Community co-financing, where needed. However, one of the main challenges for Member States, and particularly for the sites' management authorities, remains the lack of sufficient financial resources for the complete implementation of management plans or other measures. This is a threat to species and habitat conservation goals. According to Gantioler *et al.* (2010), the overall cost for implementing Natura 2000 in the EU-27 is estimated at €5.8 billion per year. The current amount of funding available to support the network is not clear, even though the annual EU budget for Natura 2000 is estimated at around €550-1,150 million (Kettunen *et al.*, 2011). However, while putting a monetary figure on the cost of implementing these plans is an essential prerequisite for ensuring sufficient economic resources for their management, establishing the economic benefits of Natura

Table 1. Funds available for financing Natura 2000 during period 2014-2020.

EU funding instruments	Proposed budget 2014-2020 (€)	European Commission Regulation
European financial instrument for the environment (LIFE)	€ 3.2 billion (of which €2,713.5 million for sub-programme for Environment)	COM(2011) 874 final
European Fund for Regional Development (ERDF) European Territorial Cooperation under ERDF	€ 183.3 billion	COM (2011) 614 final
European Territorial Cooperation (ETC) under ERDF	€ 11.7 billion	COM (2011) 614 final
European Social Fund (ESF)	€ 84 billion	COM(2011) 500 final
European Agricultural Fund for Rural Development (EAFRD)	€435.6 billion for Common Agricultural Policy €101 billion for Rural Development	COM(2011) 627 final
European Maritime and Fisheries Fund (EMFF)	€7,535 billion	COM(2011) 804 final
Framework Programme for research and innovation (Horizon 2020)	€80 billion	COM(2011) 500 final

Source: own elaboration by European Commission Regulation

2000 helps to determine its social desirability, as well as increasing awareness about the importance of Natura 2000 for human well being (Hoyos *et al.*, 2012). In this context, primary economic valuation studies can be considered a promising evaluation instrument for Natura 2000, as they can contribute to managing the network by explicitly acknowledging relevant socio-economic implications (Rojas-Briales, 2000; Halahan, 2002; Ten Brink *et al.*, 2002) particularly in a regional context (Getzner and Jungmeier, 2002).

Specific actions of the EU Biodiversity Strategy include securing adequate financing for the conservation measures required for Natura 2000 sites at both the EU and national/regional level. To date, most EU co-funding for Natura 2000 has been made available by integrating biodiversity goals into various existing EU funds or instruments. Table 1 shows the EU funds available for financing Natura 2000 during next Programming Period 2014-2020. In particular, only the LIFE fund provides dedicated support to biodiversity and Natura 2000, while other EU funding instruments primarily contribute to EU goals on rural, regional, infrastructural, social and scientific development. The integrated co-financing model continues to form the basis for EU funding of Natura 2000 in the next programming period 2014-2020, supporting strategic goals to further embed the implementation of the EU Biodiversity Strategy into other relevant policy sectors and their financing instruments and, at a practical level, linking biodiversity goals with a broader management of land and natural resources (Kettunen *et al.*, 2014).

1.2 Governance of Ecosystem Services

Many studies have demonstrated the role of biodiversity in supporting the provision of ecosystem services (MA, 2005; Díaz *et al.*, 2006; Harrison *et al.*, 2014; Byrnes *et al.*, 2014). Moreover, our understanding of the linkages between biodiversity and ecosystem services and the possible effects of biodiversity loss on the delivery of ecosystem services is increasing (Schulze and Mooney, 1993; Loreau *et al.*, 2002; Balvanera *et al.*, 2006; Cardinale *et al.*, 2006). Benefits from ecosystems are, however, rarely taken into account by politicians, private companies and other important decision makers. In this regard, the recognition and demonstration of the wider socio-economic benefits of Natura 2000 should be an important tool for influencing stakeholder attitudes, attracting new funding, informing land-use decisions, and integrating protected areas into regional development planning (European Commission, 2013). Furthermore, the value of these benefits mostly exceed the management costs associated with Natura 2000 and have been estimated at around €200-€300 billion per year (European Commission, 2013). The acknowledgement of the value of ES increases not only the social acceptance and attainment of conservation objectives, but their economic valuation also raises new arguments in favour of biodiversity conservation (Cimon-Morin *et al.*, 2013).

The integration of ecosystem services arguments into management plans and strategies for protected areas is becoming a pillar of public policies aimed at environmental protection (García-Mora and Montes, 2011; Harrison *et al.*, 2014). Moreover, policy makers are committed to identify adequate policy tools to manage the natural environment within and outside protected areas.

In order to protect biodiversity and ecosystems (BES), guarantying the provisions of their services, the TEEB studies identified three clusters of tools that policy makers could implement (TEEB, 2011):

- *providing information*, for instance, by reforming national accounting systems and integrating BES values into policy assessments;
- *setting incentives*, for instance, by rewarding benefits through payments and markets, reforming harmful subsides and addressing losses through regulation and pricing;
- *regulating use*, for instance, by creating protected areas and investing in green infrastructure.

Accordingly, it is necessary to define and implement a wide range of governance and management tools, referring to the environmental policy mixes, including both the command and control approach and market based instruments (Ackerman and Steward, 1985; Freeman, 1997). The latter are instruments that provide incentives for undertaking particular actions (OECD, 2004; OECD, 2008), such as price-based instruments (taxes and charges); liability instruments; subsidies; market creation measures and the assignment of well-defined property rights and other instruments, such as environmental agreements (EA) for biodiversity conservation. EA consist of legal frameworks for contracts between landowners and other parties, where the landowner voluntarily commits himself/herself to refrain from using land (conservation contracts) or to carry out activities that conserve or promote biodiversity (management contracts) in a specific area. The other party (either a private or a public participant) makes a financial payment in return that can take different forms, such as money transfers, tax exemptions or reductions (subsidies), or a credit (for instance, in the case of carbon market). In this framework, particular attention should be paid to Payments for Ecosystem Services (PES), defined as voluntary transactions where a well-defined ES (or land-use likely to secure that service) is 'bought' by at least one ES buyer from at least one ES provider, if and only if the ES provider secures ES provisions (conditionality) (Wunder, 2005; TEEB, 2011).

1.3 Aim of the paper

In Italy, the management authorities Natura 2000 sites can adopt a management plans or integrate conservation measures into other planning instruments such as sectorial or territorial plans to achieve a site's conservation goals. Yet the integration of regulatory instruments (general regulatory measures, specific administrative measures or contracts between public and private stakeholders) is not always clear for the management authorities of sites and this can affect achieving conservation goals and management effectiveness. Thus, innovative management tools are needed and, in our opinion, the acknowledgement of the value of biodiversity and ecosystem services provided by sites is a prerequisite for better defining and implementing conservation strategies.

In this context the aim of this paper is to assess and compare ES and management costs related to Natura 2000 sites in Italy, according to the methodology elaborated at the European level (Gantioler *et al.*, 2010), in order to highlight the benefits and costs associated with conservation actions and stimulate discussion regarding new instruments for effective management. Despite several limitations, our analysis allows to define a new governance approach aimed at improving management effectiveness through the valorisation of ES provided by Italian sites.

2. Italian Case studies

Our analysis started from initial insights from the Life+ Making Good Natura (MGN) project involving 21 Italian agro-forest Natura 2000 sites. For each site, habitat cover and land use were analysed, the site's management instruments were examined and socio-economic data were gathered through questionnaires for site management authorities. Subsequently, meetings with local public and private stakeholders were organised to assess their perceptions and identify the most important ES. After the local meetings, the main ES were selected on the basis of the socio-economic and environmental characteristics of the sites, considering critical issues and opportunities for the development of the territory.

After a brief description of the above-mentioned cognitive steps of the project (analysis of site management instruments, questionnaires for management authorities and stakeholder meetings), we presented the results of 3 ES assessments in 2 out of 21 Natura 2000 study sites and compared these values with costs for conservation measures. The two sites presented in this paper (Table 2) are "Bagni di Masino e Pizzo Badile" (IT2040019) in the Forest of Lombardy Val Masino (Lombardy Region) and "Monte della Stella" (IT8050025) in Cilento and Vallo di Diano e Alburni National Park (Campania Region).

Table 2. Natura 2000 study sites.

Type	Code	Name	Region	Bioregion	Extent [km²]
SCI	IT8050025	Monte della Stella	Campania	Mediterranean	11.8
SCI	IT2040019	Bagni di Masino - Pizzo Badile	Lombardy	Alpine	27.6

Source: Schirpke *et al.*, 2013a,b; Marino *et al.*, 2014

The SCI "Bagni Di Masino - Pizzo Badile" coincides with the Forest of Lombardy Val Masino, in the western branch of the valley. Different types of vegetation were identified: deciduous and coniferous forests in the basal part and on the upper side of the valleys; timber forests , especially in the valley and in the most accessible areas and mountain pastures to the upper limit of vegetation. This area exhibits the qualities of the classic alpine glacial cirques, rugged granite peaks, glacial deposits and accumulations of debris slopes, that are appreciated by mountain enthusiasts. The considerable wealth of the environment is accompanied by the abundance of species belonging to the alpine fauna, including: chamois, deer, ibex, marmots and eagles.

The SCI "Monte della Stella" is a typical mountainous-hilly site. It is largely covered by forests consisting mainly of chestnut trees; the lower altitudes include holm-oak woods, often mixed with downy oak and flowering ash. In the SCI, there are also thermo-Mediterranean shrubs and mountain grasslands and xeric Mediterranean shrubs. With regard to the avifauna, the total species known to date are 119, of which 22 are listed in Annex I of the Birds Directive and 57 are nesting on the site. The site presents degradation associated with inappropriate forest management and the abandonment of pastures and/or overgrazing, as well as the presence of pylons on the peaks of Mount Stella. A dense network

of trails guarantees access to the site. In addition, the Prey Rescue Centre of Sessa Cilento serves as an environmental education centre.

3. Methodology

3.1 Management instrument analysis

The Habitats Directive has a crucial role for Natura 2000 site conservation and management. According to the Habitats Directive Article 6, Member States establish necessary conservation measures including, in as need be, appropriate management plans specifically designed for Natura 2000 sites or integrated into other development plans, and appropriate statutory, administrative or contractual measures which correspond to the ecological requirements of the natural habitat types in Annex I and the species in Annex II present on the sites. In particular, the term "conservation measures" refers to "a series of measures required to maintain or restore the natural habitats and the populations of species of wild fauna and flora at a favourable conservation status".

In our study, we analysed two site management instruments with regard to all measures and tools developed for and implemented in the site areas. In particular, with the help of site management authorities we collected and examined all available documentation (specific management plans and conservation measures) for both sites.

This first review helped us to identify differences in management approaches between the sites and to highlight conservation objectives for each habitat and/or species and related management and environmental issues involving the provision of ES.

3.2 Questionnaires submitted to local management authorities

In order to acquire other specific information on the Natura 2000 study sites, we analysed the questionnaire sent by email to both site management authorities (Monte della Stella e Bagni di Masino-Pizzo Badile). The main objective of the questionnaire was to collect information related to the environmental and managerial context of each Natura 2000 study site in order to provide a functional cognitive framework for the ES analysis and evaluation in the study sites.

The questionnaire included both closed and open questions and assistance was provided to interviewees in compiling their answers. According to Gaglioppa *et al.*, 2013 the main difficulty with the design of the questionnaire was related to the different characteristics and responsibilities of local partners (National Parks, Interregional Parks, Regional administrative authorities, Regional forest management bodies, etc.), and consequently the different management approaches of each Natura 2000 site (direct, mediated by Regions or by Provinces). Therefore, it was decided to structure the questionnaire in such a way as to have different levels and sectors for the different types of information sought, in order to gather an initial general set of data with the collaboration of management authorities and other local administrative bodies and stakeholders.

The questionnaire was divided into five sections including both closed and open format questions:

1. General information: information identifying pilot site and interviewee;

2. Description of the site: a synthetic description of the site from an ecological, administrative and managerial point of view (connection with Protected Areas, state of maintenance of habitats, fauna and flora, river basin description, state of surface and groundwater, cartographic and GIS data, different authorities involved in managing the site and their interaction also with citizens, land planning instruments for the site, management plans and conservation measures and regulatory frameworks for Natura 2000 sites, local communities' civic uses and rights of common, scientific publications and research on the site);
3. Economic-financial resources: information about the site's economic and financial resources (management authorities' budgets, the sites' annual institutional financing, site management outflows over the last 5 years, administration costs, management and conservation measures, human resources, participation in projects and other measures for improving maintenance of habitat and species;
4. Economic, environmental and social aspects: qualitative information on some environmental, economic and social aspects such as change of land cover and landscape in recent years and the relationship between this change and site creation, the state of conservation of the habitats, present forest and agricultural activities within the site and other economic issues, difficulties and threats to the maintenance of protected habitats due to social-economic activities, stakeholders involved directly and indirectly in managing the site, RDP (Rural Development Programme) measures to promote organic farming and financing of Natura 2000 network, Land Maintenance and Environment Conservation Contracts);
5. Ecosystem Services (ES): information on main ES provided by the site on the basis of management authorities' in-depth knowledge of Natura 2000 sites; stakeholders directly or indirectly involved in the management of these ES; fauna species threatened by habitat fragmentation, fundraising activities, self-financing and PES or PES-like schemes implemented (Wunder, 2005; Pettenella *et al.*, 2012).

3.3 Stakeholder meetings

Along with the questionnaires submitted to site management authorities (Gaglioppa *et al.*, 2013), integrated by way of a cartographic analysis of the study sites' habitat and land uses (Schirpke *et al.*, 2013b), another useful source of information for defining main ES for each study site were meetings with institutional and private stakeholders during the preliminary project phase. Indeed, habitats and land use-based preliminary ES analyses (see Chapter 2.5) identified some differences with respect to the relative qualitative values among ES; while the analysis based on the questionnaires mainly reflected the management authorities' point of view without fully taking into account local institutions and community perceptions and needs.

Meetings with institutional and private stakeholders were organised at each Natura 2000 pilot site and generally involved municipalities, county administrations, park management authorities, farmers, hunters, fishermen, NGOs, volunteers, as well as agronomists, biologists, environmentalists, hotel and restaurant managers, local associations, environmental guides, tour operators, and local residents. During these events project actions and objectives were presented and the main ES and environmental issues were

debated in order to highlight various specific aspects (local peculiarities, the local community's perception of the site, rivalries and oppositions between different stakeholders etc.) and to make informed choices with regard to the main ES to which innovative financing schemes could be targeted (Marino *et al.*, 2014).

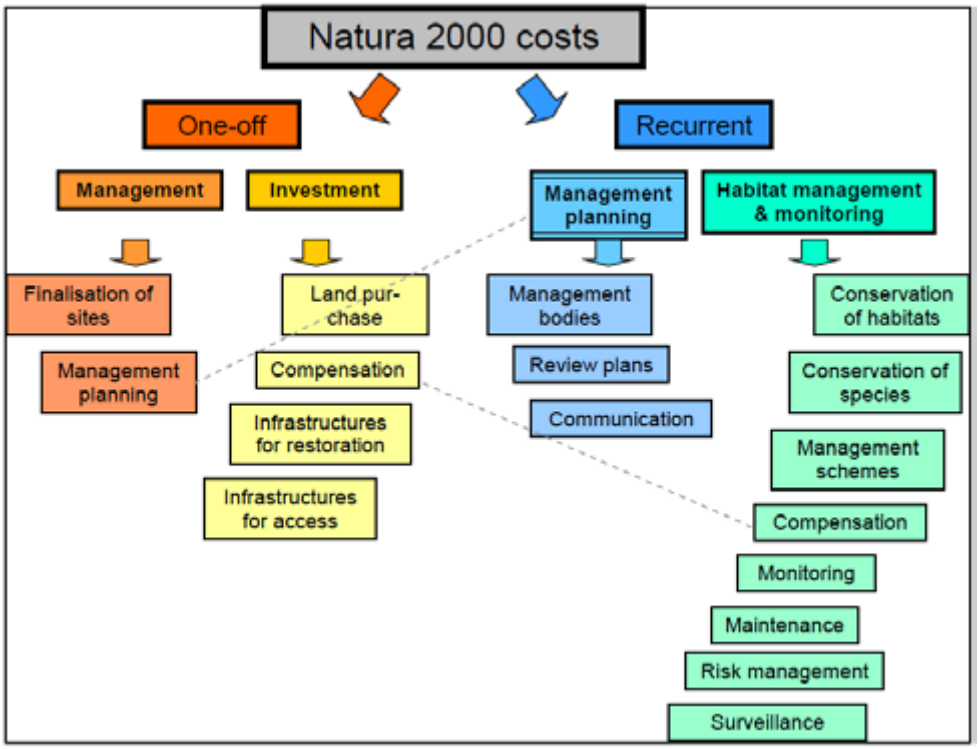
3.4 Management costs analysis

The Management cost analysis for the Bagni di Masino e Pizzo Badile (IT2040019) and Monte della Stella (IT8050025) study sites was based on the EU methodology presented in the report "Costs and Socio-Economic Benefits Associated with the Natura 2000 Network" elaborated by the Institute for European Environmental Policy (IEEP) (Gantioler *et al.*, 2010; Figure 1).

The costs of Natura 2000 can be classified into (Gantioler *et al.*, 2010):

1. One-off management costs:
   - costs for the finalisation of sites, such as costs for scientific studies, administration, consultation, etc.;

Figure 1. Structure of Natura 2000 costs.



Source: Gantioler *et al.*, 2010

- costs for management planning, i.e. one-off costs for preparing management plans, establishing management bodies, consultations, etc.

2. Investment costs:
   - cost of land purchase;
   - one-off payments of compensation for development rights;
   - infrastructure costs for the improvement/restoration of habitat and species;
   - other infrastructure costs contributing to conservation, e.g. for public;
   - access, interpretation works, observatories and kiosks, etc..
3. Costs for management planning (unlike the costs for management plans):
   - running costs of management bodies;
   - costs for review of management plans;
   - costs for public communication.
4. Habitat management and monitoring costs:
   - conservation management measures– maintenance and improvement of habitats' favourable conservation status;
   - conservation management measures– maintenance and improvement of species' favourable conservation status;
   - implementation of management schemes and agreements with owners and managers of land or water for following certain prescriptions;
   - provision of services; compensation for rights foregone and loss of income; developing acceptability 'liaison' with neighbours;
   - monitoring;
   - maintenance of infrastructure for public access, interpretation work, observatories and kiosks, etc.;
   - risk management (fire prevention and control, flooding etc.);
   - surveillance of the sites.

The dotted lines (Figure 1) indicate that two categories are covered both under "one off costs" and "recurrent costs", namely "management planning" and "compensation". Their inclusion under one or the other heading depends on the frequency of the payment (Gantioler *et al.*, 2010).

Financial resources identified in Monte della Stella's Management Plan are related to the Regional Operational Programmes (ROP) and the Rural Development Plans (RDP) Structural Funds 2007-2013 ROP Campania and, in particular, Axis I "Environmental sustainability and attractiveness of culture and tourism", Axis II "Improving the environment and the countryside" and Axis III "Quality of life in rural areas and diversification of the rural economy". Bagni di Masino e Pizzo Badile's Management Plan was prepared within Preparatory Project LIFE03NAT/IT/000139 "Reticnet: 5 SCI for the conservation of wetlands and priority habitat", funded by the European Union.

3.5 Assessment of Ecosystem Services values

The ES assessment included three different services: wild food (provisioning service), erosion regulation (regulating service) and the recreational value (cultural service). This selection of ES was carried out on the basis of the management instrument analysis, the

questionnaire to management authorities, the stakeholder meetings and cartographic data analysis for both study sites.

According to similar studies (Burkhard *et al.*, 2012; Bastian, 2013), ES were first valued qualitatively by assigning an ordinal score of ES provision (3-high, 2-medium, 1-low, 0-not significant) to Natura 2000 habitats and CORINE land cover classes. The scores were obtained by expert knowledge and account for specific ecological functions, potential distance of ES demand[1], and intrinsic biodiversity (further details in Schirpke *et al.*, 2013b). For each study site, an area-weighted mean value was calculated for the selected ES based on the cartography after attributing an ordinal score to each habitat and land cover class. Furthermore, this qualitative ES valuation was integrated by way of additional qualitative or quantitative data, where possible. In the following, we provide a short description of the applied method:

- *Wild food (mushrooms)*: The productivity of mushrooms is particularly variable and depends on local conditions such as climate, vegetation, and soil, as well as disturbance, e.g. harvest activities or timber removal. As no data on collected quantities were available, the annual mean production was estimated at 1.5 - 3 kg mushrooms per ha forest (Croitoru and Gatto, 2001; Goio, 2006). The production area was delimitated by including forest land cover classes and excluding areas above 2000 m a.s.l. and slopes over 80%. The monetary value was estimated based on the mean market value of 22.50 €/kg (De Marchi and Scolozzi, 2012).
- *Erosion regulation*: As forest has a protective role (Scrinzi *et al.*, 2006), the area with an elevated erosion and landslide risk, obtained from the Inventory of Landslide Phenomena in Italy (IFFI) (APAT, 2007), was identified and the percentage of the area without forest in respect to the area covered by forest was calculated to quantify the contribution of the forest to the avoided erosion. In this case the ES valuation did not include an economic valuation.
- *Recreational value:* The qualitative valuation based on the land cover was integrated with information including a list of the possible recreational activities. For the Bagni di Masino e Pizzo Badile (IT2040019) study site, data from two automatic counting stations were available. The tourism development of the intersecting municipalities was measured by the bed capacity obtained from statistical data (ISTAT, 2011). The bed capacity was then used for an economic valuation of the recreational value by calculating the mean accommodation value based on the mean overnight cost and the degree of utilization (Trademark Italia, 2013), as mean overnight costs can be considered as a measure of the recreational economic value and the people spending nights in hotels are usually tourists. Moreover, potential day-trippers were identified and quantified up to 1.5 hours driving from the study areas (Schirpke *et al.*, 2013c), but could not be included in the monetary valuation due to the lack of data, i.e. number and origin of visitors that is necessary to quantify travel costs.

[1] An ES only exists if there is a beneficiary (Boyd and Banzhaf, 2007).

4. Results

4.1 Management approaches

From the management instruments analysis we found that both the Monte della Stella (IT8050025) and Bagni di Masino e Pizzo Badile (IT2040019) sites have a specific Management Plan[2] the main objective of which is to ensure the maintenance of habitats and species of Community interest present on the site area according to the Habitats and Birds Directives (Table 3). However, it is worth noting that these Management Plans differ according to the specific local context.

The Bagni di Masino e Pizzo Badile (IT2040019) Management Plan was adopted in order to define a milestone for the Natura 2000 network implementation in a large and complex area including Valtellina and Valchiavenna. Accordingly, this Plan was defined to connect different elements of the environmental network (such as Pian di Spagna-Lago di Mezzola Natural Reserve and other four mountain SICs) and to define the main guidelines for their integration. Its general objective is to make human activity development more sustainable and to reduce their direct or indirect impact on species and habitats. The Plan also defines primary management provisions to follow outside the site area.

Table 3. Management instrument identified for each study site.

Type	Code	Natura 2000 Site	Management Authority	Management Instrument	General Objective
SIC	IT8050025	Monte della Stella	Campania Region	Management Plan	Ensuring the restoration or maintenance of natural habitats and species of Community interest (Habitats Directive Annex I and Annex II and Birds Directive Annex I) at a favourable conservation status. This general objective includes: ecological sustainability objectives, (habitats and species conservation); socio-economic sustainability objectives aimed at promoting a functional socio-economic development for reaching biodiversity conservation objectives.
SIC	IT2040019	Bagni di Masino e Pizzo Badile	Lombardy Region	Management Plan	Ensuring the restoration or maintenance of natural habitats and species of Community interest and guaranteeing the maintenance and/or restoration of ecological balances through proper management actions.

Source: own elaboration

[2] Piano di Gestione SIC IT 8050025 Monte Stella - DD A.G.C.5 n. 2 del 21/02/2012; Piano di Gestione SIC IT2040019 Bagni di Masino - Pizzo Badile - Pizzo del Ferro.

Since Monte della Stella (IT8050025) is already part of an ecological network along with Cilento, Vallo di Diano e Alburni National Park and other Natura 2000 sites, the main objective of its Management Plan is to ensure ecological connectivity between these areas along with the maintenance of specific habitats and species.

In Bagni di Masino e Pizzo Badile the status of habitats is excellent (97%) and species conservation is mostly good (66%), whereas in Monte della Stella habitat and species conservation is generally good (100% of habitats and 64% of species).

4.2 Management costs

On the basis of EU methodology (Gantioler *et al.*, 2010) we estimated current management costs for both study sites (Bagni di Masino e Pizzo Badile and Monte della Stella). However we could not estimate the costs for all types of activity because many items are not reported in the sites' management plans. For example, for both study sites, the running costs of the management bodies were not available as they do not have their own management bodies, and are rather managed by other authorities.

Data extrapolated from Bagni di Masino e Pizzo Badile and Monte della Stella's Management Plans revealed a total cost estimation of €3,132,000 and €497,000 respectively for a period of around 5 years (average length of a Management Plan). Of this amount more than 90% of the costs are dedicated to habitat management and monitoring costs for both study sites. Since the use of average costs provides more comparable indicators, an average cost per hectare was estimated during the process of total cost assessment (Table 4).

4.3 Results of the assessment of Ecosystem Service values

For the qualitative valuation, an area-weighted mean ES value was calculated for the selected ES for both study sites (Table 5, Figure 2). While for Bagni di Masino e Pizzo Badile (IT2040019) the ES values are generally low due to the presence of large areas without vegetation, Monte della Stella (IT8050025), which is mainly covered by forest, has high ES values. Regarding the single ES, the following results were obtained:

- *Wild food (mushrooms):* Almost 95% (1,126 ha) of the total area of Monte della Stella (IT8050025) can be considered as suitable for mushrooms, producing a total of between 1,689 to 3,379 kg/year. The potential total economic value was estimated between 38,000 and 76,000 Euro/year.
- *Erosion regulation:* A total of 1,021 ha (37%) of the Bagni di Masino e Pizzo Badile (IT2040019) study site has an elevated erosion and landslide risk of which 178 ha (17%) are covered by forest. In addition, alpine grasslands contribute to the stabilization of the soil as indicated in Figure 2a).
- *Recreational value:* The alpine landscape of the Bagni di Masino e Pizzo Badile (IT2040019) study site, with its rich flora and fauna, has an elevated aesthetic value and offers many possibilities for hiking, climbing, and excursions. A campground is located just before the entrance of the SIC,. A hotel with thermal Spa (Hotel Relais Bagni Masino Terme & Spa), is an important point of attraction, and is located on-site at Bagni Masino (1,132 s.l.). Furthermore, two mountain huts offer accommodation

Table 4. Monte della Stella and Bagni di Masino e Pizzo Badile sites' recurrent costs.

	Recurrent costs	Monte della Stella (IT80500025)		€/ha	Bagni di Masino e Pizzo Badile (IT20400019)		€/ha
		€	%		€	%	
Costs for management planning	Running costs of management bodies	0	0		0	0	
	Costs for review of management plans	190,000	6		0	0	
	Costs for public communication.	100,000	3		30,000	6	
	Subtotal	290,000	9	245.76	30,000	6	10,88
Habitat management and monitoring costs	Conservation management measures– maintenance and improvement of habitats favourable conservation status	1,528,000	49		85,000	17	
	Conservation management measures– maintenance and improvement of species favourable conservation status	0	0		30,000	6	
	Implementation of management schemes and agreements with owners and managers of land or water for following certain prescriptions	300,000	10		5,000	1	
	Provision of services; compensation for rights foregone and loss of income; developing acceptability 'liaison' with neighbours	0	0		0	0	
	Monitoring	344,000	11		80,000	16	
	Maintenance of infrastructure for public access, interpretation work, observatories and kiosks etc.	590,000	19		242,000	49	
	Risk management (fire prevention and control, flooding etc.)	80,000	3		25,000	5	
	Surveillance of the sites	0	0		0	0	
	Subtotal	2,842,000	91	2,408.47	467,000	94	169.39
	Total cost	3,132,000	100		497,000	100	

Source: own elaboration based on study sites' Management Plans

during the short summer period and are linked to the Rome Path, the most famous hiking trail in the Alps. Two automatic counting stations installed in the study area indicate between 36 and 435 visitors daily all the year round. The SIC is located within two municipalities with several accommodation facilities available with a capacity of 1,707 beds and an economic value of 61,650 Euro for the year 2013. Up to 1.5 million potential day-trippers reach the study site with 1.5 hours driving or less.

Monte della Stella (IT8050025) has a dense trail network offering nature itineraries and excursions to historic sites. For example, an ancient fort was situated at the summit of Monte Stella, also referred to as 'sacred mountain'. Nowadays, it hosts an old chapel and a radar station. The seven municipalities intersecting the SIC offer various accommodation facilities with a total of 2,143 beds and an economic value amounting to ca. 72,600 Euro for the year 2013. Moreover, the study area has huge potential for day-trippers, given that almost 4 million people live within a 1.5 hour drive from the study area.

Table 5. Area-weighted mean value obtained from qualitative ES valuation (3-high, 2-medium, 1-low, 0-not significant) based on two different maps.

Study area	ES	Qualitative ES value	
		CORINE Land Cover Map	Natura 2000 habitat Map
Bagni di Masino e Pizzo Badile (IT2040019)	Erosion regulation	1.25	1.29
	Recreational value	1.48	1.92
Monte della Stella (IT8050025)	Wild food (mushrooms)	2.82	2.79
	Recreational value	2.91	2.80

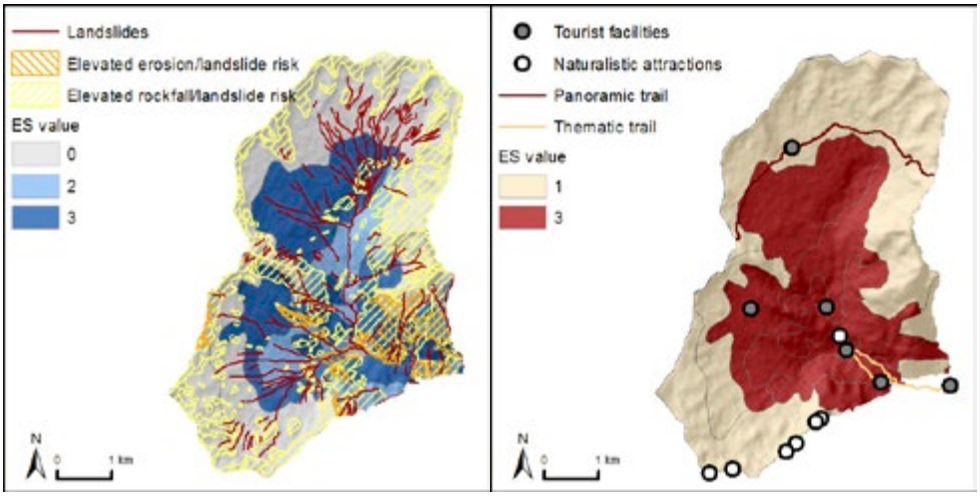
5. Discussion and conclusions

The objective of this paper was to attempt an initial quantification of the value of the ES and management costs for two Italian Natura 2000 sites. Due to the explorative nature of this study it should be noted that the preliminary results discussed here require further development and that some weaknesses were faced during the analysis of the data. Additional socio-economic data is needed to valuing certain ecosystem services and more detailed information about management costs is also required. To date, it has not been possible to estimate the monetary value of erosion regulation services for the Bagni di Masino e Pizzo Badile (IT2040019) site due to the lack of data. For the same reason, we also experienced difficulties in estimating various cost items, such as "One off costs". Accordingly, in the analysis we have only included "Recurrent costs" for those Management Plan measures aimed at ecological and socio-economic sustainability.

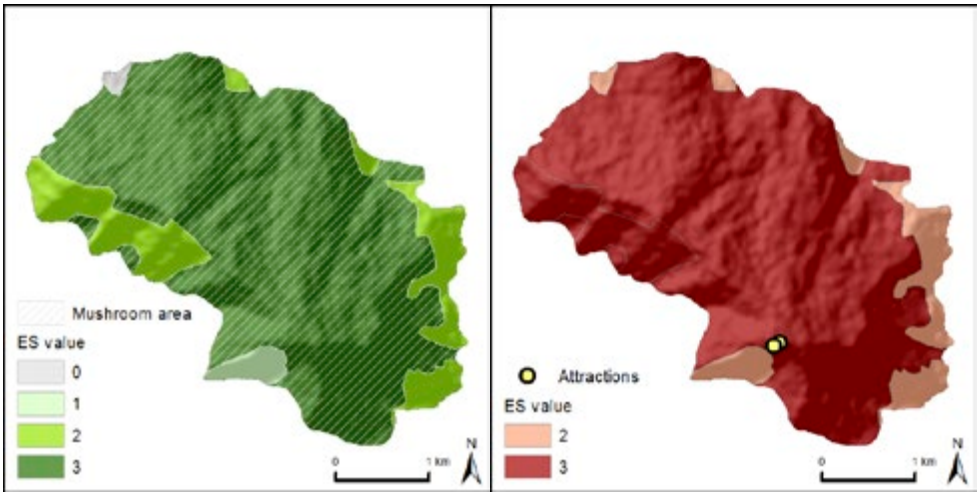
The results show a higher financial investment level for the Monte della Stella (IT2040019) site, likely due to the greater availability of EU funding, in particular through ROP-RDP Campania funds. From our analysis, it was noted that 49% of costs are dedicated to maintaining (or improving) habitat conditions that are, at present, generally in a "good state of conservation". The assessed ES show both high qualitative values, although the economic value is relatively low with respect to management costs. Besides the two ES (Wild food and Recreational value) included in this study there are many other important ones such as water provision, climate regulation, and erosion control. Furthermore, our results indicate that, given the good conditions for recreational activities, the study area has great potential for day-trippers.

With regard to the Bagni di Masino Pizzo Badile (IT2040019) site, the share of costs related to habitat conservation is around 17% and 98% of habitats are in an excel-

Figure 2. ES value (3-high, 2-medium, 1-low, 0-not significant) based on spatial land cover information for a) erosion regulation and b) recreational value of Bagni di Masino e Pizzo Badile (IT2040019), c) wild food and d) recreational value of Monte della Stella (IT8050025). Where available, further qualitative information was included as indicated on the map legends.



a) Erosion regulation (IT2040019) b) Recreational value (IT2040019)



c) Wild food (IT8050025) d) Recreational value (IT8050025)

lent state of conservation. In this case, costs for maintaining facilities for tourists (49%) are high, which is in keeping with the identification of "Recreational value" as one of the most important ES for the site area, and confirmed by the qualitative and quantitative ES assessment. Due to limited data availability, its economic valuation indicates only a small part of the total value and should be integrated with expenses for transportation, food, recreational equipment, etc. Moreover, for this area, the number of potential day-trippers

greatly exceeds the accommodation opportunities available in the area and should be considered as an important potential financial resource.

An initial comparison between annual economic benefits related to the three (2 for Monte della Stella and 1 for Bagni di Masino) ES assessed (see par. 3.3) and annual management costs (Table 4) shows an average benefit-cost ratio of around 50%. However, due to the current limited data availability, in this paper we have only considered a small number of ES, without taking into account the monetary value of erosion regulation services that could increase the benefit-cost ratio, and have limited the analysis to its qualitative (non-monetary) importance for Bagni di Masino. Hence, we suppose that when all ES are evaluated, the benefit-cost ratio of overall benefits will likely exceed costs, as was the case in previous assessments (Gantioler *et al.*, 2010; ten Brink, 2011).

The results of this paper show that information about management costs is often incomplete. However, we argue that the quantification of costs relating to the Natura 2000 networks is crucial for a systematic approach to environmental accountability that measures and evaluates the management effectiveness of Natura 2000 sites whilst redefining sites' conservation strategies.

In a context of stagnant and uncertain funding for biodiversity conservation, the need to define governance and management tools, such as PES or PES-like schemes, should offer a considerable potential to raise new funds for biodiversity or to use existing funding more efficiently. It is also necessary, however, to pay attention to their design, and to ensure both their fit within specific socio-economic contexts and their capacity to modify rule-making structures. These two aspects are fundamental when seeking both effectiveness and social acceptability (Muradian and Rival, 2012). Governance of ecosystem services is characteristically multi-layered and entails a complex structure involving a multiplicity of actors and many interrelations between the 'local' and the 'global'. Solving such problems normally requires moving from thinking in terms of single, ideal managerial approaches (e.g. command-and-control, markets or community-based management) to combining governance structures, scales and tools (Muradian and Rival, 2012).

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References

Ackerman, B.A. and Stewart, R.B. (1985). Reforming Environmental Law. *Stanford Law Review* 37: 1333-1365.

APAT (2007) Rapporto sulle frane in Italia. Il Progetto IFFI – Metodologia, risultati e rapporti regionali.

Bastian, O. (2013). The role of biodiversity in supporting ecosystem services in Natura 2000 sites. *Ecological Indicators* 24: 12-22.

Balvanera, P., Pfisterer, A. B., Buchmann, N., He, J.-S., Nakashizuka, T., Raffaelli, D. and Schmid, B. (2006). Quantifying the evidence for biodiversity effects on ecosystem functioning and services. *Ecology Letters* 9: 1146-1156.

Boyd, J., Banzhaf, S., 2007. What are ecosystem services? The need for standardized environmental accounting units. *Ecol. Econ.* 63: 616-626.

Burkhard, B., Kroll, F., Nedkov, S., Müller, F. (2012). Mapping ecosystem service supply, demand and budgets. *Ecological Indicators* 21: 17-29.

Byrnes, J.E.K., Gamfeldt, L., Isbell, F., Lefcheck, J.S., Griffin, J.N., Hector, A., Cardinale, B. J., Hooper, D.U., Dee, L.E., Emmett Duffy, J. (2014). Investigating the relationship between biodiversity and ecosystem multifunctionality: challenges and solutions. *Methods in Ecology and Evolution* 5: 111-124.

Cardinale, B.J., Srivastava, D.S., Duffy, J.E., Wright, J.P., Dowing, A.L., Sankaran, M., Jouseau, C. (2006). Effects of biodiversity on the functioning of trophic groups and ecosystems. *Nature* 443, 989-992.

Cimon-Morin, J., Darveau M., and Poulin M. (2013). Fostering synergies between ecosystem services and biodiversity in conservation planning: A review. *Biological Conservation* 166: 144-154.

Costanza, R., d'Arge, R., de Groot, R.S., Farber, S., Grasso, M., Hannon, B., Limburg, K., Naeem, S., O'Neill, R.V., Paruelo, J., Raskin, R.G., Sutton, P., van den Belt, M. (1997). The value of the world's ecosystem services and natural capital. *Nature* 387(6630): 253-260.

Croitoru, L., Gatto, P. (2001). Una stima del valore economico totale del bosco in aree mediterranee. *Monti e Boschi* 52(5): 22-30.

De Marchi, M., Scolozzi, R. (2012). La valutazione economica dei servizi ecosistemici e del paesaggio nel Parco Naturale Adamello Brenta. *Valutazione Ambientale* 22: 54–62.

Díaz, S., Fargione, J., Chapin III, F.S., Tilman, D. (2006). Biodiversity loss threatens human well-being. PLOS Biol. 4 (8), e277. http://dx.doi.org/10.1371/journal. pbio.0040277. Accessed 30 October 2013.

European Commission (2013). The economic benefits of the Natura 2000 network. Synthesis report. Final Luxembourg: Publications Office of the European Union, ISBN 978-92-79-27588-3.

European Commission. (2011). Natura 2000 Barometer. http://ec.europa.eu/environment/nature/natura2000/barometer/index en.htm. Accessed 01 July 2011.

Freeman, J. (1997). Collaborative governance in the Administrative State. *UCLA Law Review* 1: 14-19.

Gaglioppa P., Guadagno R., Marino D., Marucci A., Palmieri M., Pellegrino D. (2013). Analisi della gestione e dei finanziamenti riguardo ai servizi ecosistemici. Report del progetto MakingGood Natura (LIFE+11 ENV/IT/000168), CURSA, Roma, pp. 253.

Gantioler S., ten Brink P., Rayment M., Bassi S., Kettunen M., McConville A. (2010). Financing Natura 2000 – Financing needs and socio-economic benefits resulting from investment in the network. Background Paper for the Conference on 'Financing Natura 2000, 15-16 July 2010. DG Environment Contract ENV.B.2/SER/2008/0038. Institute for European Environmental Policy / GHK / Ecologic, Brussels.

García-Mora, M.R., Montes, C. (2011). AN+20. El desafío de la gestión de los espacios naturales de Andalucía en el siglo XXI, Consejería de Medio Ambiente, Junta de Andalucía, España.

Getzner, M., Jungmeier, M. (2002). Conservation policy and the regional economy: the regional economic impact of Natura 2000 conservation sites in Austria. *Journal of Nature Conservation* 10: 25-34.

Goio, I. (2006). La funzione produttiva delle foreste: confronto tra contabilità standard e verde. *Estimo e Territorio* 11: 16-23.

Halahan, R. (2002). Socio-Economic Benefits of Natura 2000 in the UK. WWF UK.

Harrison, P.A., Berry, P.M., Simpson, G., Haslett, J.R., Blicharska, M., Bucurd, M., Dunford, R., Egoh, B. Garcia-Llorente, M., Geamănă, N., Geertsema, W., Lommelen, E., Meiresonne, L., Turkelboom, F. (2014). Linkages between biodiversity attributes and ecosystem services: A systematic review. *Ecosystem Services* 9 (September 2014): 191-203. http://www.wwf.org.uk/filelibrary/pdf/N2Kuk.pdf. Accessed 30 October 2013.

Hoyos D., Petr Mariel P., Pascual U. Etxano I. (2012). Valuing a Natura 2000 network site to inform land use options using a discrete choice experiment: An illustration from the Basque Country. *Journal of Forest Economics* 18: 329-344.

ISTAT (2011). Rilevazione sulla capacità degli esercizi ricettivi - Anno 2011. Roma

Kettunen, M., Baldock, D., Gantioler, S., Carter, O., Torkler, P., Arroyo Schnell, A., Baumueller, A., Gerritsen, E., Rayment, M., Daly, E., Pieterse, M. (2011). Assessment of the Natura 2000 co-financing arrangements of the EU financing instrument. A Project for the European Commission – Final Report, Institute for European Environmental Policy (IEEP). Brussels.

Kettunen, M., Torkler, P. and Rayment, M. (2014). Financing Natura 2000 in 2014-2020: Guidance Handbook. European Commission DG Environment. Brussels.

Kruk R.W., De Blust G., Van Apeldoorn R.C., Bouwma I.M. and Sier A.R.J. (2010). Information and communication on the designation and management of Natura2000 sites. Summary Main Report 1: The designation in 27 EU Member States. Alterra-rapport 2043(1). Wageningen.

Loreau M., Naeem S., Inchausti P., eds. (2002). Biodiversity and ecosystem functioning: synthesis and perspectives, Oxford Univ. Press.

Marino D., Schirpke U., Gaglioppa P., Guadagno R., Marucci A., Palmieri M., Pellegrino D., De Marco C., Scolozzi R. (2014). Assessment and governance of ecosystem services: first insights from life+ making good natura project. *Annali di Botanica* 4: 83-90.

Millennium Ecosystem Assessment (MEA) (2005), Ecosystems and Human Well-Being: Biodiversity Synthesis, World Resource Institute, Washington, DC.

Ministry of Environment - Decree Guidelines for Natura 2000 management (Decree September 3rd 2002).

Muradian R., Rival L. (2012). Between markets and hierarchies: The challenge of governing ecosystem services. *Ecosystem Services* 1(1): 93-100.

OECD (2004). The Recommendation of the Council on the Use of Economic Instruments in Promoting the Conservation and Sustainable Use of Biodiversity, C(2004)81, Paris.

OECD. (2008). Report on Implementation of the 2004 Council Recommendation on the Use of Economic Instruments in Promoting the Conservation and Sustainable Use of Biodiversity. ENV/EPOC/GSP/BIO(2008)1/FINAL. OECD. Paris.

Pettenella D, Vidale E, Gatto P, Secco L. (2012). Paying for water-related forest services: a survey on Italian payment mechanisms. iForest 5: 210-215. http://www.sisef.it/iforest/contents?id=ifor0626-005. Accessed 21 November 2012.

Rojas-Briales E. (2000). Socio-economics of nature protection policies in the perspective of the implementation of Natura 2000 network: the Spanish case. *Forestry* 72(2): 199-207.

Schirpke, U., Scolozzi, R., De Marco, C. (2013a). Analisi dei servizi ecosistemici nei siti pilota. Parte 1: Analisi della letteratura. Report del progetto Making Good Natura (LIFE+ 11 ENV/IT/000168), EURAC research, Bolzano, p. 54.

Schirpke, U., Scolozzi, R., De Marco, C. (2013b). Analisi dei servizi ecosistemici nei siti pilota. Parte 4: Selezione dei servizi ecosistemici. Report del progetto Making Good Natura (LIFE+11 ENV/IT/000168), EURAC research, Bolzano, p. 43.

Schirpke, U., Scolozzi, R., De Marco, C. (2013c). Analisi dei servizi ecosistemici nei siti pilota. Parte 3: Identificazione dei potenziali beneficiari. Report del progetto Making Good Natura (LIFE+11 ENV/IT/000168), EURAC research, Bolzano, p. 44.

Schulze, E. D., Mooney, H. A., eds. (1993), Biodiversity and Ecosystem Function. Springer, New York.

Scrinzi, G., Gregori, E., Giannetti, F., Galvagni, D., Zorn, G., Colle, G., Andrenelli, M. (2006). Un modello di valutazione della funzionalità protettiva del bosco per la pianificazione forestale: la componente stabilità dei versanti rispetto ai fenomeni franosi superficiali. *Forest@* 3: 98-155.

TEEB (2008) An Interim Report. European Communities. Available online: http://www.teebweb.org/publication/the-economics-of-ecosystems-and-biodiversity-an-interim-report/. Accessed: 16-01-2014.

TEEB (2011). The Economics of Ecosystems and Biodiversity in National and International Policy Making. Earthscan, London and Washington.

ten Brink P., Monkhouse C., Richartz S. (2002). Promoting the Socio-Economic Benefits of Natura 2000. Institute for European Environmental Policy. Brussels.

ten Brink P., Badura T., Bassi S., Daly, E., Dickie, I., Ding H., Gantioler S., Gerdes, H., Hart, K., Kettunen M., Lago, M., Lang, S., Markandya A., Mazza, L., Nunes P.A.L.D., Pieterse, M., Rayment M., Tinch R. (2011) Estimating the Overall Economic Value of the Benefits provided by the Natura 2000 Network. Final Synthesis Report to the European Commission, DG Environment on Contract ENV.B.2/SER/2008/0038. Institute for European Environmental Policy/GHK/Ecologic. Brussels.

Trademark Italia (2013). Il trend alberghiero 2013. http://www.trademarkitalia.com. Accessed 13 May 2014.

Wunder S (2005). Payments for environmental services: some nuts and bolts. CIFOR Occasional Paper No. 42. http://www.cifor.cgiar.org/publications/pdf_files/OccPapers/OP-42.pdf. Accessed 30 October 2013.