

The Economic Value of Protected Areas in Romania

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Abstract. *Natural ecosystems are extremely vulnerable to the ever-increasing changes in population growth and the increased need for resources. The economic capitalization of their constituent elements makes their degradation and conversion more profitable than conserving them. However, mankind is aware of the importance of nature, and over time has developed its policy and tools of protection and conservation to help it integrate its actions so that they respect the paradigm of sustainable development. Most functions of the ecosystem are also economic functions. Determining the economic value of an ecosystem is a laborious approach involving specific instruments that depend on many variables. These variables are induced by the innate/ natural transformations of the biogeographical environment or by particular situations generated by extreme phenomena. The presented study addresses the economic value of natural areas (with the example of Bucegi Natural Park –B.N.P.) in a methodological context focused on international studies, with results in certain protected areas in Romania. The established report has made possible to establish an economic value obtained not only from the revenues generated from the costs for visitors and jobs but also through the capitalization of the non-commercial benefits. The pressures and threats identified in protected areas have been an important element in our investigation. Natural activities (geological and geomorphological events, climate changes) and anthropogenic events (e.g. development of residential and commercial space, transport corridors and services, tourism activities) with all associated negative elements (pollution, hunting and overfishing, degradation) but it also involves costs. Dedicated by ever-changing legislation, inadequate financial support, and a faulty management approach, they tend to balance the balance against the benefits. The economic valorization of the components defining a protected natural area clearly represents an advantage for all involved in this process. This must be done within the limits of the legal framework in force but in the spirit of protection and respect for nature in all its forms.*

Keywords: *ecosystem; protected natural areas; economic value; Bucegi Natural Park.*

Introduction

Contemporary society is in a continuous and rapid transformation. The processes involved are resource-intensive. Natural capital provides the resources and services underpinning these socio-economic development processes. Under these circumstances, the products and support capacity of natural capital can be overcome, generating discrepancies and differences both spatially and temporally, but with a reflection on the well-being of people. Natural and semi-natural ecosystems are the main components of natural capital. Protected areas are exposed to ecosystems, being the guarantor of their assessment, protection and monitoring. Worldwide there is a tendency for irreversible degradation of natural capital

through intensive exploitation of natural ecological systems that negatively affect biodiversity. Thus, the development of biodiversity conservation strategies has become a priority. At the EU level, environmental policies on biodiversity have been transposed into the *EU 2020 Biodiversity Strategy*, which, starting in 2011, aims to halt its loss and ecosystem services. The two concerned elements must be *properly protected, harnessed and restored, given the intrinsic value of biodiversity and the essential contribution of ecosystem services to human well-being and economic prosperity* (Vision for 2050, WFP 7-A *Good Life within our Planet's limits*).

In the current socio-economic context, the way to approach protected natural areas should not be limited to *protecting - preserving*, but a pragmatic, integrated vision that overrides the traditional concept, meaning *we protect for our benefit* (Frînculeasa & Chițescu, 2018). The process of economic assessment of ecosystems has emerged as a natural consequence, and the influence of ecosystem-generated services on human well-being demonstrates the usefulness of identifying and capitalizing on them. A Millennium Ecosystem Assessment (MEA, 2005) report states that society depends on ecosystem services, but it behaves as if it was independent, as over 60% of these services are either diminished or unsustainable.

The perspectives offered by the socio-economic approach of the natural elements that make up various ecosystems lead to the multiple definitions of the *ecosystem services* concept. There are connections between the permanent change of the market and its positive and negative incentives in relation to services provided by the ecosystem (Carpenter et al., 2006), but most of them have as a core point the interdependence between services, subject, and benefits. Among these, we mention:

- *Ecosystem services are flows of materials, energy, and information from natural capital stocks that combine with manufactured and human capital services to produce human welfare* (Constanta et al., 1997, p.254).
- *Ecosystem services are components of nature, directly enjoyed, consumed, or used to yield human well-being* (Boyd & Banzhaf, 2006, p.8)
- *The ecosystem services are the benefits people get from interacting with nature* (MEA, 2000; Huntsinger & Oviedo, 2014).

The benefits of identifying and sustainable exploitation of natural resources through ecosystem services for the community underline the social valence of these services. To be evaluated, they must be relevant to different social actors. It is the social actors who recognize or not the existence of a certain type of service, and they also give value to this service. These vary in time and space depending on the way of recognition and the importance each community assigns to it. We take into account regional, national or scientific communities. Economically, the ecosystem services represent all the benefits and benefits that arise from the existence of a natural area.

In order to maintain these benefits, a number of costs are involved: management costs (equipment, infrastructure, human resources, etc.), opportunity costs-the value of the uses to be dropped due to its protection and indirect costs (the impact of tourism, mineral exploitation).

Protected natural areas ensure evolution and enable the adaptation of natural systems by preserving environmental conditions to certain parameters supported by legal regulations and financial interventions. Thus, depending on the complexity of the systems, the quantity/quality of services provided and beneficiaries have a different impact at a local, regional or national economic level.

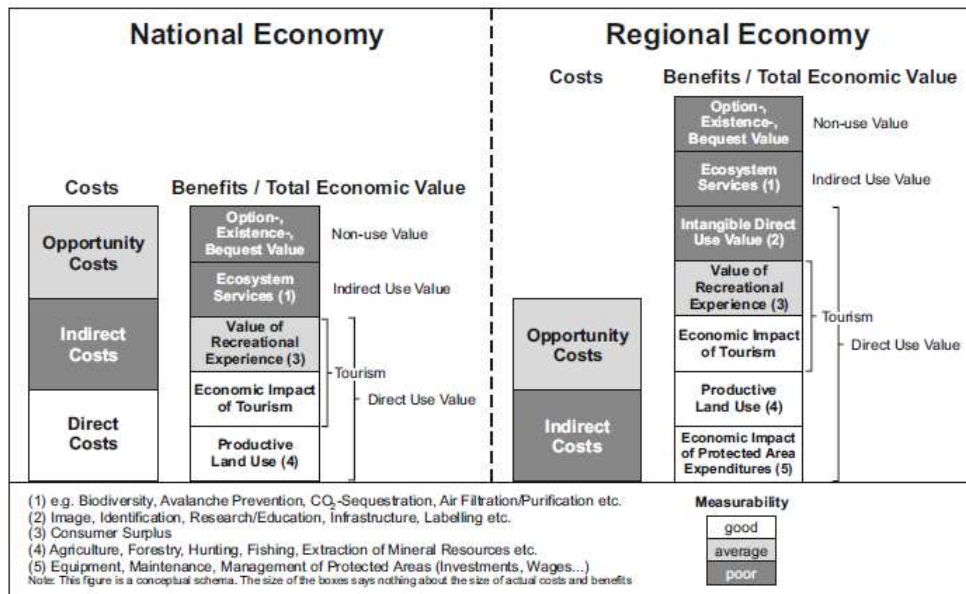


Figure 1. Costs and benefits of protected areas on the national and regional economic level (Mayer & Job, 2014, p.76)

The importance of ecosystem services is found in their capacity to generate significant values in the local economy but have a substantial multiplier effect in the national economy, too. Many ecosystem services are unaware, so the attribution of economic effects is lacking. On another level, at the level of the protected areas, they reflect the insufficiency of public investments and sustainable management that would increase the added value in the economy.

"The Common International Classification of Ecosystem Services" (CICES) proposes the following typology for ecosystem services (<http://cices.eu>):

1. *Supply services* are based on tangible products supplied by the ecosystem.
2. *Regulatory/Regulatory Services* refer to the natural processes of regulating an ecosystem, such as carbon sequestration and water redistribution, wind protection, stabilization of landslides. They contribute to people's safety.
3. *Cultural services* are the non-material benefits of ecosystem exploitation, meaning activities specific to tourism, creative and educational activities that emphasize the aesthetic, cultural and spiritual value of the landscape.
4. *Support services* needed to achieve all other benefits-generating ecosystem services. Their impact on social actors is indirect.

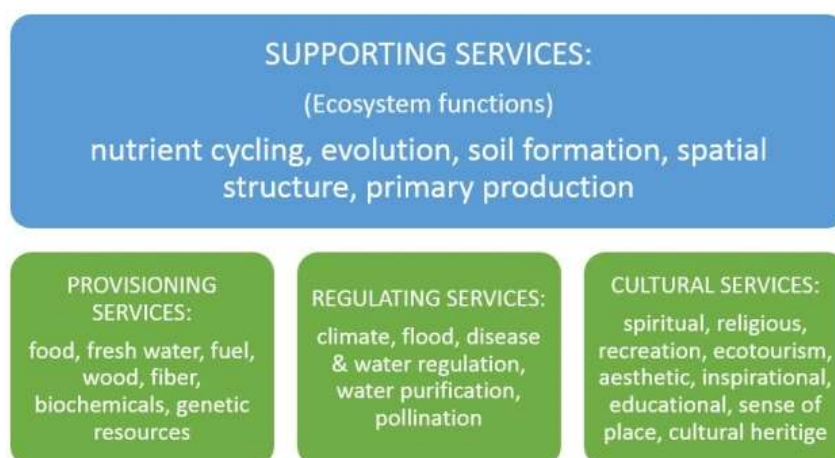


Figure 2. Classification of Ecosystem Services Cf. 2005 (CEEweb for Biodiversity)

This typology emphasizes the numerous connections established between ecosystem services for its optimal operation and highlights the importance of biodiversity. Under the relatively stable conditions of a protected site, the use of environmental services can generate imbalances when the balance between the types of systems providing assistance, regulation and cultural services on the one hand and those providing production services has induced fluctuations generally, external factors. Among the determining factors, we identify-population growth, technology development, increased economic activity, socio-political factors, religion, and culture.

Research methodology

Research area

Romania has a long experience in the protection of the environment. According to the Romanian legislation, the protected natural area is *"the terrestrial or aquatic area with a legal perimeter established and having a special regime for protection and preservation"* (E.O. 57/2007). Currently, the natural areas occupy about 23% of the country's territory and are grouped into several categories according to the priority conservation objectives and the manner in which they are managed. There were 28 major natural protected areas in terms of surface area, namely 13 National Parks and 15 Natural Parks, and Natura 2000 sites-protected natural areas of European interest (ANAP, 2018).

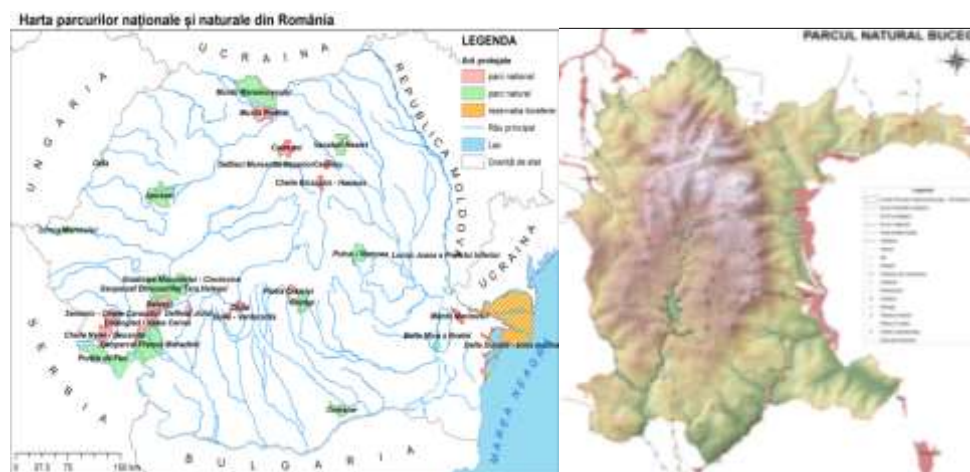


Figure 3.a. Map of national and natural parks in Romania; **b.** Map of B.N.P.
(a. Tîrlă, 2014, b. <http://www.bucegipark.ro>)

B.N.P. is located in the eastern part of the Southern Carpathians and covers an area of 32662 ha. The park is part of Romania's protected area network, being established by Law 5/2000. Within its perimeter, the Natura 2000 site (ROSCI0013) was declared by O.M 1964/2007, and 14 Natural Reserves are included (35% of the protected area). Due to the diversity of the morphological forms, the result of the geological processes and the phenomena induced by the external modeling agents, 46 monuments of nature were defined, especially the shapes of the karst relief, specific erosion differentiated, hydrological and morpho-hydrographic elements.

Research methodology

The economic assessment of biodiversity and ecosystem services is a challenge because the analyzed system is characterized by a multitude of factors that vary over time, and the results of interdependencies between humans and nature are partly captured, interfering with personal filtering in the appreciation of the benefits. The intrinsic value of biodiversity and ecosystem services is difficult to assess, and obvious local or regional particularities, so that a unitary methodology allowing the integration of all physical parameters into a value equation with comparable regional results is not yet used (Maes et al., 2014) inducing *"inconsistency in the methods used to quantify ecosystem services with consequences on the robust assessment of ecosystem services and their inclusion in national statistical systems and in decision-making process."* (Crossman et al. 2013, p.8)

The topicality of the theme has led to the elaboration of many studies regarding the evaluation of ecosystem services. These can be found either as reports of local or regional/European institutional bodies (e.g. MAES - An analytical framework for ecosystem assessments under Action5 of the EU Biodiversity Strategy to 2020-E.C. 2013; EUNIS habitat classification-a guide for users-Moss, 2008, European ecosystem assessment-concept, data and implementation, EEA Technical Report 6/2015, MA-Millennium Ecosystem Assessment, 2005. Ecosystems and human well-being: synthesis report. Washington; WAVES- The richness of accounting and the means of valuation of the World Bank's Environmental Services, 2015; Assessment of ecosystems and ecosystem services in Romania. Methodological guidelines for rapid assessment of ecosystem services in protected areas in Romania – Adamescu et al., 2016), either as articles of specialty.

The ecosystem assessment (ES) methodology has the greatest impact on the environment (Liu et al., 2010). The evaluation involves three stages:

1. Identification and analysis of ecosystem services based on the "*Cascade Model*" proposed by Potschin and Haines-Young (2011) that integrates social actors' perceptions about the ability of ecosystems to deliver various goods and services.
2. The hierarchy of the importance of ecosystem services has been achieved through its sociological method in order to establish a hierarchy of these services at the local and regional level.
3. Monetary evaluation of these services.

Value is what man associates with goods or services in a socio-economic characteristic context of a well-defined time period. In this context, the values represent potential benefits (after the Protected Areas Benefit Evaluator-PA-BAT, Dudley, 2008). Monetary value was the main dimension in establishing the value of ecosystem services (Costanza et al., 1997; Heal et al., 2005; TEEB, 2010), but the multidimensionality of the assessment cannot be limited to this value (Gomez-Baggethun & Perez, 2015). To introduce these values into the economic system, numerous evaluation methodologies and tools have been developed to quantify the services, benefits, and costs generated by them (Grigorescu et al., 2019). These tools allow the use of integrated indicators to express the direct link between economic activities and the environment in the context of the principles of sustainable development. The evaluation represents "*the act of assessing, appraising or measuring value, as value attribution, or as framing valuation (how and what to value, who values)*" (Dendoncker et al., 2013, p.7). The valuation methodologies have taken into consideration several types of values such as ecological, socio-cultural and monetary values (Gómez-Baggethun & Martín-López, 2015), intrinsic values (non-anthropocentric values), instrumental values and relational values.

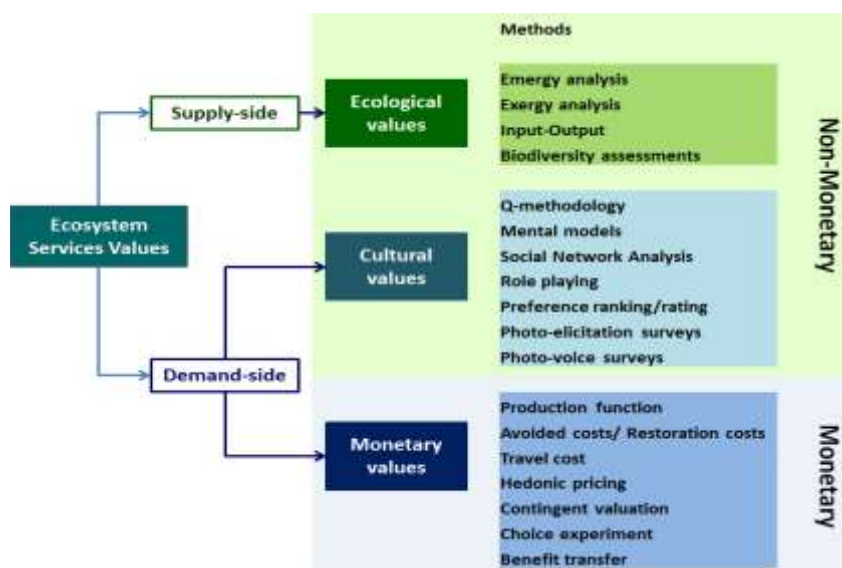


Figure 4. Non-monetary and monetary valuation methods and the value-pluralism (Gómez-Baggethun & Martín-López 2015, p.14)

Frequently, the calculation of the total value of ecosystem services in a protected area contains two major components: the value of use and non-use value (IUCN, 2004; Ceroni, 2007). These are:

1. Values of use

- *Directly usable values* are directly accessible and can be consumed (e.g. goods used or processed directly, such as hay, wood, medicinal plants, forest fruits) and non-consumption (e.g. recreational, cultural values).
- *Indirectly useable values* represented by the role and natural function of the ecosystem (e.g. regulation of watercourses, soil protection, atmospheric carbon dioxide fixing). They are in the category of regulation and control services. They are essential to society.
- *Optional and quasi-optional values* are attributed by a user, from a perspective of neutrality or aversion to the elements deriving from the ability of protected areas to preserve (by conservation) or generate, in the future, satisfaction regarding an ecosystem service.

2. Non-use values

- *Existential values*-with the role of life support
- *Intrinsic values*-refer to the mere existence of values that create satisfaction and whose preservation can be considered necessary for ethical or moral reasons.

Table 1. Values categories and valuation methods used
(regarding the data of Barbier et al., 2009)

Values	Methods of determining the value	
Value of use	-direct	1. Cost of travel 2. Virtual markets 3. Hedonic prices 4. Conditioned evaluation
	-indirect	1. Ecosystems' productivity modification 2. Avoided costs 3. Cost of travel 4. Cost of replacement 5. Conditioned evaluation
	-optional	1. Conditioned evaluation 2. Comparative evaluation 3. Individual selection methods
Value of non-use	-existential	1. Conditioned evaluation
	-intrinsic	1. Conditioned evaluation

(authors representation)

Results and discussions

The assessment of ecosystems defining a protected natural area is a laborious process (meetings with the involved social actors, debates) and involves economic and mathematical modeling for each ecosystem. This involves the statistical and economic analysis of environmental indicators. To obtain these, the National Accounts System (INSS database) was used where several modules were included regarding atmospheric emissions, environmental taxes and material flows (2011), physical energy flow, environmental goods and services, and environmental protection expenditure (2013). The data can only be converted into quantifiable information at the national level, but for many local studies (partly the area under consideration), quantitative research is limited due to the lack of updated, thus relevant, socio-economic data from the temporal series of the institution's statistics. In Romania, the total/partial value of ecosystem services was calculated for several protected areas: Maramureş Mountains Natural Park (Ceroni, 2007 with a value/year of 152.756RON/ 298.008RON depending on CO₂ sequestration-lower/upper bound; Popa et al., 2016), Cozia National Park, Domogled National Park, Piatra Craiului National Park, Iron Gates National Park (Dumitraş et al., 2011; Dumitraş & Dragoi, 2007), Piatra Craiului Mountains (Popa et al., 2013).

In B.N.P. the forests occupy approximately 60% of the total area of the protected area. The main types of ecosystems identified fit into the category of mountainous, subalpine and alpine. These are (according to the M.P. of the B.N.P., 2018, p.36): a) forest ecosystems mainly represented by beech forests, mixed forests: beech, fir and spruce; fir and spruce woods; spruce forests; on a small area, Silvestre pine forests and larch

forests; ribbon corridors of white anin and black anin; b) mountain pasture ecosystems, used as meadows or pastures; c) Subalpine grassland ecosystems, some of which are used as pastures; d) Subalpine ecosystems formed mainly by associations characterized by the dominance of juniper, smolder, juniper, cranberry or cranberry; e) ecosystems of rocks and grooves; f) aquatic ecosystems-rivers, streams, ponds.

Taking into account these considerations, the study stopped to present the evaluation of the services provided by the forest ecosystem. It fulfills an important socio-economic role for local communities. 11078.1ha (52% of total forest area) is certified wood (as it was initiated in 1993 by the Forest Stewardship Council-FSC). This certification of forest management ensures better conservation and capitalization which translates into improving the way forest works are done, reducing illegal cuts and marketing to Western European markets.

Following the methodology, the main services/functions offered by the forest ecosystem have been identified: Carbon sequestration, Erosion control, Habitat establishment and provision of seclusion areas, ensuring timber and non-timber resources, facilitating hunting activities, securing water reserves, preserving artistic cultural values, Recreation. Their hierarchy, as well as their monetary value, has not been calculated, and they are subject to further study.

Carbon sequestration is the amount of carbon found in the wood mass where it has been accumulated through increases and is not subsequently reintroduced into the carbon circuit. Carbon sequestered wood is the result of the difference between the current increase and the harvested opportunity. Romania has not yet regulated the carbon sales mechanism, so carbon storage as a service for forest ecosystems is not yet well defined. The calculation formula for the carbon content within the estimated wood volume represents 50% of the total as follows:

$$V_c = C_c - P_a, CO_2 = 50\%V_c$$

Where V_c – the cumulated wood volume, C_c – the current increase, P_a – the annual opportunity

The total forest fund in B.N.P. is 27,280.95ha-privately managed and managed by the state (the M.P. of the B.N.P., 2018, Annex 18a). Since the forest fund is shared among several owners, centralized information on current increases for each area is not available. Thus, the average national average increase of 5.6m³/year/ha was adopted, and the harvested option is the average national estimate of 2.67m³/year/ha.

Ensuring water resource. This service represents an accumulation of sub-services such as:

a. *Drinking water reserve.* Several karst hydro structures are highlighted, but their hydrodynamic complexity is a problem in operation. There are several water abstractions that provide the needs of neighboring localities (e.g. the Rătei Source). Mineral water is also exploited inside the park, but users capture sources by the natural spill, thus taking only the surplus water released by the deposit. The value is calculated in terms of the amount captured per unit of time.

b. *Water needs for irrigation.* As a mountain area where two main river basins are found, this value is not calculated

c. *Hydropower generation.* Within the B.N.P. there are CHE Scropoasa, CHE Dobrești, and CHE Gâlna-Moroieni

d. *Water needs for industry.* The need for water for the industry is provided by supplementing the natural contribution of the Ialomita River, by the three accumulation lakes: Bolboci, Scropoasa and Dobrești.

e. *Water needs for fisheries (trout).* The natural park has more fishing funds. Fishing Fund Ialomița, Brătei, Bolboci, Scropoasa. There were also some private trout capturing water from the Natural Park (some inside the natural area, others in the surrounding areas)

f. *Recreational role.* The waters with the recreational role are the lakes (Scropoasa, Bolboci) and the waterfalls. They are well-valued by tourist facilities.

The value of this service is calculated by summing the values obtained for each subsystem, the dominant one being the result of water capture for communities and energy generation.

Providing timber and non-timber resources. In the category of non-timber resources, forest fruits and mushrooms are taken into account. These are harvested and valued in compliance with the legislation in force. Wood products are not harvested for commercial purposes.

Set up habitats and ensure quiet areas. The diversity of habitats, 24 in number, is ensured by the protection of biological diversity by strictly integrated forests or those that maintain the conditions for the development of a variety of flora and fauna species with relict species and endemic.

Facilitate hunting activities. The forest ecosystem, in its complexity, allows the development of a hunting fund on an area of 27317ha. They are hunted within the quota limits set by hunting fund law. They can hunt deer, boars, and birds. The economic value is calculated by summing the national harvesting prices and recreational costs.

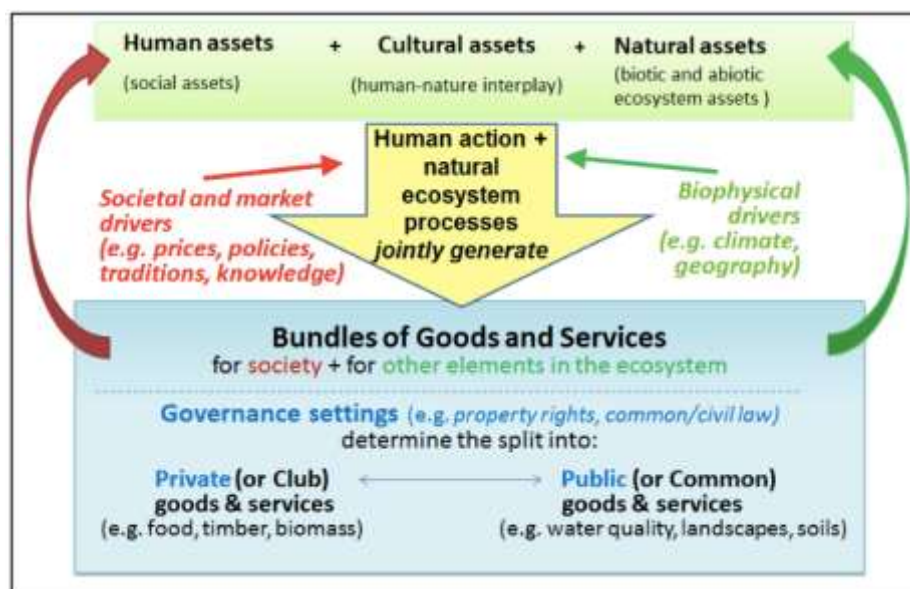


Figure 5. Ways of efficient management and exploitation of the forest ecosystem
The Ecological System (PEGASUS, 2015)

In accordance with the Romanian legislation, the main beneficiaries of forestry services are (Drăgoi & Cirmu, 2016, p.98):

- The National Forestry Board whose funds can be made up of the *"equivalent value of forest ecosystem services provided by maintaining forest protection functions, which are borne by the direct or indirect beneficiaries of forest ecosystem services, which are transferred to the fund for the improvement of the fund land-based forestry"*(Forest code Art.11, lit.e);
- Private owners *"imposing restrictions ... through forest landscaping, regulation of national parks, natural reserves, biosphere reserves, and Natura 2000 sites or other rules, including those establishing different types of functional groups, can be made either with the consent of the owner or with the payment of a fair and preliminary compensation, paid annually, fully offsetting the unrealized income of the forest owner, a natural or legal person "*(National Rural Development Program. Art.97) Estimation according to WWF methodology at national level is around 40 million euros per year from the national budget (SOLIDARON-PES Pay Pilot, 2016, p.38).

The administrations of protected areas are those who, from their own revenues or attracted by projects, provide financing for assessment, conservation and protection activities. For example, *Funding of B.N.P. activities is provided by funds from:* a) *annual allocation from the Romsilva, structural funds through the implementation of projects with various sources of financing;* c) *taxes, fees set for visiting or for the facilities, services and specific activities carried out in the Park, sponsorships, income from collaborative contracts* (Art.222 M.P. of the B.N.P, and the Natura 2000 site ROSCI0013 Bucegi).

Thus, the importance of paying ecosystem services as an element that ensures the balance between preservation and pressures is crucial, but this is not fully realized (e.g. negotiation with the Tourism Authority, tour operators or travel organizations as a percentage, 1% of profit to return to natural areas). *The implementation of a payment system does not solve the problem of providing long-term protection services but only places it in the mercantile paradigm* (Kosoy & Corbera, 2010, p.1230; Grigorescu, 2005), but effective management can harness ecosystem services as a successful alternative in local or regional economic development.

Conclusions

The natural areas are the guarantor of the biodiversity's protection, of the ecosystems. They ensure the support of people's lives and well-being. They generate direct benefits (eg tourist and recreational activities), as well as ecosystem goods and services (eg flood control, water pollution, pollination and recycling of nutrients), underlining their economic function. Starting from the analyzed case, to fully benefit from the multiple benefits of ecosystem services, at the level of all protected areas, it is recommended:

1. In *general*

- integrating the ecosystem approach in the public policies developed in the paradigm of the green economy of the environment-halting the loss of biodiversity and degradation of the ecosystem services;
- standardization of the methods of ecosystem assessment, meaning the adoption by Romania of some evaluation elements-the implementation of the MAES at the national level;
- development of communication channels accessible to the widest audience (accessible language, efficient, functional sources)

2. In *particular* for the B.N.P. (as constituent elements of adaptive management, flexible and based on the reality within the limits of the capacity of the functioning of the local and adjacent ecosystems)

- the protection of the surface of the forest ecosystems with potential for physical use of the landscape, of the animals and of the wild plants and their products, of the climate;
- the protection of the hydrological flows by maintaining the average level of evapotranspiration and ensuring the potential for feeding the water through infiltration;
- development of tourism based on nature (B.N.P. has a rich natural potential), especially the one associated with forests and the characteristics generated by them-accessibility, services;
- employment-increasing the number of employees in the forestry sector and educating the human resource-training of specialists in specific issues of the protected areas (geologist, biologist, zoologist, construction engineers, cartographers, lawyers, economists), raising the awareness of the beneficiary of the services green;
- development of efficient tools, adapted to the specific area of the protected area, for the payment of ecosystem services.

The limitations of the economic evaluation of ecosystem services are lack of data (eg statistics on tourism activities specifically associated with forests and their characteristics) to develop the indicators for recreational values (natural, cultural tourism) or rights of use and resolution of available data, price variability AUs/EUAs leading to the uncertainty related to the calculation of the economic value of CO2 emissions compensation, the absence of a time series on the age structure of forests of Romania with national coverage, time.

The effective economic contribution of ecosystem services is difficult to determine. It is certain, and the image capital that it brings to the regional local identity is an added value. The perspectives of increasing the economic value of ecosystems in protected natural areas (including the B.N.P.) are ensured by raising awareness of the importance of ecosystems and their sustainable use through the adoption of management strategies based on efficient tools, knowledge, and respect for the environment. However, the relevance of monetary values depends on the context and the purpose for which the ecosystem services are evaluated.

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