

Discussion Paper

Methodological challenges and emerging issues of assessing sustainability of protected areas



Eva Streberová*

Department of Landscape Ecology, Comenius University
842 15 Bratislava 4
Mlynská dolina
* streberova@fns.uniba.sk

Abstract: This paper discusses the emerging issues in assessing sustainability of PAs with emphasis on ecosystem services management in national parks and the necessary attention that should be given to trade-offs between ecosystem services in decision-making processes. After a short introduction into the concept of ecosystem valuation, the focus narrows onto provision of ecosystem services and goods provided by protected areas from the perspective of the IUCN classification of PAs, UNESCO Man and Biosphere Programme and the NATURA 2000 network. The paper goes into detail on emerging issues and possible negative impacts of trade-offs between provisioning, habitat, regulation and cultural services. The integration of regulation and cultural services into assessment frameworks and decision-making processes still seems to remain a methodological challenge. The institutional context, cumulative effects of trade-offs between ecosystem services, temporal aspect, aspects of cultural and ecological identity, and the reversibility variable should be also recognised in ecosystem valuation and decision-making frameworks.

Key words: ecosystem services; biodiversity conservation; national parks; decision-making; participatory planning

Received: 16 Nov 2012 - Revised form: 3 May 2013 - Accepted: 3 May 2013

1. Introduction

Protected areas (PAs) are being established for different purposes, based on various criteria and ideally they are being managed to reach their objectives. Ensuring the internal sustainability of PAs, convincing all stakeholders of possible benefits and ensuring that costs can be evenly shared among all stakeholders is very challenging under the conditions of the continuing global economic crisis (Houdet 2011). Although most people and institutions support the existence of PAs, their sustainable future is threatened, if the costs related to implementation and management are not balanced with the benefits of conservation (Berghöfer et al. 2010: 12).

In this paper we discuss the emerging issues in assessing sustainability of PAs with emphasis on ecosystem services management and the

necessary attention that should be given to trade-offs between ES in decision-making processes. We analyse the provision of our categories of ES in NPs (provisioning, habitat, regulation and cultural services) according to the IUCN categorisation of PAs, the NATURA 2000 network and the Man and Biosphere Program of the UNESCO objectives. Based on this analysis we outline the consequences of biodiversity conservation on benefits and costs provided by ecosystem services in national parks (NPs) and identify the related issues and methodological challenges in the ecosystem valuation process.

2. Theoretical concepts of ecosystems valuation

The popularity of the ecosystem services concept has been growing since 1960s. Simultaneously a new discipline - Ecological economics emerged

along with first definitions and frameworks, which were later on applied in international programmes and global projects for assessing human induced ecosystem changes and their influence on human wellbeing and biodiversity (Constanza et al. 1997; Turner et al. 2000; de Groot et al. 2002; Gómez-Baggethun et al. 2009; de Groot et al. 2010; TEEB 2008). The concept of ecosystem valuation is considered anthropocentric, where humans are seen as “valuing agents” which “enables the translation of basic ecological structures and processes into value-laden entities”. In this concept the value of ecosystem functions is analysed and assessed through: regulation, habitat, and cultural services (De Groot et al. 2002: 395; TEEB 2010).

In 2005 an initiative of the United Nations Organisation brought more than 1300 experts together to work on the Millennium Ecosystem Assessment (MEA) programme which focuses on the consequences of ecosystem change for human well-being (MEA 2005). Shortly after the launch of MEA, another global study named “The Economics of Ecosystems and Biodiversity (TEEB)” initiated in 2007. TEEB aims to “promote a better understanding of the true economic value of ecosystem services and to offer economic tools that take proper account of this value” and “to contribute to more effective policies for biodiversity protection and for achieving the objectives of the Convention on Biological Diversity.” (TEEB 2008: 11).

3. Ecosystems service in the context of national parks as protected areas

National parks often engage or overlap partly with international networks, either on a voluntary basis or by law, in order to enhance their own biodiversity conservation management, contribute to international conservation goals, for international cooperation and experience sharing, to foster regional development, etc. The following international networks were selected for this paper: the International Union for Nature Conservation (IUCN), the UNESCO Man and Biosphere Program and the NATURA 2000 of the European Union. Based on the objectives and criteria of these networks, we analyse the provision of each category of ES in NPs.

The IUCN is the world’s oldest and largest global conservation network (established in 1948) of state and non-governmental organization members. The IUCN provides a categorisation system of PAs which can help the applying organisation to design protected areas systems to meet the needs of biodiversity conservation. The IUCN definition of a protected area mentions that PAs should be managed to “achieve the long-term conservation of nature with associated ecosystem services and cultural values” where the main objective is conserving nature. In the IUCN classification system, the category II refers to national parks as “large natural or near natural areas set aside to protect large-scale ecological processes, along with complement of species and ecosystem characteristic of the area, which also provide a foundation for environmentally and culturally compatible spiritual, scientific, educational, recreational and visitor opportunities”. The objective of this category is “to protect natural biodiversity along with its underlying ecological structure and supporting environmental processes, and to promote education and recreation” (Dudley 2008: 27). It is important to note, that within a NP of the IUCN category (cat.) II, there may be also other categories designated, which creates a more diverse zonation of the PA. Usually at the core of the NP there are one or more areas, which can be defined as strict nature reserves (cat. Ia) or wilderness areas (cat. IIb), where conservation of biodiversity and ecological processes are privileged and more strictly protected than in cat. II. Secondly there can be areas of smaller scale but of high conservation relevance – a natural monument or feature (cat. III), a habitat or species management area (cat. IV). In the marginal buffer zones the level of conservation and human use and economic activities usually equals a protected landscape (cat. V).

The World Network of Biosphere Reserves (WNBR) under the UNESCO Man and Biosphere program to was created in 1974 to promote approaches for sustainable development in natural and cultural diversity, and build partnerships for research and sharing of knowledge on participatory decision-making. The biosphere reserves (BR) are “areas of terrestrial and coastal/marine ecosystems or a combination thereof”, which are internationally recognised

and promoted within the framework of UNESCO's MaB Programme. BRs fulfil multiple functions: biological diversity conservation, sustainable development, research and monitoring, training and education and international cooperation (UNESCO 1996: 3). BRs are subdivided into one or more core areas (securely protected sites for conserving biodiversity, with allowance of only low-impact activities – for example non destructive research, equalling IUCN cat. I-IV), a buffer zone (activities like ecotourism, recreation, applied research and environmental education, equalling IUCN cat. V, VI) and a transition area (may contain settlements, agricultural activities and other activities, does not correspond with any of the IUCN categories). In many cases BR physically overlap with PAs established under other systems (IUCN) – like NPs and reserves and other types of protected sites (NATURA 2000, Ramsar sites, etc.) (UNESCO 1996; Dudley 2008).

The third network assessed in this paper is the NATURA 2000, which was initiated as a response to fragmentation of European habitats and continuing biodiversity loss with the aim to secure a long-term survival of Europe's most valuable and threatened species and habitats. Member states are fully responsible for selecting and managing NATURA 2000 sites: Special Areas of Conservation (SAC) designated under the Habitats Directive, and Special Protection Areas (SPAs) established within the frame of the Birds Directive. The Habitat Directive refers to conservation of natural habitats and the habitats of species and ensures the system of strict protection regime (for species listed in Annex IV a) and conditions for derogation from this regime. The Birds Directive is very close to the Habitats Directive in terms of common objectives and provisions (European Council 1992, 1997).

Assignment for an IUCN management category II or assignment for a BR under the UNESCO MaB Programme is optional, whereas NATURA 2000 requires the implementation of both directives into the environmental policy of EU member states. Thus NPs protected on a national level can be simultaneously covered by SPA or SAC sites of the NATURA 2000, as well as an IUCN category or a UNESCO BR Reserve, if they meet necessary criteria and conditions required by each of these networks. In the following paragraphs we mach

the appropriate ES of NPs according to the objective of the three conservation networks.

In general PAs offer a wide range of provisioning services and goods (fuel wood, building materials, biomass for fodder and fertilizers, medicinal plants, etc). If biodiversity conservation, maintenance of ecological processes and environmental functions is the privilege – like in the case of our three networks – than the use of provisioning services and goods is very limited. An exemption here would be the need to maintain some of NATURA 2000 habitats which require a certain level of human activity which can yield biomass for fodder – for example species rich grasslands and meadows. Nevertheless the conservation objective plays an important role in contributing to the provisioning services outside protected sites, where the use and harvesting takes place. In a small amount fresh water can be used directly in the core areas (for example use of local water resources in high altitude mountain huts) but it is the surrounding areas to the protected site (or buffer & transition zones) where development of activities and local population largely depend on fresh water coming down from "healthy" environment of the PA.

Habitat services represent the role of ecosystems in providing living and breeding space for wild plant and animal species, which is crucially important for maintenance of biological and genetic diversity. Maintenance of habitat function is an important provision for halting biodiversity loss, which is also the main objective of the three networks discussed in the article. In addition, preservation of species with a cultural or spiritual value, and so-called "flagship species", has a positive effect on attracting visitors and might be of greater importance to local communities than the affiliated monetary values for biodiversity conservation.

Regulation services are based on the ability of natural ecosystems to influence natural processes that regulate essential ecological processes and life support systems. This makes regulation services also fundamental for the provision of other ES (de Groot et al. 2002). For example, the density and type of vegetation cover affects solar heat absorption, cloud formation and water retention leading to regional and local impacts on precipitation, temperature and wind conditions.

The vegetation cover also has a considerable effect on flood and erosion control mitigation. The ability of forests and wetlands (as well as other ecosystems) to absorb carbon from the atmosphere (carbon sequestration) is another important regulation service especially in regard to climate change (Kettunen et al. 2009). Often in the case of smaller NPs or NATURA 2000 sites, it is important what happens in the vicinity of the protected site. When assessing the environmental impact of different economic activities outside the borders of a PA, local stakeholders should consider the cause-effect chains that might be started off since ecosystems are open systems. For example increasing capacities of tourism or facilities or infrastructure can have an impact on a local and regional scale and effect the proper functioning of regulation functions (water purification, waste control, disturbance prevention – floods, fires, avalanches, storms, etc.).

Cultural services relate to the “non-material benefits people obtain from contact with ecosystems” (TEEB 2010: 34). Natural environments have been shaping peoples’ life styles, livelihoods and contributed to their cultural identity. The motives for visiting a NP vary greatly, but the visitors generally hope to enhance their physical and mental health, maybe to have a special spiritual experience from the local culture, etc. National parks with the IUCN or MaB “label” as well as NATURA 2000 sites support all this, by means of regulated nature-based sustainable forms of tourism, environmental education and low-impact research activities.

4. Methodological challenges and emerging issues of applying the concept of ecosystem valuation in protected areas

To ensure ecological and financial viability of management frameworks of PAs, the costs must be recognised alongside the benefits of all interested actors (Fischer-Kowalski et al. 2008; Berghöfer et al. 2010; see Appendix 1 for further examples of benefits and costs). From the previous chapter, it is obvious that NPs (either an IUCN category, BR or a NATURA2000 site) largely contribute to the provision of regulation, habitat and cultural services, which benefit stakeholders on local, regional, national and even global scales.

Nevertheless there are also the costs related to PA objectives implementation, maintenance of the management regime and costs related to foregone benefits from provision services (for example local stakeholders are not permitted to harvest ecosystems goods or expand economic activities, etc.). The benefits of maintenance of habitat, regulation and cultural services are not usually possible to be accrued in a short-term, which might be also experienced as a disadvantage by local users. Payment schemes for ES are being introduced to compensate for losses of stakeholders. However not every government has the necessary and efficient policy interventions to compensate for maintenance of regulation or habitat services. In addition a certain level of self-government and participatory planning is necessary to integrate ecosystem valuation effectively into decision-making.

Secondly, there are still several methodological challenges to the concept of monetary valuation of ecosystems – especially in regard to cultural and regulation services. Every individual experiences the contact with natural ecosystems differently, which is affected by the individual’s perceptions of ES. Some cultural ES matter more to people than do the affiliated material benefits (natural monuments in PAs can be symbols of cultural identity or may have an important heritage or spiritual value, contribute to sense-of-place, etc.). According to Kumar and Kumar (2008: 817) “the psycho-social and cultural perceptions of natural ecosystems and their services reflect a spectrum of attitudes ranging from complete separation of nature from culture to total integration with nature”. The authors relate to this as the concept “ecological identity” and emphasise that integrating the individual’s perception and relationship to nature remains a challenge to be embodied in valuation methods.

Thirdly, regulation services are quite hard to be expressed only in monetary values. Although a cost-benefit analysis will give stakeholders relevant information on trade-offs between regulation and other services, the questions remaining is will they be able to use the results properly? Regulation services are often not recognized until they are completely disturbed, which might not occur immediately, but rather after some time. Research and scientific

facilitation in ecosystem valuation and interpretation of qualitative, quantitative and monetary information and interpretation of ES trade-offs impacts to stakeholders plays an important role in keeping PAs on the sustainability path.

5. Discussion

Implementation of biodiversity conservation objectives requires engaging stakeholders across various scales. However not all countries have effective institutional mechanisms which would enable sufficient negotiation and interaction between stakeholders at various decision-making levels. Some countries are still in a process of institutional rebuild and evolution of new democratic institutional structures. This has been also the case of Central and Eastern European Countries in the period of designating NATURA 2000 sites. Public participation and effectively working multi-level governance in decision-making is still quite rare in these countries and cooperation among stakeholders and authorities is rather sporadic. The literature explains this as the remains of the past socialist institutions. Molding existing institutions and building new ones if needed, is currently one of the most important challenges (Klůvanková-Oravská et al. 2010).

As natural processes are very complex, forecasting the impacts ES trade-offs is very difficult. According to the literature the following variables are important in relation to ES trade-offs and assessment of benefits and costs of ES use: spatial scales (local, regional, national, etc.), temporal aspect, ecosystem dynamics, management variables, vulnerability, ecological identity, etc. (Rodrigues et al. 2006; Kettunen et al. 2009; Kumar, Kumar 2008; de Groot et al. 2010). From the previous chapter we could also include to the list the aspect of reversibility aspect and the institutional context. A recent study on a comparison of degraded and restored environments and the provision of ES proved that restoration cannot completely erase the effects of degradation (Benayas et al. 2009). Therefore special attention should be paid to the “overall-picture”, the direction of development trends over a longer period of time, while considering also cumulative effects of economic activities on ecosystems carried out in PAs. To include

properly these variables into modelling ecosystem services trade-offs still remains a very complex, difficult and challenging task.

6. Conclusions

The concept of economic valuation of ecosystem services and goods represents a tool which can help policy-makers as well as local stakeholders to gain a deeper insight into the relationships between different categories of ecosystem services and use the information for choosing the right development path. Some methodological aspects of ecosystem valuation still have not been tackled – especially integration of some variables and aspects (reversibility, the individual’s relationship to nature, the cumulative effects, the institutional context). Having designated NATURA 2000 sites or a prestigious UNECO or IUCN label does not guarantee overall success. Some countries still struggle with the restoration of self-government tradition and engaging stakeholders, lack of institutions to integrate ecosystem valuation into decision-making. In some countries policy interventions are absent or not efficient and fail to regulate development and compensate for nature conservation. Local actors could be motivated for cooperation by receiving support, for example through already mentioned incentives, and by joining adaptive partnerships of stakeholders from multiple levels, different sectors and scientific community. Good practice examples from Europe which integrate many of the elements important for conserving biodiversity but also enabling sustainable development are the certification systems for PAs under PANParks foundation and the EUROPARC Federation.

Monetary, qualitative but also qualitative information obtained through transdisciplinary research has a great potential in helping policy makers in conceptualising alternative subsistence solutions and in developing sufficient monetary compensation schemes for stakeholders, who have to withstand the costs related to conservation regimes in PAs.

Acknowledgements

This research was supported by the VEGA project no. 2/0016/11 Socio-ecological factors of strategic planning and landscape management in

the conditions of democracy and market economy.

References

- Benayas R, Newton JM, Diaz AC, Bullock JM (2009) Enhancement of Biodiversity and Ecosystem Services by Ecological Restoration: A Meta-Analysis. *Science* 28 (325), 1121-1124.
- Berghöfer A, Dudley N, Förster J (2010) Ecosystem services and protected areas. In: *TEEB - The Economics of Ecosystems and Biodiversity Handbook for Local and Regional Policy Makers*, 126-140.
- Costanza R, d'Arge R, Groot de R, Farber S, Grasso M, Hannon B, Limburg K, Naeem S, O'Neill RV, Paruelo J, Raskin RG, Sutton P, Belt van den M (1997) The Value of Ecosystem Services: Putting the Issues into Perspective. *Ecological Economics* 25, 67-72.
- European Council (1992) Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora. In: *Official Journal of the European Communities*. No L 206/7. Available online: <http://rod.eionet.europa.eu/instruments/560>. Accessed: 29-4-2013.
- European Council (1997) Council Directive 79/409/EEC on the conservation of wild birds. In: *Official Journal of the European Communities*. Available online: <http://rod.eionet.europa.eu/instruments/563>. Accessed: 29-4-2013.
- De Groot RS, Wilson MA, Boumans RMJ (2002) A typology for the classification, description and valuation of ecosystem functions, goods and services. *Ecological Economics* 41, 393-408.
- De Groot RS, Fisher B, Christie M (2010) Integrating the ecological and economic dimensions in biodiversity and ecosystem service valuation. In: *TEEB - The Economics of Ecosystems and Biodiversity: The Ecological and Economic Foundations*, 9-40.
- Dudley N (2008 ed.) *Guidelines for Applying Protected Area Management Categories*. Gland, Switzerland: IUCN. 86p. Available online http://cmsdata.iucn.org/downloads/guidelines_for_applying_protected_area_management_categories.pdf Accessed: 26-04-2013
- Gómez-Baggethun E, de Groot RS, Lomas PL, Montes C (2009) The history of ecosystem services in economic theory and practice: From early notions to markets and payment schemes. *Ecological Economics* 69(6), 1209-1218.
- Fischer-Kowalski M, Erb K-H, Singh SJ (2008) Extending BRIM to BRIA: Social monitoring and integrated sustainability assessment. In: *Nature conservation management: From idea to practical results*. Lublin: PWZN "Print 6", 208-219.
- Houdet J (2011) *The economics of wilderness: Overcoming challenges and seizing opportunities*. Hungary: PanPARKS Organisation. 37p. Available online: http://ecosystemcommons.org/sites/default/files/the_economics_of_wilderness.pdf. Accessed: 10-10-2012.
- Kettunen, M., Bassi, S., Gantioier, S. rink, P. (2009): *Assessing Socio-economic Benefits of Natura 2000 – a Toolkit for Practitioners* (September 2009 Edition). Output of the European Commission project Financing Natura 2000: Cost estimate and benefits of Natura 2000 (Contract No.: 070307/2007/484403/MAR/B2). Institute for European Environmental Policy (IEEP), Brussels, Belgium. 191 pp. + Annexes. Available online: http://ec.europa.eu/environment/nature/natura2000/financing/docs/benefit_s_toolkit.pdf. Accessed: 10-10-2012.
- Klůváňková-Oravská T, Chobotová V, Banaszak I, Slavíková L, Trifunová S (2010) From Government to Governance for Biodiversity: The Perspective of Central and Eastern European Transitions Countries. In: *From government to Governance? Alfa Publishing, Prague*, 59-73.
- Kumar M, Kumar P (2008) Valuation of the Ecosystem Services: A Psycho-Cultural Perspective. *Ecological Economics* 64(4), 808-819.
- MEA (Millennium Ecosystem Assessment) (2005): *Ecosystems and Human Well-being: Synthesis*. Island Press, Washington, DC. USA.
- Rodriguez JP, Beard Jr. TD, Bennett EM, Cumming GS, Cork S, Agard J, Dobson AP, Peterson GD (2006) Trade-offs across space, time, and ecosystem services. *Ecology and Society* 11(1), 28.
- TEEB (The Economics of Ecosystems and Biodiversity) (2008) *Interim Report*. Available online: <http://www.teebweb.org/teeb-study-and-reports/additional-reports/interim-report/>. Accessed: 25-10-2012.
- TEEB (The Economics of Ecosystems and Biodiversity) (2010). *Mainstreaming the Economics of Nature: A Synthesis Approach, Conclusions and Recommendations of TEEB*. Available online: <http://www.teebtest.org/teeb-study-and-reports/main-reports/synthesis/>. Accessed: 25-10-2012.
- Turner RK, Paavola J, Coopera P, Farber S, Jessamya V, Georgiou S (2003) Valuing nature: lessons learned and future research directions. *Ecological Economics* 46 (200), 493-510.
- UNESCO (1996) *Biosphere Reserves: The Seville Strategy and the Statutory Framework of the World Network*. Paris: UNESCO. Available online: <http://unesdoc.unesco.org/images/0010/001038/103849eb.pdf>. Accessed: 01-02-2012.

Appendix 1

Examples of costs and benefits in PAs Source: after Kettunen et al. (2009)

	BENEFITS	COSTS
GLOBAL LEVEL	Dispersed ecosystem services (e.g. climate change mitigation/adaptation) Nature-based tourism Global cultural, existence and option values	Protected area management (global transfers to developing countries) Alternative development programmes (global transfers to developing countries)
NATIONAL LEVEL	Dispersed ecosystem services (e.g. clean water for urban centres, agriculture or hydroelectric power) Nature-based tourism National cultural values	Land purchase, Protected area management (in national protected area systems) Compensation for forgone activities Opportunity costs* of forgone tax revenue
LOCAL LEVEL	Local ecosystem services (e.g. pollination, disease control, natural hazard mitigation) Local cultural and spiritual values Consumptive resource uses	Restricted access to resources, Displacements (people, economic activities), Protected area management (private land owners, municipal land) Opportunity costs* of foregone economic activities Human-wildlife conflict

* Opportunity cost is the cost of any activity measured in terms of the value of the best alternative that is not chosen (that is foregone). It is the sacrifice related to the second best choice available to someone, or to a group, who has picked it among several mutually exclusive choices. The opportunity cost is also the cost of the forgone products after making a choice. Opportunity costs are not restricted to monetary or financial costs: the real cost of output forgone, lost time, pleasure or any other benefit that provides utility should also be considered opportunity costs (Houdet, 2011).