THE CONCEPT OF ECOSYSTEM SERVICES AS A TOOL FOR THE SUSTAINABLE AND EQUITABLE REGIONAL DEVELOPMENT OF THE BALKANS

Jeroen Arends

Abstract

Being positioned at the crossroads of central Europe and Asia Minor, the Balkan Peninsula has high biodiversity values and is home to many species and taxa. It has the greatest richness of flora and fauna in Europe and an exceptional number of endemic and relict species. Biodiversity in the Balkans is under pressure by a range of environmental threats, both historical and contemporary as well as by future trends. Biodiversity in the Balkans is threatened by pressures to and pollution of air, water and soil as well as by illegal logging, overfishing, poaching and the effects of climate change. Furthermore, landscapes face fragmentation caused by a range of human activities such as industry, agriculture, energy production, infrastructure and transport, etc. At the same time, society increases its demands for natural resources. Overall, there is a lack of adequate adoption and application of cross sector environmental policies, regulations and standards. Environmental enforcement is poor and the institutional and regulatory framework as well as harmonization with international and EU policies and standards remain lagging and inadequate, in both EU and non-EU member states (MS) in the Balkans. Conservation efforts have had success to some extend but overall, biodiversity is under threat in the Balkans. What further exacerbates the situation is a general lack of awareness and appreciation at all levels of governance, as well as within the general population, of the values of biodiversity to society. What is needed, is an approach that ensures sustainable and equitable regional development while securing the preservation and conservation of biodiversity. The concept of ecosystem services is an approach that could provide a role in the region's sustainable use and management of natural areas and natural resources.

Keywords: Biodiversity, regional development, sustainable development, natural areas, natural resources, ecosystems, ecosystem services

1.- The Balkans as an area of high biodiversity.

The Balkan Peninsula is positioned at the junction of central Europe and Asia Minor and is characterized by extreme topographic and climatic diversity (Stojak et al., 2015). The region features a high biogeographic, biome and ecosystem diversity and the biomes of the Balkans are distinguished by a large number of biotopes, approximately 250 (Savić, 2008). The diversity of these biotopes explains two particularities specific of the Balkan Peninsula: The greatest richness of flora and fauna in Europe and an exceptional number of endemic and relict species. Through the variety of its regions, complex geological history, interactions between populations, species, and ecosystems, as well as being shaped by historical and contemporary evolutionary forces, the Balkan Peninsula represents a region with high genetic diversity (*Kryštufek and Reed, 2004;* Savić, 2008). Not only are the vast number of endemic and relict species highly significant in themselves, but their different ecological characteristics, distribution and origin contribute to the region's uniqueness.

The region is a hotspot of European plant diversity and an important centre of endemism (Horvat, et al., 1974; Davis, et al., 1994; *Kryštufek and Reed, 2004;* Stevanović et al., 2007). Compared to other regions of Europe, it harbours the richest flora, including a high percentage of endemism (e.g. Eastwood, 2004; Kryštufek *and Reed, 2004;* Stevanovic, et al., 2007; Hewitt, 2011). Floristically, the Balkans hosts about 6,500 species of which more than one third (ca 2,600 to 2,700) are endemic and about 400 are considered local endemics (Horvat, et al., 1974; *Kryštufek and Reed, 2004;* Stevanović, et al., 2007).

The Balkan Peninsula is also characterized by an exceptionally rich and diversified fauna, and is home to large number of mammals, bird species, invertebrates, insects, etc. The Balkan avifauna is one of the two richest in Europe. The area is an important hotspot for migratory species. Balkan amphibians and reptiles are diverse in many respects. Species richness is very high, with a total of 104 species (33 amphibians and 71 reptiles) (Džukić and Kalezić, 2004).
Despite its high biodiversity and endemic species, the area remains understudied.

2.- Threats to biodiversity in the Balkans.

Biodiversity in the Balkans is under pressure by a range of environmental threats, both historical and contemporary as well as by future trends, depending on the growth scenario pursued. The Balkans suffers from the results of legacy technologies and industries as well as poorly formulated and enforced policies from

the past. Industries, transport, agriculture, energy production, urban sprawl (both regulated and illegal), land degradation, etc. all exert pressures and pollution on air, water and soil and lead to fragmentation of the landscape and habitats for biodiversity. Other threats to biodiversity are illegal logging, overfishing and poaching while climate change will affect the region due to rising temperatures causing extended drought periods alternated with weather extremes. Within and between the countries of the region, there is a lack of adoption and application of environmental policies, regulations and standards in all sectors. Environmental enforcement is poor and the institutional and regulatory framework as well as harmonization with international and EU policies and standards remain inadequate, in both EU and non-EU member states (MS) in the Balkans. Over the last decades within the region, many CSO have surfaced that aim to protect biodiversity from mentioned threats with varying degrees of success. However, their inclusion and that of other stakeholders in policy formulation and management of biodiversity remains insufficient. International organisations dedicated to biodiversity conservation (such as IUCN and WWF) also have entered the Balkans and have contributed to the protection and preservation of biodiversity with various levels of success. However, much remains to done at all levels in all sectors in the Balkans. Cross border and transnational cooperation in conservation, protection of biodiversity and sustainable regional development remains lagging behind. What is needed is a regional approach which next to securing economic development and additions to livelihoods also protects the precious biodiversity and ecosystems of the region. The concept of ecosystem services promises to provide this regional approach.

3.- The concept of ecosystem services (ES).

Ecosystem services are the benefits that people obtain from nature, either directly or indirectly (de Groot et.al., 2002). They are the goods and services people derive from biodiversity and ecosystems through their biological and ecological processes. Examples of ecosystem services are food, raw material, drinking water (so called provisioning services); air and water purification, climate regulation, flood prevention and protection against water extremes (regulating services); recreation, spiritual belonging, opportunities for study (cultural and amenity services); and supporting services such as habitat for biodiversity and sources of genetic material (MA, 2005; TEEB, 2010These services provide benefits to humans such as nutrition, protection, wellbeing, etc. which humans can put a value to, in ecological, economical but also in socio-cultural values. The concept of ecosystem services is a

young one in the relatively young discipline of ecology when compared to other scientific disciplines. Ecosystem services try to connect the natural with the human world and therefore is multidisciplinary.

4.- History of ecosystem services research.

The moment when humans start to dominate nature and use it for development, marks the moment that nature and ecosystems start to become part of economic theory, albeit for its utilitarian use. Most theories in classical and neo classical economics focus exclusively on labour and man-made physical capital as drivers for wealth development but they tend to overlook nature´s role in this. Nature is seen as a utility and a virtually limitless and free resource that can be exploited as inputs for industrial processes. This leads to further impacts on and the destruction of the natural environment (Gómez-Baggethun et.al., 2009).

Damage to nature and to human health was already known to the ancient Greeks. But the first modern realizations of environmental damage and effects on human health occurred in the late 19th century and was further developed in the 20th century through the natural sciences. The first realizations of impacts on the economy also started to occur.

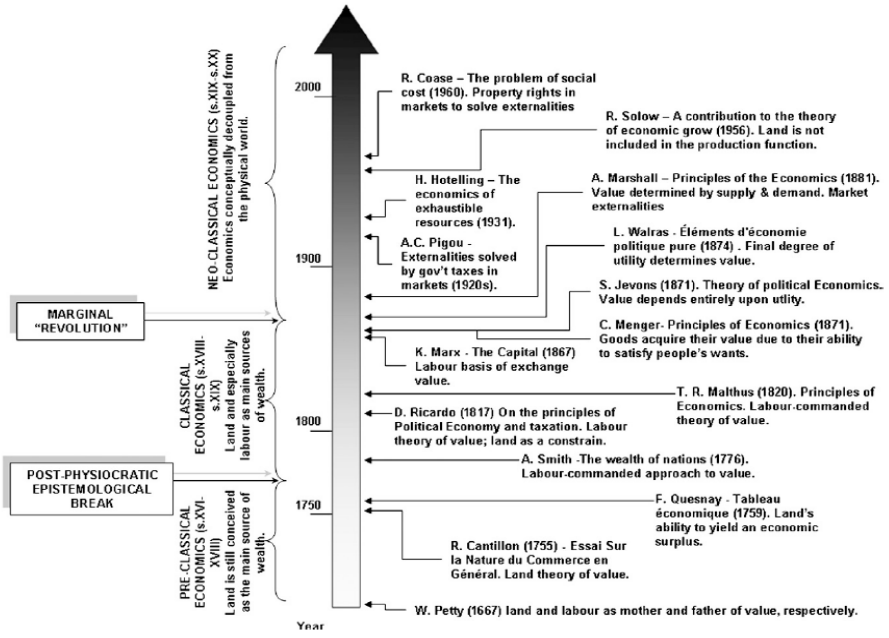

Fig. 1. Landmarks in the evolving conception of nature by economics.

Figure 1. Overview of inclusion of nature in economic theory. Milestones in the evolving conception of nature by economics from notions of providing "free services" worthy of distinct analytical treatment to the realization of nature being a separate non-substitutable factor in the production function, marking physical constraints to growth (adapted from Gómez-Baggethun, et al., 2009.)

A realization emerges that nature and ecosystems provide goods and services that are beneficial to humans. First theories to that effect are developed in the 1970s with publications by Odum (1969) and others. The concept of ecosystem services and natural capital is further developed by authors such as de Groot and Costanza. A breakthrough occurs with the 1997 publication in *Time* magazine of Costanza et al. who made an inventory of the value of Nature's Services to the world economy (Costanza, et.al., 1997). Assessing 17 services of 16 biomes around the world resulted with a value of 33 trillion USD, almost twice the world's GDP at that time. Later, the TEEB study (2010) recalibrated the Constanza study with a value of 125 trillion USD (2011 USD) (Costanza, et.al., 2013). The publication received both praise and criticism but marks a definite point in the further development and attention for the concept. Continued research and development of concepts, definitions, classification systems, valuation methods, etc. takes place. Other milestones are the 2005 Millennium Ecosystem Assessment (MA) and the 2010 TEEB study.

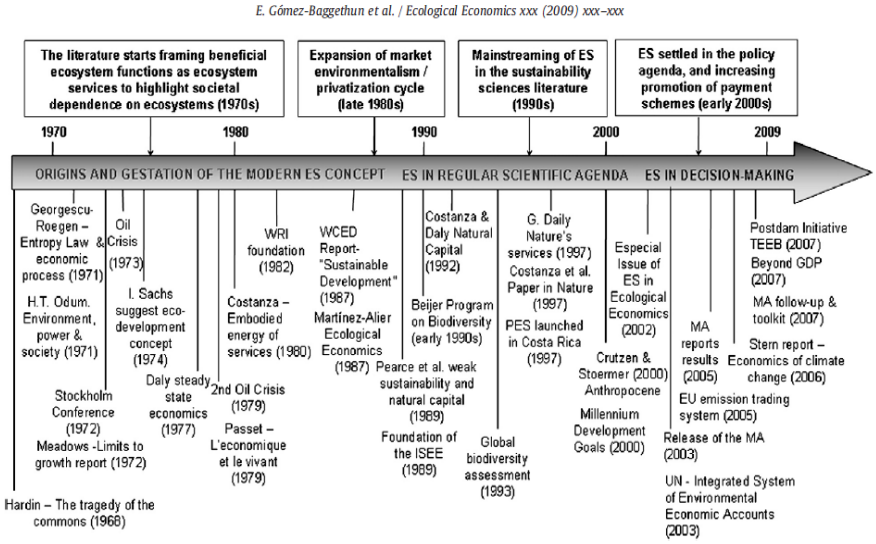

Figure 2. Overview of development of the concept of ecosystem services (adapted from Gómez-Baggethun et al, 2009.)

In order to understand what ecosystem services are, first an understanding of what biodiversity and ecosystems themselves are needs to occur. Biodiversity is defined as the "variety of living things" (Cunningham and Cunningham 2009) and consists of: (1) *genetic diversity* or the variety of versions of the same genes within individual species; (2) *species variety* or the number of different kinds of organisms within individual communities or ecosystems; and (3) *ecological diversity* or the richness and complexity of a biological community, including the numbers of niches or unique positions within that community, and the ecological processes that capture energy and recycle materials within this system (Cunningham and Cunningham, 2009).

Ecosystems form important and integral parts of the landscape and are defined as the "result of complex interactions between the biotic and abiotic components of a biological community via the exchange of matter and energy" (Cunningham and Cunningham, 2009). In other words, ecosystems comprise of species that via complex constructions and processes interact with each other and with their environment. Biotic components include species that act as producers, consumers or decomposers, and the abiotic components are the non-living chemical and physical parts of the environment, e.g. climate, geomorphology, hydrology and minerals.

Ecosystems themselves can be composed of sub-ecosystems and ecosystems can vary in size and scale. Ecosystem often have clear boundaries that sets them apart from other ecosystems in the landscape. Sometimes, however, these borders are diffuse and it is not clear where there is a border or where another ecosystem begins. Often, there are buffer zones and species from one ecosystem also function in other ecosystems.

Ecosystems perform different ecosystem functions based on the biophysical structures, functional traits and the ecological processes of the biodiversity present in the ecosystem in interaction with their environment through the exchange of matter and energy (adapted from MAES, et.al., 2013). There is much debate in scientific literature on what exactly constitute ecosystem functions. They were first described by Odum (1969) and the first effort to comprehensively identify and classify ecosystem functions was attempted by de Groot (de Groot, 1992; de Groot et.al., 2002). Since then, multiple definitions of ecosystem functions were developed and the term is often used synonymously with ecosystem services (Srivastava and Vellend, 2005; Lamarque, et.al., 2011), ecological processes (Lawton and Brown, 1993) and ecosystem processes (Dominati, et.al., 2010; Mace, et.al., 2012).

One definition is, that ecosystem functions are the capacity of natural processes and components to provide goods and services that satisfy human needs, directly or indirectly (de Groot, et.al., 2002). Others simply relate ecosystem functions to ecological processes and the fluxes of energy and matter while another definition assigns ecosystem functions to attributes related to the performance of an ecosystem that is the consequence of one or of multiple ecosystem processes (Lovett, et.al., 2006). The latter definition focuses on the aggregation of attributes of the ecosystem processes of ecosystems. Examples of ecosystem functions under this definition include nutrient regulation, biomass production and water supply (Pettorelli, et.al., 2017).

Finally, ecosystem services are defined as the benefits that human populations derive, directly or indirectly, from ecosystem functions (Costanza, et.al., 1997). Costanza calls ecosystem functions "natural capital stocks" and states that ecosystem services consist of flow of materials, energy and information from natural capital stocks which -combined with manufactured and human capital- benefit human welfare. So, in addition to ecosystem functions, Costanza also adds manufactured and human capital as important components to the delivery of ecosystem services (Costanza, et.al., 2017).

A key distinction between ecosystem functions and services is that functions can have both intrinsic and potential anthropocentric values, while services are defined only in terms of their benefits to people (Petter, et.al., 2012). Humans put values on the benefits provided to them and these values can be monetary values but also socio-cultural values. Much research focuses on ecosystem services supply while there are also the issues of ecosystem services demands, flows and budgets (Burkhard, et.al., 2009; 2012; 2014). Demand for ecosystem services comes from society. These are the ecosystem services that are used by society to fulfill human wellbeing. The demands are fulfilled by the flow of ecosystem services from ecosystems to society. There might be a mismatch between what is demanded by society from the natural world and here lies the danger of overexploitation. Ecosystem services supply is the domain of biology and ecology research while the demands come from the human side of the framework.

With the focus much on ecosystem services delivery (MA, 2005; TEEB, 2010) and ecosystem services being derived from ecosystem functions, there has been much research into the relation between biodiversity and ecosystem functioning (Cardinale, et.al., 2006; Cardinale, et.al., 2012; Balvanera, et.al., 2006). Species richness as a proxy for assessing ecosystem function and service delivery has been the subject of research and intense debate for over two decades. The hypothesis is that higher species diversity leads to greater ecosystem function and

ecosystem services delivery. The aim is to establish species richness as a proxy for ecosystem attributes (Balvanera, et.al., 2006; Cardinale, et.al., 2006). Results so far seem to indicate that functional diversity and certain species (Petchey and Gaston, 2006; Mouchet, et.al., 2010; Cadotte, et.al., 2011), rather than species richness itself, directly affects ecosystem function and the delivery of ecosystem services (Tilman, et.al., 2001; Cadotte, et.al., 2011).

In order to put ecosystems and the services they provide to benefit human welfare and wellbeing into perspective, conceptual frameworks are often used. The ecosystem services cascade framework is used to explain and mainstream ecosystem services, for awareness raising, and to operationalize ecosystem services by functioning as a reference and guiding framework for ecosystem services assessments and valuation (ESAV) projects. As such, the cascade framework can be used as an organising structure to help to clarify 'complex relationships', to re-frame biodiversity related issues, and to provide an analytical template for empirical research and operational strategies or applications (Potschin-Young, et.al., 2017). It is useful for instance for development of indicators at any step along the cascade.

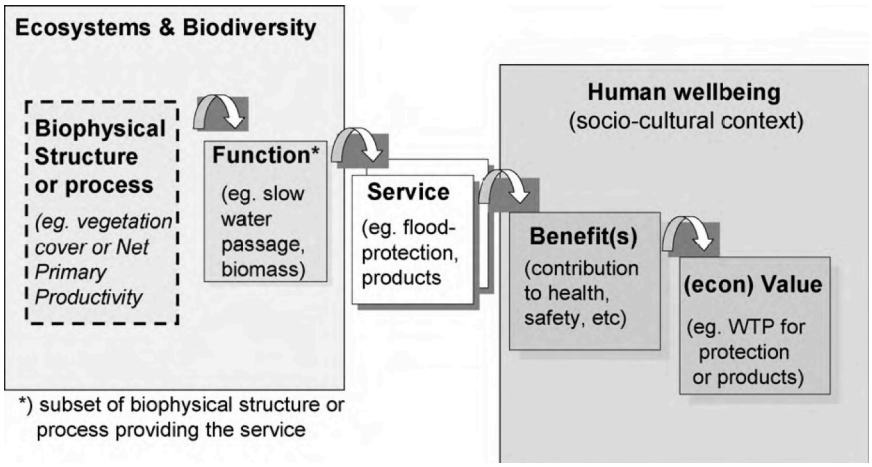

Figure 3. ecosystem services cascade framework adapted from Potschin-Young et.al., 2017.

As with any model or conceptual framework, the ES cascade framework is a simplification of an otherwise complex reality and the framework is not without its own set of shortcomings (Potschin-Young, et.al., 2017). In fact, Costanza et al. (2017) describe the framework as an oversimplification of a complex reality while at the same time being an unnecessary complication of what is "essentially a very

straightforward definition" (of ecosystem services and benefits). In their opinion, the connections between "ecosystem processes, functions and benefits to humans are complex, non-linear and dynamic" and these connections are poorly represented by a linear cascade that assumes "simple linkages and effects". In addition, they argue, the cascade follows conventional economic thinking which limits its definition of value only to elements that people perceive as beneficial and are willing to pay for. They come with their own representation that in their opinion recognizes that services equal benefits and that "complex interactions and feedbacks are required among built, human, social and natural capital in order to produce ecosystem services" (Costanza, et.al., 2017). This is in line with what Costanza et al. already said in their milestone publication in 1997.

5.- Uses of ecosystem services.

Ecosystem services (ES) are used in a variety of ways. Firstly, ES provides a framework for studying nature and how it contributes to human wellbeing and welfare. It covers both the natural domain as well as the human domain and therefore understanding, modelling and measuring ES requires a trans- and multidisciplinary approach (Costanza, et.al., 2017). Much research into and the development of the concept in these various topics of ecosystem services has sprung up over the last two decades and the concept is ever developing. The science has not settled yet and this poses challenges for adopting ES, mainstreaming it and operationalising into policy making and application.

Despite these challenges, however, ES can be and is already used as a tool for policy and decision making. Through trade off analysis and the development of scenarios, possible futures can be depicted, explored, evaluated and valued which then can be used to formulate informed policies and decisions that address sustainable development. The valuation part of the concept can make values provided by ecosystems visible and tangible, thereby supporting argumentation for the sustainable, inclusive and equitable use and management of natural areas and natural resources. ES can also be used as policy analysis to evaluate the outcome of implemented policies and management practices and how these can be improved. The concept helps to design and create policy and financial instruments for sustainable and equitable development such as rules and regulations, and payment for ecosystem services (PES) such as use-payments, tax incentives, market based instruments (MBI), etc. It can help in setting up private-public partnerships. PES is a scheme whereby, among others, the providers of ecosystem services are compensated or paid, either directly or indirectly, by the users of these services. ES

often do not flow directly to the users of these services but are enjoyed or consumed far away from the location of production of these services. PES schemes can be constructed whereby areas which produce these services (often marginalized areas) are duly compensated, thereby contributing to regional and rural development. Examples from other parts of the world, most notably Costa Rica[12], show that PES schemes benefit both users as well as providers of ES and are also beneficially to maintenance and expansion of biodiversity.

ES can be used in the designation, planning and regional management of ecosystems, protected areas (PA) and National Parks (NP). Next to ensuring their protected status and conservation objectives, these areas can then also be designed and managed in such a way that they provide multifunctional sustainable uses to society. The concept can be used as a tool to evaluate impacts of policies and strategies for development -so called Strategic Environmental Assessments (SEA)- as well as to evaluate the impacts of (infrastructural) projects not only on the environment but also on the delivery of ecosystem services (Geneletti, et.al., 2016). In this way, the use of Environmental Impact Assessments (EIA) that traditional has been used to assess and evaluate environmental impacts of projects is extended to cover the impacts on human wellbeing and welfare in the form of impacts on ecosystem services.

In these days of climate change and the rise in numbers and intensity of natural disasters as a consequence of climate change, the concept of ecosystem services can be used in climate change adaptation (CCA) and in use for disaster risk reduction (DRR) policies and measures. Not only can the potential impacts of climate change and natural disasters on society be assessed and evaluated with ecosystem services, also their costs on society can be established and valued with ES. The concept can therefore help society to mitigate and adapt to the effects of climate change and can provide Nature Based Solutions (NBS) for disaster risk reduction, such as for example the designation of flood plains for flood prevention or the restoration of wetland areas to provide protection against weather extremes. In this way, damages to society in the form of externalities such as storms, floods, drought and extreme weather events can be avoided or reduced, potentially leading to fewer losses of lives, less damages to people's livelihoods and saving societies huge damages to infrastructure and preventing other costs.

Relevant to all that is mentioned above, ES can be a valuable tool in communication and awareness raising. By focusing on the benefits provided by nature to humans, people can become more and better aware of the importance of

[1] Vid. https://www.iied.org/payments-for-ecosystem-services-costa-rica-s-recipe
[2] Vid. https://www.cbd.int/financial/pes/costarica-pestechnical.pdf

nature conservation and raise a sense that we need to take better care of our natural world. With this, changes in human behaviour regarding how we treat nature and how we handle our practices concerning waste and dealing with environmental pollution can be better addressed and positively influenced.

6.- Valuation of ecosystem services.

Valuation was already mentioned in the previous section but due to its contentiousness merits more explanation. Ecosystem services can help society to value the benefits provided by nature to humans. The valuation part of the concept is not uncontested and without criticism (Kosoy and Corbera, 2010; McAfee and Shapiro, 2010) and many -especially in the conservation area- are very critical of this with some saying that it should not be done at all. But the argument of 'nature is priceless', to which many people whether conservationists or laymen would agree, has little merit in policy and decision making which often *does* rely much on valuation of potential policy decision outcomes. Valuation in monetary values lies at the basis of many policy decisions. Cost reductions, cost benefits analysis and potential added value to GDP are often used in policy making. Therefore, a decision maker sees no use in the 'nature is priceless' argument and it is to the conservationists' benefit to make total economic value of a natural area visible in the argumentation for its preservation.

With an assessment of total economic value (TEV) of the ecosystem services provided by an area, conservationists and others have a powerful tool at their disposal to influence decision making. With valuation, potential cost savings in the form of avoided costs to damages or avoided replacement costs as well as additions to GDP in the form of extra jobs provided by recreation or ecotourism can be made visible and used for argumentation. Examples of avoided damages are cost savings to infrastructure, real estate, livelihoods due to protection against floods and weather extremes, etc. provided by natural areas. Another example of avoided costs is less take of sick leave because people feel better if they recreate in nature. Examples of replacement costs are costs saved if for instance artificial flood prevention measures would need to be constructed when a natural area is converted, or the construction of artificial water purification facilities.

7.- Critique on ES.

Just as there is much appreciation of the concept of ecosystem services for research, policy making and application in practice, there is also substantial critique on it.

Initial significant controversy and critique followed the 1997 publication of the study by Costanza et.al., regarding the value of nature whose results were published in *Nature*. While the article also received positive acclaim in the press and sparked much of research into ecosystem services, some scholars and authors questioned the methods and results (Heuting, et.al., 1998; Norgaard, et.al., 1998; Pearce 1998; Bockstael et.al., 2000). The authors of the 1997 ground breaking *Nature* publication were well aware of the shortcomings of their study but the publication had the authors' intended effect of starting the debate and to increase the research into ecosystem services (Costanza, et.al., 2017).

Critique on the valuation part of ecosystem services is often voiced, with some claiming that valuation signifies a commodification of nature (Kosoy and Corbera, 2010; McAfee and Shapiro, 2010).

Critique on ES falls to some extent or another into several categories which often reside under ethical considerations; relate to the science-policy interface; and regarding vagueness and ambiguity in science regarding terms and definitions as well as optimistic assumptions and normative aims (Schröter, et.al., 2014). A full discussion of the critiques falls out of the cope of this article. For further study and counter argumentation, the reader is referred to the publications in the reference list (Kosoy and Corbera, 2010; McAfee and Shapiro, 2010; Lele et.al., 2013; Boyd and Banzhaf, 2007; Fisher, 2009; Barkmann, et.al., 2008; McCauley, 2006; Sagoff, 2002; Redford and Adams, 2009; Chee, 2004; McCauley, 2006).

8.- Uses and application of ES in the Balkans.

a) Overview of ES conducted in the region. First attempts to conduct ES related research but first steps seem to have taken place during the 1990s when the Serbian Institute of Economic Sciences made a theoretical exploration of valuation methods. This study was followed up in 2013 by a study into the use and management of natural good, values and capital of PAs in Serbia.

Then for some time not much seems to be happening. Until the years 2000-2003, when in Greece some assessment and economic valuation of ES takes place. For Greece, the research mostly takes place regarding Marine and Coastal Ecosystem Services (MCES), mainly in the area of energy and climate change, environmental management and resource management (Latinopoulos, 2015). The research is conducted via questionnaires and interviews and the method of valuation is contingent valuation, mainly willingness to pay (WTP). The year 2006 clearly marks a turning point in ES research, not only in Greece but also globally.

From 2006 onwards, other countries in the Balkans start to catch up. In Turkey and Serbia for example, the number of studies conducted increases. The studies are mostly conducted by either Ministries and/or development agencies and take place in case study areas. From the year 2010, ES research also takes place in Bulgaria. In contrast with Turkey and Serbia, but in line with Greece, these studies were conducted by universities in Bulgaria. Next to assessing economic valuation of ES using contingent valuation methods, mostly WTP, research in Bulgaria also uses remote sensing data, geospatial data, hydrological models, GIS and mapping as methods for assessment and valuation of ES. Other countries in the region such as Albania, FYROM and Montenegro stay behind in research. Overall in the region there is a lack of cross border and transnational initiatives and joint research projects.

9.- Characteristics of the studies.

The ES research conducted in the Balkans appears to be mostly local or regional studies (within one country). No national, regional cross border or transnational studies have been conducted other than a pan Eastern European study, which was actually conducted by institutions in Western Europe, and a few studies between connecting areas in Croatia and Serbia, and between Albania and FYROM. The conducted research varied in angle, size, scope and duration. Some studies were theoretical explorations while others only identified and described ES. There were also studies that make calculations and valuations of ES. Some assessments focused on a single or a bundle of ES (mostly provisioning) and others explored a complete set of ES. The studies used a variety of approaches and methods of assessment including questionnaires, surveys, direct use and market values, WTP, benefit transfer, statistical methods with trend analysis/regression and correlation analysis, hydrological models, global sets of land use data, geospatial data, remote sensing, GIS and mapping. In line with the rest of the world, few ESAV are taken up by policy makers and translated into policies or management practices.

10.- Challenges to the implementation of the ecosystem services approach in the Balkans.

Overall, at all levels of governance, academia, civil society, etc. there is a lack of knowledge of and confusion about the concept of ES and how it can be applied to policy formulation and decision making, and the management and use of natural areas and resources. Also, a fair deal of skepticism is still present, especially among

conservationists and academics dealing with preservation and conservation issues. On the other hand, some might be overly optimistic or opportunistic regarding what the concept can do for the region. This, especially in the light of the lack of resources being designated for the implementation of the concept or the incorporation of ES into policies and management practices. Another challenge is the steep learning curve which is getting steeper since now more and more sophisticated research, definitions, methods, etc. are being developed as of late. Overall in the region, there is a lack of ES assessments and indicator development, a lack of application of ES in policy making and management of natural resources, and lack of funds for ES assessments. There is also a lack of local, regional and transboundary projects and cooperation.

11.- Global and regional initiatives regarding ES relevant to the Balkans.

a) Convention on Biological Diversity (CBD). The Convention on Biological Diversity (CBD)[3] is a multilateral treaty. The Convention has three main goals: 1) the conservation of biological diversity; 2) the sustainable use of its components; 3) the fair and equitable sharing of benefits arising from genetic resources. As signatories of the Convention on Biological Diversity, many countries in the region are obligated to report on biodiversity in their countries to the convention. Also, they need to incorporate biodiversity and the aims of the convention into relevant policies. As part of the Aichi Targets, the convention recognises ecosystem services as part of the functions of biodiversity and as such, countries are obligated to incorporate ES into their respective National Biodiversity Strategy and Action Plan (NBSAP). Some countries in the Balkans have done so but often not specific targets or road maps have been assigned.

b) EU Mapping and Assessment of Ecosystem Services (MAES) and Natural Capital Accounting. EU member states (MS) are required by action 5 of target 2 of the EU 2020 Biodiversity Strategy to conduct so called *Mapping and Assessment of Ecosystem Services (MAES)* and *Natural Capital Accounting.* MAES is for identifying and assessing ecosystems in a member state and to assess and map the ecosystem services they deliver. Next, values of ecosystem services should be accounted as the Natural Capital of a member state. MAES should be concluded by 2014 and the accounting of natural capital by 2020. These processes are driven by the governments of member states themselves, however in the EU only a few have

[3] Vid. www.cbd.int

completed the former (Spain, UK, Flanders) while others have done so only partly, are just beginning or have not started at all. Regarding the accounting no or little progress has been made.

c) IPBES. In 2012, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)[4] was found. IPBES can be considered as the IPCC for biodiversity and ecosystem services. The mission of IPBES is to strengthen knowledge foundations for better policy through science, for the conservation and sustainable use of biodiversity, long-term human well-being and sustainable development**.** Currently, about 130 countries are signatories. Many countries in the Balkans are member with some of them assigning local focal points, while others have joined as observers. A large number of NGOs, organizations, conventions and civil society groupings also participate in the formal IPBES process as observers, with several thousand individual stakeholders, ranging from scientific experts to representatives of academic and research institutions, local communities and the private sector, contributing to and benefiting from IPBES' work. Next to policy support, knowledge transfer and capacity building, the IPBES conducts regional assessments and one of them is the Eastern Europe and Central Asia assessment. This assessment is open to review and individuals from the Balkans are reviewing the assessments.

d) Ecosystem Services Partnership -ESP[5]. The ESP is a global network of researchers, universities, conservation organisations, policy makers and practitioners dedicated to the advancement and promotion of the concept of ecosystem services in policy making and the management of natural areas and natural resources. Many members of the ESP are involved in developing the concept further by contributing to the development of new concepts, frameworks, definition and classification systems, methodologies, etc. as well as conducting assessments. There are over 40 organisations and over 3000 people connected to the ESP. There are many working groups covering biomes, ES themes and sectors as well as regional chapters and national networks. Several of these networks in various stages of development exist in Regional Chapter South East Europe[6].

[4] Vid. www.ipbes.net
[5] www.es-partnership.org
[6] Vid. http://www.researchgate.net/project/Ecosystem-Services-via-the-Ecosystem-Services-Partnership-ESP-Regional-Chapter-South-East-Europe

e) GIZ Open Regional Fund for Biodiversity. The Open Regional Fund for South-East Europe – Biodiversity project (ORF BD)[7], funded by the German Federal Ministry of Economic Cooperation and Development (BMZ) and implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) aims to promote regional cooperation between various actors working in the field of biodiversity and supporting the implementation of the EU Biodiversity Strategy 2020. This is done through the implementation of regional sub-projects. The ORF BD sub-project "Ecosystem services assessment and valuation (ESAV) in a future course of action in South-East Europe region (SEE)" seeks to enhance the extent to which cross-sectoral regional recommendations on ecosystem services assessment and valuation are considered in development decision-making.

f) WWF. WWF's Protected Areas Benefits Assessment Tool (PA-BAT)[8] is a tool designed to fill an important gap in the toolbox of protected area agencies and conservation institutions, by providing a methodology to collate and build information about the overall benefits from protected areas. The PA-BAT aims to help collate information on the full range of current and potential benefits of individual protected areas. In the Balkans, the tool has been used in assessing PA in the Dinaric Arc region of the Balkans. Also, WWF Adria has launched a new regional initiative under the title Nature for People[9], with an aim providing information and share examples of good practice in order to help improve management of natural resources and living conditions of communities in South-East Europe (SEE).

g) EU and other programmes. The EU provides a number of programmes for regional development. These programmes launch several calls addressing a host of issues and sectors. Some of these calls relate to sustainable development and green infrastructure and involve ecosystem services. An example of an EU programme where the region can be involved in are the Interreg programmes[10]. Also, bilateral and multilateral donor programmes by countries have programmes in these areas. One example is the European Economic Area (EEA) programmes which in Bulgaria and Romania substantially contributed to ES research in these countries[11].

[7] www.giz.de/en/worldwide/40686.html
[8] wwf.panda.org/?174401/PABAT
[9] Vid. natureforpeople.org
[10] Vid. https://www.interregeurope.eu/
[11] Vid https://eeagrants.org/

12.- Need for ES assessment and incorporation in cross sector policies in the Balkans.

The natural areas with it high biodiversity in the Balkans are under threat of bad land use decisions, both historical and current ones, and are under threat of climate change and economic development projects.

While this is already detrimental for biodiversity, it also puts pressures on human welfare and wellbeing of which this article already gave some examples. In the end, damages to biodiversity and ecosystems in the Balkans also can cause damages, or exacerbate, them to humans. Not only in terms of physical human safety but also to livelihoods and costs to the economy that in the end need to be carried by society. Many conservation programmes in the region, how well intended, in the end did not provide sufficient protection to species. In contribution to conservation programmes, ES can offer a more sustainable path for economic development that also increases biodiversity while at the same time offer new opportunities for people to secure and increase their livelihoods in a more sustainable and equitable way.

The concept of ecosystem services in the Balkans should be used to make apparent to decision makers, conservationists, the wider public, etc. the value of ecosystems and their services in the region in order to promote sustainable and equitable use of natural resources. Valuation and Natural Capital Accounting (NCA) of ES is a useful tool to make these values apparent. Through trade-off analysis, scenarios (or possible futures) can be explored to analyse what happens if certain development decisions are favoured and pursued over others, e.g. the conversion of a natural area for some other use such as agriculture. Valuation can help to make this trade-off analysis possible. ES can help to reduce costs to societies to provide utilities and services such as water and air purification, energy provisioning and raw material, savings that could be lost and be incurred by society if these services fall away when other development options are preferred. Eventually, society will have to find other often more expensive ways to provide for these services.

ES can also be useful for preventing further ecosystem degradation by highlighting threats and making recommendations for improving ecosystems' conditions and the delivery of ES. It can play important roles in the planning of new and the restoration of old natural areas and resources, and their management.

The Economist magazine of April 2005 stated that "every dollar invested saves anywhere between 7 to 200 US$ (2005) in damage and repair costs". Later studies (TEEB 2010; Gantioler, 2010*; inter alia*) and more recent studies also

confirm that it pays to invest in ecosystem restoration. Not only does it provide direct benefits in term of avoided and repair costs, and direct economics related to new jobs and addition to GDP, but also added benefits such as people taking less sick leave.

In this day and age of climate change and increased occurrence of natural disasters in the form of flood, drought, land erosion and extreme weather events in the region, and their impact on society and the economy in the Balkans, ES can help to reduce damages to society by increasing abilities of ecosystems to prevent or mitigate effects of disasters. ES can help to mitigate the effects of climate change as well as making areas in the Balkans more resistant to climate change as well as improving their resilience and recovery. The UN's Disaster Risk Reduction (DDR) efforts recognize the role that Nature Based Solutions (NBS) can play in helping countries and societies to prevent natural disasters or to dampen their effects and improving resilience. Restoring and expanding flood plains or wetland areas or 'giving room to the river' as is now occurring in countries near the Rhine River are some examples of the Nature Based Solution. Not only to they play their role in DRR and CCA related ecosystem services but they also increase biodiversity and create new opportunities for livelihoods.

It is therefore imperative that the region embraces the concept of ecosystem services and apply that to policy making and the management of natural areas and natural resources.

Bibliography

- Balvanera P., Pfisterer A.B., Buchmann N., He J.S., Nakashizuka T., Raffaelli D., Schmid B. (2006) "Quantifying the evidence for biodiversity effects on ecosystem functioning and services". Ecology Letter Volume 9, Issue 10.
- Barkmann, J., K. Glenk, A. Keil, C. Leemhuis, N. Dietrich, G. Gerold, and R. Marggraf. (2008) "Confronting unfamiliarity with ecosystem functions: the case for an ecosystem service approach to environmental valuation with stated preference methods". Ecological Economics 65(1), p. 48–62.
- Bockstael, N.E., Freeman, A.M., Kopp, R.J., Portney, P.R., Smith, V.K., (2000). "On measuring economic values for nature. Environ". Sci. Technol. 34, p. 1384–1389.
- Boyd, J. and S. Banzhaf (2007) What are ecosystem services? The need for standardized environmental accounting units. Ecological Economics 63(2–3), p. 616–626

- Burkhard B., Kandziora M., Hou Y., Felix Müller M. (2014) "Ecosystem Service Potentials, Flows and Demands – Concepts for Spatial Localisation, Indication and Quantification". Landscape online 34:1-32, DOI 10.3097/LO.201434
- Burkhard B., Kroll F., Müller F., Windhorst W. (2009) "Landscapes' Capacities to Provide Ecosystem Services - a Concept for Land-Cover Based Assessments". Landscape Online 15, p. 1-22.
- Burkhard B., Krolla F., Nedkov S., Müller F. (2012) "Mapping ecosystem service supply, demand and budgets". Ecological Indicators 21, p. 17–29
- Cadotte M., Carscadden K. & Mirotchnick N. (2011) "Beyond species: Functional diversity and the maintenance of ecological processes and services". Journal of Applied Ecology 48(5), p.1079 - 1087
- Cardinale B., Duffy J.E., Gonzalez A., Hooper D.U., Perrings C., Venail P., Narwani A., Mace G.M., Tilman D., Wardle D.A., Kinzig A.P., Daily G.C., Loreau M., Grace J.B., Larigauderie A., Srivastava D.S., Naeem S. (2012) "Biodiversity loss and its impact on humanity". Nature volume 486, p. 59–67.
- Cardinale BJ, Srivastava DS, Duffy JE, Wright JP, Downing AL, Sankaran M, Jouseau C. (2006) Effects of biodiversity on the functioning of trophic groups and ecosystems. Nature. vol. 443, p. 989-92.
- Chee, Y.E. (2004) "An ecological perspective on the valuation of ecosystem services". *Biol. Conserv.*, 120, p. 549-565.
- 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* volume 387, p. 253–260 (15 May 1997).
- Costanza R., de Groot R.S., Sutton P., van der Ploeg S., Anderson S.J., Kubiszewski I., Farber S., Turner R.K. (2013) Changes in the global value of ecosystem services. Global Environmental Change Volume 26, May 2014, p. 152-158.
- Costanza, R; Groot, Dolf de; Braat, L.; Kubiszewski, I; Fioramonti, L; Sutton, P; Farber, S; Grasso, M. (2017) "Twenty years of ecosystem services: How far have we come and how far do we still need to go?" Ecosystem Services, Volume 28, Part A, 2017, Pages 1-16, ISSN 2212-0416, https://doi.org/10.1016/j.ecoser.2017.09.008.
- Cunningham W. and Cunningham M. (2009): *Principles of Environmental Science: Inquiry and Applications 5th edition*. McGraw-Hill, NY, USA.

- Daily G.C., Postel S., Bawa K.S.,Kaufman L. (1997). *Nature's Services: Societal Dependence On Natural Ecosystems*. Island Press. Washington D.C. United States of America
- Davis, S. D., V. H. Heywood, and A. C. Hamilton. (1994) "Centres of plant diversity. A guide and strategy for their conservation". Volume 1. Europe, Africa, South West Asia and the Middle East. World Wildlife Fund & World Conservation Union, Cambridge, United Kingdom.
- de Groot R.S. (1992) *Functions of nature: Evaluation of nature in environmental planning, management and decision- making*. Wolters Noordhoff B.V. Groningen, the Netherlands.
- de Groot R.S., Wilson M., Boumans R. (2002) *A typology for the classification, description and valuation of ecosystem functions, goods and services*. Elsevier science B.V., the Netherlands.
- Dominati, E., M. Patterson, and A. Mackay (2010) "A framework for classifying and quantifying the natural capital and ecosystem services of soils". Ecol. Econ. 69, p. 1858–1868.
- DžukiĆ G., KaleziĆ M.L. (2004) "The Biodiversity of Amphibians and Reptiles in the Balkan Peninsula", in: Griffiths H.I., Kryštufek B., Reed J.M. (eds) Balkan Biodiversity. Springer, Dordrecht.
- EEA Report No 1/2010. Environmental trends and perspectives in the Western Balkans: future production and consumption patterns.
- Eastwood WJ. (2004) "East Mediterranean vegetation and climate change", in: Griffiths HI, Kryštufek B, Reed JM, editors., eds. Balkan biodiversity. Pattern and process in the European hotspot. Dordrecht: Kluwer Academic Publishers, p. 25–48.
- Fisher B., Turner R.K., Morling P. (2009) "Defining and classifying ecosystem services for decision making". Ecological Economics, Volume 68, Issue 3, 15 January 2009, p. 643-653.
- Gantioler S., Rayment M., Bassi S., Kettunen M., McConville A., Landgrebe R., Gerdes H., ten Brink P. (2010) Costs and Socio-Economic Benefits associated with the Natura 2000 Network. Final report to the European Commission, DG Environment on Contract ENV.B.2/SER/2008/0038. Institute for European Environmental Policy / GHK / Ecologic, Brussels.
- Geneletti D. (ed) (2016) *Handbook on Biodiversity and Ecosystem Services in Impact Assessment*. Edward Elgar Publishing. Cheltenham, UK.

- Gómez-Baggethun E., de Groot R.S., Lomas P.L., Montes C., (2009) "The history of ecosystem services in economic theory and practice: From early notions to markets and payment schemes". Ecological Economics 69 (2010), p. 1209–1218.
- Hewitt GM. (2011) "Mediterranean peninsulas: the evolution of hotspots", in: Frank E, Zachos FE, Habel JC, editors., eds. Biodiversity hotspots. Distribution and protection of conservation. Berlin: Springer, 123–147.
- Horvat, I., Glavač, V. & Ellenberg, H. (1974) *Vegetation Südosteuropas* — G. Fischer, Stuttgart.
- Hueting, R., Reijnders, L., de Boer, B., Lambooy, J., Jansen, H. (1998) "The concept of environmental function and its valuation". Ecol. Econ. 25 (1), p. 31–35.
- Kosoy N., Corbera E., (2010) "Payments for ecosystem services as commodity fetishism". Ecological Economics Volume 69, Issue 6, 1 April 2010, p. 1228-1236.
- Kryštufek B., Reed J. M., Griffiths H.I. (Eds.) (2004). *Pattern and Process in Balkan Biodiversity — An Overview*. ISBN 978-1-4020-2854-0. Springer International Publishing AG.
- Lamarque, P., Tappeiner, U., Turner, C. *et al.* (2011) "Stakeholder perceptions of grassland ecosystem services in relation to knowledge on soil fertility and biodiversity". Region. Environ. Change, 11, p. 791-804.
- Latinopoulos D. (2015) "Environmental valuation in Greece: a review and analysis of contingent valuation studies". Interdisciplinary Environmental Review (IER), Vol. 16, No. 1, 2015.
- Lawton, J. H., and V. K. Brown. (1993) "Redundancy in ecosystems". p. 255–270 in E. D. Schulze and H. A. Mooney, eds. Biodiversity and ecosystem function. Springer, New York.
- Lele S., Springate-Baginski O., Lakerveld R.,Deb D., Dash P., (2013) Ecosystem Services: Origins, Contributions, Pitfalls, and Alternatives. *Conservation & Society* Volume: 11 Issue: 4, p. 343-358.
- Lovett, G. M., C. G. Jones, M. G. Turner, and K. C. Weathers. (2006) Ecosystem function in heterogeneous landscapes. Pp. 1–4 in G. M. Lovett, C. G. Jones, M. G. Turner and K. C. Weathers, eds. Ecosystem function in heterogeneous landscapes. Springer, New York.
- Mace, G. M., K. Norris, and A. H. Fitter. (2012) "Biodiversity and ecosystem services: a multi-layered relationship". Trends Ecol. Evol. 27, p.19 –26.

- MAES 2013. Technical Report – 067 Environment Mapping and Assessment of Ecosystems and their Services. An analytical framework for ecosystem assessments under Action 5 of the EU Biodiversity Strategy to 2020. Discussion paper – Final, April 2013. JRC Ispra.
- McAfee, Kathleen and Shapiro, Elizabeth N. (2010) "Payments for Ecosystem Services in Mexico: Nature, Neoliberalism, Social Movements, and the State", Annals of the Association of American Geographers, First published on: 07 June 2010 (iFirst).
- McCauley, D.J. (2006) "Selling out on nature". Nature, 443, p. 27-28.
- Millennium Ecosystem Assessment. (2005) *Ecosystems and human well-being: biodiversity synthesis*. World Resources Institute, Washington, DC
- Mouchet M.A., Villéger S., Mason N.W.H., Mouillot D. (2010) "Functional diversity measures: an overview of their redundancy and their ability to discriminate community assembly rules." Functional Ecology 24(4), p. 867 - 876.
- Norgaard, R.B., Bode, C., Values Reading Group (1998) "Next, the value of God, and other reactions". Ecol. Econ. 25 (1), p. 37–39.
- Odum, E. P. (1969) "The strategy of ecosystem development: an understanding of ecological succession provides a basis for resolving man's conflict with nature". Science 164, p. 262–270.
- Pearce, D., (1998) "Auditing the earth: the value of the world's ecosystem services and natural capital". Environ.: Sci. Policy Sustainable Dev. 40 (2), p. 23–28.
- Petchey OL., Gaston KJ. (2006) Functional diversity: back to basics and looking forward. Ecol Lett 9, p. 741-758.
- Petter, M., S. Mooney, S. M. Maynard, A. Davidson, M. Cox, and I. Horosak (2012) "A methodology to map ecosystem functions to support ecosystem services assessments". Ecol. Soc. 18:31
- Pettorelli N., Schulte to Bühne H., Tulloch A., Dubois G., Macinnis-Ng C., Queirós A.M.,Keith D.A., Wegmann M.,Schrodt F. (2017) *Satellite remote sensing of ecosystem functions: opportunities, challenges and way forward*. John Wiley & Sons Ltd on behalf of Zoological Society of London
- Potschin-Young M., Haines-Young R., Görgb C., Heink U., Jax K., Schleyer C. (2017) "Understanding the role of conceptual frameworks: Reading the ecosystem service cascade". Ecosystem Services Volume 29, Part C, p. 428-440.

- Redford, K.H. & Adams, W.M. (2009) "Payment for ecosystem services and the challenge of saving nature". Conserv. Biol., 23, p. 785-787.
- Sagoff, M. (2002) "On the value of natural ecosystems: the catskills parable". Polit. Life Sci., 21, p. 19-25.
- Savić R. (2008) "Diversification of the Balkan fauna: its origin, historical development and present status. Advances in Arachnology and Developmental Biology". Inst. Zool., Belgrade Monographs, 12, 57-78
- Schröter M., Zanden, van der. E., Oudenhoven, van A., Remme, R. Serna-Chavez, H.M., Groot, de R.S., Opdam, P. (2014) "Ecosystem Services as a Contested Concept: a Synthesis of Critique and Counter-Arguments." Conservation Letters, Volume7, Issue6, November/December 2014, p. 514-523
- Srivastava, D. S., and M. Vellend (2005) "Biodiversity-ecosystem function research: is it relevant to conservation?" Annu. Rev. Ecol. Evol. Syst. 36, 267–294
- Stevanović V, Tan K, Petrova A. (2007) "Mapping the endemic flora of the Balkans – a progress report". Bocconea 21, p. 131–137.
- Stojak, Joanna & McDevitt, Allan & Herman, Jeremy & Searle, Jeremy & Wajcik, Jan. (2015). "Post-glacial colonization of eastern Europe from the Carpathian refugium: evidence from mitochondrial DNA of the common vole Microtus arvalis". Biological Journal of the Linnean Society. 115.
- TEEB. (2010) *The economics of ecosystems and biodiversity: ecological and economic foundations*. Earthscan, London and Washington.
- Tilman D, Reich P, Knops J, Wedin D, Mielke T, Lehman C. (2001) "Diversity and Productivity in a Long-Term Grassland Experiment", Science 294(5543), p. 843-5.