



Andrzej Mizgajski • Arnold Bernaciak • Jakub Kronenberg
Ewa Roo-Zielińska • Jerzy Solon • Jerzy Śleszyński

DEVELOPMENT OF THE ECOSYSTEM SERVICES APPROACH IN POLAND

Prof. Andrzej Mizgajski , Ph.D.	– Adam Mickiewicz University
Assoc. Prof. Arnold Bernaciak , Ph.D.	– Poznań School of Banking
Jakub Kronenberg , Ph.D.	– University of Lodz
Prof. Ewa Roo-Zielińska , Ph.D.	– Stanisław Leszczycki Institute of Geography and Spatial Organization Polish Academy of Science
Prof. Jerzy Solon , Ph.D.	– Stanisław Leszczycki Institute of Geography and Spatial Organization Polish Academy of Science
Prof. Jerzy Śleszyński , Ph.D.	– University of Warsaw

correspondence address:
Adam Mickiewicz University
Department of Integrated Geography
Dziegiełowa 27, 61-680 Poznań
e-mail: andrzej.mizgajski@amu.edu.pl

ROZWÓJ BADAŃ NAD ŚWIADCZENIAMI EKOSYSTEMÓW W POLSCE

STRESZCZENIE: W tekście przedstawiono zarys stanu badań nad świadczeniami ekosystemów w Polsce, który zrelacjonowano opierając się na materiałach Sympozjum ECOSERV2014. Na tle zaawansowania prac w instytucjach Unii Europejskiej zestawiono wyniki najnowszych badań w Polsce. Oprócz zagadnień teoretycznych, w tym metod oceny i wyceny, uwzględniono przydatność tego podejścia w zarządzaniu środowiskiem. W sposób szczególny wyodrębniono korzyści oferowane przez ekosystemy terenów zurbanizowanych i ekosystemy terenów wiejskich. Rozpatrując tę problematykę w świetle percepcji przez człowieka, pokazano wyniki badań nad kulturowymi świadczeniami ekosystemów. Przedstawiono ogólną ocenę badań w tej dziedzinie w Polsce i rekomendacje.

SŁOWA KLUCZOWE: świadczenia ekosystemów, teoria ekosystemów, ekosystemy Polski

Introduction

The Millennium Ecosystem Assessment has popularised in the world an approach that defined ecosystem services, although benefits from processes in ecosystems have been known since time immemorial¹. The rapidly growing interest of researchers in this approach² reflects a distinct shift of the paradigm concerning the humans environment relationship. This is shown by moving away from the opposition between the two components, which gives way to a search for harmony between them. In the classical approach, the researchers focused on forms and the scope of the negative human impact on the environment, while the new research area is clearly targeted at various aspects of identifying and stimulating benefits, which people can draw from nature³. Such an approach is very attractive politically as it justifies the rationality of efforts and costs incurred to preserve natural systems in an understandable manner.

European context

This was expressed in the EU environmental policy, especially in the formulation of the Biodiversity Strategy, which calls Member States to “map and assess the state of ecosystems and their services on their national territory by 2014, assess the economic value of such services, and promote the integration of these values into accounting and reporting system at the EU and national levels by 2020”⁴. Following the political document, the European Commission took supportive actions initiating the activity of the European Environment Agency as well the Joint Research Centre and creating the process entitled Mapping and Assessment of Ecosystems and Their Services (MAES). The results of this activities include the publication of two MAES reports⁵, development of several generations of the Common International Classification of Ecosystem Services⁶ and the

¹ E. Gómez-Baggethun et al., *The history of ecosystem services in economic theory and practice: from early notions to markets and payments schemes*, “Ecological Economics” 2010 no. 69, p. 1209-1218.

² R. Costanza, I. Kubiszewski, *The authorship structure of “ecosystem services” as a transdisciplinary field of scholarship*, “Ecosystem Services” 2012 no. 1, p. 16-25.

³ A. Mizgajski, *Świadczenia ekosystemów jako rozwijające się pole badawcze i aplikacyjne*, „Ekonomia i Środowisko” 2010 no. 1(37), p. 10-19.

⁴ Our life insurance, our natural capital: an EU biodiversity strategy to 2020 (target 2, action 5) European Commission 2011, p. 244.

⁵ An analytical framework for ecosystem assessments under Action 5 of the EU Biodiversity Strategy to 2020; Indicators for ecosystem assessments under Action 5 of the EU Biodiversity Strategy to 2020.

⁶ www.cices.eu [20-10-2014].

creation of an online platform⁷ facilitate the circulation of information concerning the issues under consideration. During the 3rd ECOSERV 2014 National Symposium, Anne Teller, representing the European Commission, presented a methodological approach and directions for actions conducted at the European level aimed at increasing the recognition of ecosystem services (ES) in member states.

ECOSERV Symposiums

Against this background, it can be concluded that applied work in Poland has not gained momentum yet. However, Poland has vast databases of spatial data, which can be the basis for the construction of indices and the first comprehensive concept of ES for Poland was formulated in 2012⁸.

In the latest Polish literature, the issue of environmental values and its resources is currently based on economic sciences⁹. Among naturalists, looking at the nature through the prism of benefits for humans, especially economic ones, is not very popular. However, already in the mid-1970s, Polish geographer Tadeusz Bartkowski formulated the following view: *“At the same time, it should be emphasised that it is necessary to develop geographical information in such a way that it is possible to move from its geographical valuation. It is the first step towards research, in which it will be possible to establish relationships between physico-geographical data and their economically tangible impact”*¹⁰.

National symposiums on ecosystem services (ES) held in Poznań every two years refer to this approach as the object of transdisciplinary studies. These meetings and publications that follow¹¹ create a very good opportunity to review progress in methodology and application of this concept. The development of cooperation between representatives of natural, economic and social sciences is an element conditioning progress in research on ecosystem services. Both an amateur approach of economists to nature and a non-professional use of tools of economic and social sciences by ecologists significantly inhibit the development of this multidisciplinary research and application issue.

The third symposium in this cycle reflected a new stage of development of ES research in Poland. It is mostly manifested by the reflection on the availability of source data and their quality and the growing number of original research studies conducted mostly on a local and regional scale. The plenary part convincingly showed the necessity of forming a competent connection between the natural

⁷ www.biodiversity.europa.eu [20-10-2014].

⁸ A. Mizgajski, M. Stepniewska, *Ecosystem services assessment for Poland – challenges and possible solutions*, „Ekonomia i Środowisko” 2012 no. 2(42), p. 54-73.

⁹ E.g.: J. Famielec, *Straty i korzyści ekologiczne w gospodarce narodowej*, Warszawa 1999; B. Fiedor, p. Czaja, A. Graczyk, Z. Jakubczyk, *Podstawy ekonomii środowiska i zasobów naturalnych*, Warszawa 2002; T. Żylicz, *Ekonomia środowiska i zasobów naturalnych*, Warszawa 2004.

¹⁰ T. Bartkowski, *Ochrona zasobów przyrody i zagospodarowania środowiska geograficznego*, Warszawa–Poznań 1975, p. 334.

¹¹ „Ekonomia i Środowisko” 2010 no. 1(37); „Ekonomia i Środowisko” 2012 no. 2(42).

and social and economic areas in a presentation on the importance of ES bundles for the regional development. The recognition of importance of benefits from nature as a developmental factor is not duly reflected in the availability of statistical data; however, it was demonstrated with a well-documented analysis of public statistics, which allows for a quantitative determination of the scope of ES, especially on a local level. These findings correspond with an overview of possibilities of taking into account the benefits drawn from ecosystems in the existing measures. The overview was performed against the background of an original discussion of the national scope of ES. An important theoretical reflection pertained to the importance of time as a factor significantly influencing the results of economic valuation of ES. Attention was paid not only to instability of prices in the market, but also to the assessment of benefits and costs which vary over time.

Data for the valuation of ecosystem services

A large part of presentations referred to the problem of source data and their use for ES quantification. Attention was paid to the usefulness of data collected by base stations of the integrated environmental monitoring and reference values based on multi-year observation cycles. They can be used for the assessment of a range of regulating services of forest and water ecosystems, in particular as regards the regulation of the hydrological cycle. The research was conducted using the example of three municipalities from the Podlaskie province and it focused on the possibility of using various sources of local data for estimating ES supply. At the same time, the need exists for precise distinction between the potential and actual levels (as used by society) of ES. It also resulted from the established findings that although the hierarchy of resources used mostly depended on the land cover structure, the knowledge about the land cover is not sufficient for realistic modelling of the use of the natural capital.

The analysis of the influence of the degree of generalization of spatial data on the estimation of the ES size touched upon an important issue. By using data with a varying degree of aggregation for a selected commune, statistically significant differences were shown unambiguously for the results obtained as regards both provisioning services (production of crops) and cultural services (recreational and aesthetic value).

Using the example of the Gorczański National Park, an attempt was made to use the ES conceptual framework for the analysis of erosion risk using the modelling in the GIS environment. On this basis, the presentation considered the possibility of managing the space in a way that would minimise the erosion risk. In other words, the scope and necessity of human actions to preserve/improve the ecosystem ability to fulfil a given function were analysed. Such an approach, different from the classical way of handling issues pertaining to ecosystem services, is, however, consistent with the model resulting from MAES work, in which ecosystem services are considered to include natural environment functions togeth-

er with human activity that stimulates them. An atypical approach was used for the analysis of environmental consequences of three variants to use a dry flood reservoir in Racibórz. Depending on the capacity for water retention, the surface areas of ecosystems, which can be lost were determined, which was identified with ES elimination. The size of this loss was expressed in monetary units using a controversial evaluation on a global scale¹² for this purpose.

An important group of papers pertained to the differentiation of the perception of benefits provided by the functions of ecosystems in society. The results of surveys allowed for determining the level of knowledge about benefits provided by nature and their assessment by various groups of inhabitants and tourists in the Suwałki and Augustów areas. Research conducted in the Gdańsk Bay area also focused on the differentiation of perception. It revealed distinct conflicts of interests in the assessment of various forms of tourist use, from fishery to the use of aesthetic values and the protection of environmentally valuable areas. The presented study did not answer the question to what degree environmental inequalities result from different perception of the same phenomena and to what degree they have obtained from depriving certain social groups of benefits so far. Other research pertained to the detailed problem of differences in the assessment of the role of benefits from the occurrence of seagrass in marine ecosystems. Basic differences were identified between assessments of experts and assessments of lay people. In many aspects, the social perception of seagrass was distinctly different not only from the actual function of this ecosystem component, but even from the proper identification of this object. Research results documented that the survey of the value attached to specific ecosystem services are heavily dependent on the respondents' level of knowledge.

Urban ecosystem services

A special session devoted to urban ES allowed for an overview of research conducted in this area in Poland. This research is undertaken from the perspective of various scientific disciplines and, although individual researchers still usually fail to go beyond disciplinary boundaries, the early symptoms of such an approach can already be seen. The possibility of distinguishing in the symposium programme of a group of studies devoted directly to ecosystem services in cities constitutes a considerable difference as compared to the previous edition of the symposium when only one study was directly devoted to cities¹³. Practical conclusions developed as a result of research presented during this year's conference seem particularly valuable from this perspective.

¹² R. Costanza et al., *The value of the world's ecosystem services and natural capital*, "Nature" 1997 no. 387, p. 253-260.

¹³ J. Kronenberg, T. Bergier, K. Maliszewska, *Overcoming barriers to the use ecosystem services for sustainable development of cities in Poland*, „Ekonomia i Środowisko” 2012 no. 2 (42), p. 106-120.

The growing interest in ecosystem services in cities and for the urban population reflects a tendency observed in research conducted on an international scale. It is mostly connected with ongoing urbanization – already nearly 55% of people in the world live in cities, and the share of urban population has already reached 75% in the European Union. The fact that the condition of the natural environment in cities and outside of them influences the quality of city dwellers' lives is reflected to an increasing degree in the results of ES research conducted in Poland.

An overview of indices illustrating the situation of green areas in 38 Polish cities has a diagnostic nature. It provides basic information, which should be used in further considerations on greenery management. Another analysis shows differentiation of the spatial structure of urban green infrastructure systems in ten European metropolitan areas. On the basis of land use/land cover data for these areas, the authors prepared maps of ecosystem services provided by these areas. Eventually, this was used as a basis for recommendations for the creation of a system of green infrastructure in Warsaw. The example of Warsaw was also considered in an analysis of land use/land cover changes of selected urban and suburban areas in the years 1972-2012. On this basis, changes in the potential for ES provision were estimated. Another analysis focused on ecosystem services provided by areas set aside (semi-natural or developed but currently not used), based on the example of Poznań. It was found that their area is equal to that of organized green spaces and they are often characterised by a significantly greater biodiversity.

Two reports present the perspective of economic sciences on monetary valuation of selected ES. The first shows the pertinence of the economic valuation of ES provided by allotment gardens, which significantly increases the scope of arguments in discussion on the desirability of keeping this form of land use. An attempt at estimating the monetary value of street trees and the scope of services they deliver in a medium-sized city has a practical application.

The problems reported here do not exhaust the scope of research on urban ecosystem services in Poland. It is worth noting that practical guidelines with regard to the management of ES in urban areas¹⁴ have already started to stimulate a practical use of this approach.

¹⁴ A series of guides published by the Institute of Spatial Management and Housing, e.g.: H.B. Szczepanowska, *Wycena wartości drzew na terenach zurbanizowanych*, Warszawa 2007; A series of guides published by the Sendzimir Foundation: "Nature in the city. Ecosystem services – untapped potential of cities" "Nature in the city. Solutions", "Water in the city", all available in English and in Polish at www.sendzimir.org.pl [20-10-2014].

Ecosystem services in rural areas

A separate session was devoted to ecosystem services in rural areas. The specificity of agricultural ecosystems and forests draws attention to provisioning services. This type of benefits has been known since time immemorial and no significant new research findings are expected in this area. Insufficient knowledge mostly pertains to other types of benefits, i.e. regulating and cultural ones provided by ecosystems of rural areas. The results presented provide significant research findings for both kinds of services mentioned above. Research on ES changes in the Dębnica catchment area (NW Poland) was based on the recognition of changes in biotops used for agriculture during the political transformation. On this basis, directions of ES changes were estimated, which involved the growing role of regulating services at the expense of provisioning and cultural services. Another report focuses on identification and assessment of regulating services using selected villages in S Poland. Based on detailed cartographic sources, the author showed prevention of water erosion, absorption of pollutants, protection of groundwater quality and self-purification of surface water bodies. At the same time, it was established that the size of individual regulating services is varied in individual villages, depending on the properties of the environment and the degree of human pressure.

An analysis on a regional scale of spatial diversity of selected ecosystem services against the background of naturally valuable areas in the Lower Silesian Province has a methodological nature. Thematic maps of spatial diversity, physical and biotic properties of water bodies, soils, forests and the air, plants, animals and land cover are to constitute the basis for ES identification. In the authors' opinion, ES levels in protected areas are to constitute benchmarks, with which the results obtained from other parts of the region will be compared.

The identification of benefits drawn from the structure and functions of ecosystem in the Lębork District pertains to a supralocal level. Using the ES conceptual framework, the authors focused on environmental protection, taking into consideration biological diversity and actions, which need to be taken to maintain sustainable development.

An interesting study of non-productive functions of fish pond ecosystems is presented using the example of Milicz Ponds in the Barycza Valley. Apart from provisioning services connected with food production, they play an important role in retaining and protecting water quality, in maintaining biodiversity (regulating services), and are also characterised by aesthetic and cultural values.

Cultural services

A separate session was devoted to reports on research on cultural services as a special type of services provided to the social and economic system by ecosystems. Their different nature results from the fact that they are the result of subjective perception of the natural reality by individual persons while provisioning and regulating services pertain to goods and services, which have a material dimension. The fact of the subjectivity of the assessment cultural benefits from the functioning of ecosystems constitutes a fundamental difficulty in their quantification. However, cultural services are subjected to research and analyses, including, in particular, attempts at various valuations. Numerous varied methods are used for determining their value.

A meta-analysis of 53 studies on declared and revealed preferences in recreational use of forests, which were conducted in eight countries in the years 1970-2012. Owing to a long time span of the analysis, it was possible to identify their variability in time and space. The research showed that the following factors contribute to an increase in the recreational value of forests: location in a national park, a considerable distance from cities and a relatively large surface area.

A study conducted in the Wielkopolski National Park, in turn, using the WTP (willingness to pay) and WTA (willingness to accept) methods made it possible to estimate its social value. At the same time, it revealed factors, which had a significant influence on the shape of these values. It is striking that the financial readiness to support environmental protection is not significantly related to the respondents' affluence.

A very interesting cost-benefit analysis was conducted to determine the economic efficiency of protecting sites of colonial nesting of white storks and their adaptation to the provision of tourism-related ecosystem services. Creating such "stork villages" required the development of infrastructure, additional expenditures on environmental protection as well as marketing and educational activities. Public benefits were connected with tourist and recreational use of the village and estimated with the travel cost method.

A study of social assessment of forest littering and the degree of readiness to incur the costs of cleaning adopted a different perspective. Such an approach can be treated as an analysis of weight attached by various social groups to restoration of an appropriate level of cultural services, which has been degraded by littering.

Significant recreational services are provided by water ecosystems. An attempt was made for selected lakes in NW Poland to relate the sanitary condition of beaches and bathing areas to the level of recreational services.

Attention was drawn to the difficulty in classification of cultural services in a report on a survey conducted among experts pertaining to the types of ecosystem services, which are of importance for tourism and recreation. The results show that these activities are connected with the use of various types of benefits. This outcomes questioned the legitimacy of treating tourism and recreation as a one separate group of cultural services.

Evaluation and Conclusions

The presented synthetic overview of completed and ongoing research on ecosystem services in Poland distinctly shows a high activity of numerous research groups from various academic centres. It shows that a transition was made from the stage of speculations to a stage of collecting and interpreting information. However, it is quite easy to notice that individual authors use different basic assumptions and different research methods. In particular, the approach to relations between the environmental complex of processes occurring in the environment and ecosystem services. The results presented are generally very interesting, however, they show distinctly that it is necessary to establish theoretical foundations and develop at least an outline of a common methodological platform allowing for an analysis of various problems in a manner, which makes it possible to compare the results obtained by teams from different research centres.

Ecosystem services, as a research approach, have an applied character in the political and social context. Therefore, it is necessary to expect a greater activity from state authorities as regards the implementation of this approach at various levels of society. This would be an impulse for harmonisation of future research and applied work. However, as shown by an analysis of 46 legal acts and strategic documents presented during the symposium, the issue of ecosystem services is only marginally present in legal acts and strategic documents pertaining to environmental protection policy.

The presentation by Leon Braat related the results of Polish research to the international debate on ES, featuring the following four most important issues:

- The boundary between ecosystems and economic systems: functions, services & benefits;
- Biodiversity & Ecosystem Services: causal links and management options;
- Cultural Services: human mental frames of ecosystem information flows;
- Economic & Social Value: ecosystems as the basis of the Value Production Chain.

The list of issues shows that ES as a research field is still at a very early stage of development. The summing-up discussion conducted on the basis of this information identified the following conclusions and future challenges.

ES as a multidisciplinary research field enjoys a constantly growing interest among ecologists, including, in particular, experts in geographic and economic sciences. Representatives of other social science are less numerous, despite the fact that their area occupies an important place in the research. The quality of transdisciplinary ES studies would be higher if joint research projects were undertaken with the participation of representatives of various fields of knowledge.

The notion of ES is understood in various ways, which is understandable at this stage. However, this notion should not be overly extended, e.g. to include all natural processes and phenomena or all humans environment relations, as it might become blurred as a result – as in the case of the notion of “sustainable development”.

The ES area is an attractive research and application field as it stimulates a social interest in natural matters, which evokes an interest among politicians. It is to keep the sovereignty of science against unavoidable expectations of politicians regarding the results of the diagnosis of benefits from processes occurring in ecosystems.

ES research should not be reduced to their monetary price. Such a valuation is usually obvious as regards provisioning services connected with the management of natural resources. Their prices are shaped on the market. A large part of benefits, however, has a non-market character, which is why the methods of estimating the monetary value are used. However, economic valuation is always heavily dependent on its context. The context of each valuation study is unique and consists of methodology, sample, place and time what limits validity and comparability of diverse assessments. It is risky to sum up such diverse monetary values or to use the calculated values as the basis for making practical decisions with no further reflection.

So far, research in Poland has focused on the provision of ecosystem services; however, the problem of demand for ecosystem services and ES stimulation by appropriately targeted human activity is beginning to emerge.

As ecosystem services develop as a research and application approach, the issue of sources of data and the influence of their quality on the results of ES quantification is becoming more and more significant. The qualitative and quantitative recognition of processes in ecosystems is of key importance as without it, even the best interpretations of secondary data as statistics or GIS may be encumbered with unacceptable errors. On the other side, we deal with valuation by recipients, i.e. a subjective area which must become standardized to account for the "average recipient". In this area, there are a large number of possibilities for the occurrence of inadequate findings.

The fact that we are at an early stage of ES research should motivate interested researchers, who should not become discouraged by the lack of precision of the findings made. At the same time, however, it is necessary to perform a reliable analysis of limitations in the interpretation of results.