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Title:

Capability of the Polish Legal System to Introduce the Ecosystem Services Approach into Environmental Management

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Abstract

Following the scientific progress and the European Union activity, Polish strategic papers have started to postulate the implementation of the ecosystem services (ES) approach (National Urban Policy, 2015; Program for biodiversity protection and sustainable use, 2015). The aim of this paper is to show the implementation of the ES concept into the Polish legal system and the challenges related to its implementation. The paper attempts to review the legal acts concerning the protection of ecosystems, their functions and benefits for people.

Until now, the term "ecosystem services" has not been presented in Polish legal acts. However, the results of study show that current regulations allow for this approach (although not in a direct way) to be taken into consideration to a significant extent. Perceiving the ecosystems as beneficial for human beings is, in Polish regulations, clearly visible in the spatial management, nature conservation, forestry, and water management. The existing provisions incorporate both the services, which are already captured by the market mechanisms, and non-market services. The character of these regulations is preventive, maintaining, restoring and ES enhancing. We conclude that a further effort should be aimed at: harmonization of existing provisions; introducing the ES notion directly into legal acts; and implementation of ES approach in executive regulations.

1. Introduction

In the EU, the mapping and assessment of ecosystems and their services (MAES), is seen as a key tool to maintain, restore and avoid degradation of natural capital (Maes et al., 2015). The EU 2020 Biodiversity Strategy calls Member States to map and assess the state of ecosystems and their services in their national territory, assess the economic value of ecosystem services and promote the integration of these values into accounting and reporting systems (Action 5, Target 2). Member states differ significantly in the implementation levels of Action 5; although their activity in this area has been growing recently (Kopperoinen et al., 2016).

In the case of Poland, the concept of ecosystem services (ES) has entered into scientific discussions in the 2000s (e.g. Mizgajski, 2010; Żylicz, 2010). Every two years since 2010, a Symposium on Ecosystem Services in Transdisciplinary Approach (ECOSERV) has taken place in Poznań. These meetings and publications that follow (Ekonomia i Środowisko, 2012, 2014, 2016) create an opportunity to review progress in the methodology and application of this concept. As the last symposium in this cycle reflected, a current stage of

development of ES research in Poland is mostly manifested by the reflection on the availability of source data and their quality, and the growing number of original research studies conducted on a local and regional scale (Mizgajski et al., 2014). Following the scientific progress and the EU activity, at present, the ES approach, albeit with difficulty, is reaching the policy. The conceptual framework of a national ecosystem services assessment was proposed in 2012 (Mizgajski and Stępniewska, 2012). In 2015, two projects commissioned by Polish Ministry of Environment have been completed: MAES for Poland (UNEP/GRID-Warszawa, 2015) and Urban MAES (Mizgajski et al., 2015). A case study of the Poznań city became part of the EU MAES pilot study for urban ecosystems (Maes et al., 2016a). The first result of the actions presented is the introduction of the ES term into national strategic documents (National Urban Policy, 2015; Program for biodiversity protection and sustainable use, 2015).

The aim of this paper is to show the implementation of the ES approach into the Polish legal system and the challenges related to its implementation. The paper attempts to review the legal acts concerning the protection of ecosystems, their functions and benefits for people. Our objective is to point out the possibilities of applying the ES approach within the scope of actions referred to in legal regulations. Legal acts have been reviewed and discussed in three dimensions: i) Protection and enhancement of ES in the context of environmental protection and spatial planning; ii) Chosen types of ecosystems; and, iii) Specific elements of ecosystems.

2. Material and Methods

In this study we use an inductive, exploratory approach to examine the implementation of the ES approach in Polish national law. Regarding policy-making at various administrative levels, the national level is the key scale, which links European Union law and strategic documents with their implementation according to a top-down approach (Albert et al., 2014; Maes et al., 2016b). There are numerous studies on the legislative aspects of environmental management at different levels of legislation (e.g. Matczak et al., 2014; Sadath and Krott, 2012; Vasarhelyi and Thomas, 2006; Zhenghong et al., 2013). The methodological concerns faced during the course of this study were a lack of direct identification of the ES concept in Polish legislation. For this reason, we reviewed the legal acts in search of equivalent notions of those elements, which in the state-of-the-art literature (e.g. Bastian et al., 2013; Burkhard et al., 2014; Grêt-Regamey et al., 2016; MAES, 2013, 2014; Potschin and Burkhard, 2015; Villamagna et al., 2013) are considered to be an integral part of the ES concept. We have

followed the viewpoint that "Ecosystem services are the direct and indirect contributions of ecosystems in interaction with contributions from human society to human well-being" (Braat, 2014, p. 23). Legal acts which we have selected for analysis concern the use and protection of natural capital. Referring to the ES concept, these are partly include ecosystem functions that underpin ES, partly various contributions of ecosystems to human well-being, and partly interactions of the natural capital with human input in the supply of ES.

The review allowed to select nine legal acts considered as the most relevant to the issue of ES (Table 1).

Table 1. Legal acts considered.

Name of Act	Year of launch*	Scope of regulation
Environmental Protection Law	2001	The Act defines the principles of environmental protection and conditions for using its resources, in particular: – principles of defining: conditions for protection of environmental resources; conditions of releasing substances or energy into the environment; costs of using the environment; – duties of administrative bodies; – responsibility and sanctions.
Act on providing information on the environment and environmental protection, public participation in environmental protection and on environmental impact assessment	2008	The Act defines: – principles and procedures in cases of: a) providing information about the environment and its protection; b) environmental impact assessments and strategic environmental assessments; c) cross-border impact assessments; – principles of public participation in environmental protection.
Act on Planning and Spatial Management	2003	The Act defines: – principles of shaping spatial policy by administrative bodies; – the scope and procedures related to intended use of areas and defining principles of their development.
Act on changing certain acts in connection with strengthening landscape protection tools	2015	The Act introduces changes to 10 acts in force.
Nature Conservation Act	2004	The Act defines the objectives, principles and forms of animate and inanimate nature and the landscape.
Forest Act	1991	The Act defines the principles of maintaining, protection and increasing forest resources and principles of forest management in connection with other elements of the environment and the national economy.

Act on protection of agricultural areas and forests	1995	The Act regulates the principles of protecting agricultural land and soil improvement.
Water Law	2001	The Act regulates water management in accordance with the principle of sustainable development, in particular, the shaping and protection of water resources, and the use of water.
Act on Inspectorate of Environmental Protection	1991	The Act defines competences and organization of the Inspectorate of Environmental Protection as a body for controlling the compliance of environmental regulations and monitoring of the condition of the environment.

* All acts have been amended several times

We adopted the legal status as of June 1, 2016. In interpretation of the content of analyses acts, we used the categorization of ES provided by the Common International Classification of Ecosystem Services (CICES version 4.3, 2013). As CICES has a hierarchical structure with five levels of generality (section – division – group – class – class type), depending on the degree of detail of the law, we matched the individual provisions with the most detailed possible level of CICES.

3. Results and discussion

3.1. Protection and enhancement of ES in the context of environmental protection and spatial planning

3.1.1. The Environmental Protection Law

The Act of April 27, 2001 on the Environmental Protection Law establishes a general framework for the management of ecosystems in Poland (Lew-Gliniecka, 2012). Detailed principles of protection and conditions for using individual components of ecosystems are regulated by specialist acts discussed further in the article. Although the Act does not contain a single explicit use of the ES term, natural capital is intuitively and automatically perceived as a provider of goods and services. For this reason, a lot of regulations in the Act can be related directly to individual ES categories (Table 2).

Table 2. Examples of regulations in the Environmental Protection Law with reference to ES categories.

Regulation	ES category
Protection of ES potential	
The protection of land surface consists of keeping its environmental, economic, social and cultural functions, including:	
food and biomass production;	Provisioning
storage, filtration and transformation of nutrients, substances and water;	Regulation & Maintenance
basics of the development of life and biodiversity;	Regulation & Maintenance
sources of raw materials;	Provisioning
a carbon pool;	Global climate regulation by reduction of greenhouse gas concentrations;
a collection of geological, geomorphological and archaeological heritage.	Heritage; Bequest
Restoration of ES	
For areas in which the level of substances in the air exceeds the allowable level, the provincial assembly defines an air protection program by means of a resolution.	Micro and regional climate regulation
Prevention against ES degradation	
A licence to release substances and energy into the environment defines the type and parameters of installations, which are significant from the point of view of pollution prevention.	Provisioning; Regulation & Maintenance; Cultural
Everybody who intends to operate or operates a facility with increased risk is obliged to ensure that this facility is designed, constructed, kept and closed in a way preventing industrial accidents and limiting their consequences for people and the environment.	Provisioning; Regulation & Maintenance; Cultural
Payments for ES	
Payments for using the environment are due for:	
releasing gases or particles into the air;	Dilution by atmosphere, freshwater and marine ecosystems
assigned rights for greenhouse gas emissions;	Global climate regulation by reduction of greenhouse gas concentrations
releasing wastewater into water or the ground;	Dilution by atmosphere, freshwater and marine ecosystems; Chemical condition of freshwater systems
water intake;	Provisioning - Water
storage of waste.	Mediation of waste, toxic waste and other nuisances
Sanctions for ES degradation	
Whoever uses an installation without the required licence, or breaches its conditions, shall be punished by arrest, imprisonment or a fine.	Provisioning; Regulation & Maintenance; Cultural

The structure of the Act is organized by the following main titles:

- TITLE I - General provisions.
- TITLE II - Protection of environmental resources.
- TITLE III - Pollution prevention.
- TITLE IV - Major industrial accidents.
- TITLE V - Legal and financial means.
- TITLE VI - Liability in environmental protection.
- TITLE VII - Administrative bodies and institutions for environmental protection.

Regulations contained in the titles listed above can be assigned to specific issues concerning ES. And so, titles I-II contain general provisions regarding the protection and restoration of ES potential. This applies in particular to regulating ES concerning the "maintenance of physical, chemical, biological conditions". For example, the requirement of adopting air protection programs in areas in which allowable concentrations of substances in the air are exceeded can be identified with striving after enhancement of regulating services regarding air quality. In this section, the Act defines the legal framework of the supervision of environmental pollution levels. This supervision includes the following sequence of actions: specification of environmental quality standards (e.g. the quality of air, water and soil), control of pollution levels and implementation of recovery programs. With regard to environmental quality standards, the Act contains general guidelines; detailed standards are defined in executive regulations. The condition of environmental components is monitored by the Inspectorate of Environmental Protection. In areas where environmental standards are exceeded, recovery programs are implemented (which constitute acts of local law). Recovery programs create conditions for restoring ES, e.g. the air protection program for restoring ES within the scope of micro- and regional climate regulation.

Titles III and IV contain regulations that can be combined with prevention against ES degradation. To prevent or reduce pressure on ecosystems, the Act formulates a legal framework for the supervision of substances and energy released into them. This framework includes: emission prevention, minimization of emissions and controlling the compliance of emission permits. Emission prevention is connected with the implementation of the precautionary principle. Limits on emissions are determined by individual administrative decisions, i.e. emission permits. If emission permits are not complied with, the Inspectorate of Environmental Protection imposes a penalty payment.

Title V of the Act can be connected with payments for ES. In accordance with the regulations of the Act, entities using the environment in the scope, which requires an administrative licence, are obliged to pay fees for using the environment. These fees are paid for: releasing gases or particles into the air; assigned rights for greenhouse gas emissions; releasing wastewater into water or into the ground; water intake and storage of waste. The fees were originally introduced at the end of the 1980s to ensure funds for the improvement of the disastrous condition of the environment upon the country's transition. These funds abstracted from the budget have played a significant role in increasing the quality of ecosystems in Poland. The existing fee system is predisposed for transformation into an instrument of payment for ES after a stronger link between the amounts of payments with the costs of restoring the environment to the appropriate condition.

Title VI of the Act can be perceived as a set of sanctions for ES degradation. It defines the principles of civil, penal and administrative liability for negative environmental impact and infringement of individual provisions of the Act (Mróz et al., 2011).

Title VII defines the competences of administrative bodies in the management of ecosystems and their services. Responsibilities for prevention, protection and restoration of ES are dispersed among numerous authorities and institutions. As a result, difficulties in the coordination of actions occur (Mączka et al., 2016).

3.1.2. Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA)

The EIA and SEA procedures are regulated by the Act of October 3, 2008 on providing information on the environment and environmental protection, public participation in environmental protection and on environmental impact assessment (Act on providing information…). This Act is a transposition of the Environmental Impact Assessment Directive and Strategic Environmental Assessment Directive (Brodawka, 2014). It can be said that the Act has significant potential for the introduction of the ES approach directly into the documentation drawn up within the EIA and SEA.

According to the Act, the consent for public and private projects that are likely to have significant effects on the environment (e.g. construction works or other installation) should be granted only after prior assessment of the likely significant environmental effects of these projects (EIA procedure). The assessment has to take into account the influence of the project on human health, quality of life, ensuring maintenance of the diversity of species and maintaining the reproductive capacity of the ecosystem as a basic resource for life.

The likely significant effects on the environment should be identified (in the SEA procedure) also for draft plans and programmes developed at the national, regional and local levels, such as:

- the concept of the spatial development of the country, the study of conditions and directions of spatial development of the municipality, local master plans, strategies for regional development;
- plans and strategies in industry, energy, transport, telecommunications, water management, waste management, forestry, agriculture, fisheries, tourism.

It is possible to match the requirements specified in the Act for the reports prepared during the EIA and SEA with concrete ES categories. Table 3 contains examples of how the aforementioned reports can support the mapping and assessment of different ES; e.g. identification of the impact on ecosystem components such as: fauna, flora, soil, water, air can be related to the influence on the structure and level of a large number of provisioning and regulating ES. On the other hand, describing an impact on material assets, cultural heritage and the landscape is related to a section of the cultural ES.

Table 3. Relating the scope of the contents of EIA and SEA reports to ES categories.

ES category	Content of the report according to Act on providing information …
Report on environmental impact assessment	
Provisioning; Regulation & Maintenance; Cultural	Definition of the predicted environmental impact of analysed variants of the project.
	Justification of the variant proposed by the applicant, indicating its environmental impact, in particular on:
Provisioning; Regulation & Maintenance; Cultural	plants, animals, fungi and habitats;
Gaseous and air flows; Atmospheric composition and climate regulation	climate;
Dilution by atmosphere; Micro and regional climate regulation	air;
Provisioning; Regulation & Maintenance; Cultural	water;
Mass stabilisation and control of erosion rates	land surface, taking into account mass movements;
Physical and intellectual interactions with biota, ecosystems, and landscapes	landscape.
Provisioning; Regulation & Maintenance; Cultural	Description of predicted actions aimed at prevention, limitation or compensation of negative environmental impacts.
Report on strategic environmental assessment	
	Definition of predicted significant environmental impacts, in particular on:
Regulation & Maintenance; Cultural	biodiversity;
Water; Hydrological cycle and water flow maintenance; Water conditions	water;
Dilution by atmosphere; Micro and regional climate regulation	air;
Mass flows; Soil formation and composition	land surface;
Physical and intellectual interactions with biota, ecosystems, and landscapes	landscape;
Gaseous and air flows; Atmospheric composition and climate regulation	climate;
Provisioning	natural resources;
Heritage	monuments.
Provisioning; Regulation & Maintenance; Cultural	Description of predicted solutions aimed at prevention, limitation or compensation of negative environmental impacts.

There are strong arguments in the literature that support the need to consider ES in EIA and SEA procedures to improve the understanding of consequences of the implementation of plans and projects on human well-being (e.g. Kumar et al, 2013; Mascarenhas et al., 2015; Rozas-Vásquez et al. 2016 in press). Main challenges for the integrating ES approach into EIA and SEA are issues of scope, scale, ES trade-offs and indicators (Genelletti, 2011). These challenges can be overcome by carrying out pilot applications in a real planning context (e.g. Partidario and Gomes, 2013; Josimović at al., 2016) and by taking advantage of the methods, tools and data for MAES that are becoming increasingly available (UNEP, 2014).

3.1.3. Nature conservation

In the context of ES, what is of key importance are the provisions of the Nature Conservation Act of April 16, 2004 that describes the rules of legal protection of ecosystems and their elements. After many amendments (the last on April 15, 2016), the Act does not use the term “ecosystem services”. However, its objectives, principles and forms of biotic and abiotic nature protection and landscape refer directly to the benefits for people resulting from the functioning of ecosystems (Matczak et al. 2014).

Objectives of protection focus on prevention, conservation and restoration of ecosystems and their elements. These objectives include:

- maintaining ecological processes and ecosystem stability;
- conservation of biodiversity;
- conservation of geological and paleontological heritage;
- ensuring the continuity of the existence of plant, animal and fungus species, together with their habitats, by maintaining or restoring them to the appropriate state of protection;
- protection of landscape values, green areas in cities and villages and tree stands;
- maintaining or restoring the appropriate condition of natural habitats and also other resources, formations and components of nature;
- shaping correct attitudes towards nature by education, information and promotion in the area of environmental protection.

In the context of the ES concept, these objectives indirectly contribute to the protection of services generated by ecosystems. The protection of values and benefits of the natural and cultural environments has a long history in Poland (Cole 1995, Kozłowski et al.

2004, Oszlányi et al. 2004). Areas of distinct importance for people are protected by law. Their closer analysis shows that the ability to provide ES underlies their legal protection (Table 4).

Table 4. Relations between legally-protected natural values and ES.

Protected values and corresponding services*	Form of nature conservation									Number of nature conservation forms
	Natura 2000	National Park	Reserve	Landscape Park	Protected Landscape Area	Ecological site	Nature and landscape complex	Documentation site	Natural monument	
Natural values/functions Service: Maintaining nursery populations and habitats	●	●	●	●	●	●			●	7
Cultural values Service: Heritage, cultural		●	●	●					●	4
Historical values Service: Heritage, cultural				●					●	2
Landscape and aesthetic values Aesthetic values		●	●	●	●		●		●	6
Tourism and recreation Service: Physical use of landscapes in different environmental settings					●					1
Didactic/educational value Service: Educational		●		●				●		3
Scientific value Service: Scientific		●	●					●	●	4
Number of protected services	1	5	4	5	3	1	1	2	5	

*According to CICES version 4.3.

Protected areas must meet criteria (as regards the value and/or protection goals) specified in the Act. This shows that specific benefits for people were appreciated earlier and regarded as worth the protection.

On the basis of Table 4, forms of protection can be divided into 3 groups:

- supporting only regulating services. These include Natura 2000 and ecological sites;
- supporting only cultural services (documentation sites and a nature and landscape complexes);
- supporting ecosystem services in a comprehensive manner (other forms of nature protection).

Both a national park and a landscape park are areas which must be characterized by the occurrence of all values listed in the Act, so they must be treated as multiservice areas. The creation of landscape parks is not only aimed at protection of their values but also on their popularization. The situation is different for nature reserves which are aimed at the protection of individual values and services according to the subject of protection or the type of ecosystem (Executive Regulation, 2005). Even greater diversity of protect values occurs among natural monuments - from natural to historical ones. Protected Landscape Areas have a special place among forms of natural protection supporting ecosystem services in a comprehensive manner. It is a form of protection which can be aimed at satisfying the need for tourism and recreation or the function of ecological corridors. Therefore, only in this case the services of tourism and recreation are literally criteria for setting the protection regime.

3.1.4. Spatial planning

Pursuant to the Act of March 27, 2003 on Spatial Planning and Development, sustainable development is the basis for shaping the spatial policy and using areas for specific purposes, together with establishing the principles of their development. This can be seen mostly in planning documents drawn up in various spatial scales, i.e. the concept of the spatial development of the country, provincial development strategy, spatial development plans for provinces, studies of conditions and directions of spatial development of the municipality and local master plans. These documents contain provisions, which have a significant influence on the potential, flow, demand of ES and pressure on ecosystems.

In Poland, the largest influence on spatial changes is exerted by planning arrangements at the local level. Therefore, the local governments have a basic tool that can be used for implementing the ES concept in land-use planning. Similarly, the leading role of the local governments in the implementation of ecosystem services-based regulation for the U.S. is

pinpointed by Hirokawa (2011). For most ecosystem services decisions, local governments can improve the receipt of ecosystem benefits by engaging in the planning process (Hirokawa, 2011; Woodruff and BenDor, 2016).

In Poland, spatial policy at the municipal level is expressed by the study of conditions and directions of spatial development (SCDSD) and next implemented in local master plans. These plans are acts of local law and they must be consistent with the provisions of the SCDSD, but their enacting is not obligatory (with exceptions). If the master plans are not enacted, individual decisions have to be issued to set development conditions.

Pursuant to the Act, the SCDSD must include, amongst other things, conditions of the natural environment, which, from the point of view of the ES concept, are a source of ES supply. The document treats these conditions and the closely related potential of ecosystems and service providing units to provide ES as one of the basis for spatial planning.

Special attention is paid to agro-ecosystems, forest, freshwater and marine ecosystems as well as abiotic outputs (Table 5).

Table 5. Conditions taken into account in the SCDSD in reference to the concept of ES.

Reference to the concept of ES	**Selected conditions taken into account in SCDSD**
Ecosystem condition and related ES potential	The condition of the environment, including: the condition of the agricultural and forest production space, the amount and quality of water resources, requirements for the protection of the environment, nature, landscape, including the cultural landscape;
	The condition of the cultural heritage and monuments as well as contemporary cultural assets;
	Recommendations and conclusions from the landscape audit, including borders of priority landscape;
	The occurrence of documented mineral deposits, underground water resources and documented complexes of underground carbon capture;
	The occurrence of protected objects and areas;
Ecosystem condition and related disservices	The occurrence of mining areas (a space affected by predicted harmful influence of mining work)
	The occurrence of areas of natural geological threats;
	Requirements concerning flood protection.

The conditions mentioned above, also in the context of quality of life of inhabitants, including the protection of their health and threats to safety of people and property are one of the bases for designating areas and directions for development in the SCDSD.

It is argued that type of land cover, use and access determines ES that can be provided or reduced (Wurster and Artmann, 2014). Therefore, the local master plan that establish forms

of land use and principles of land development can be regarded as the key tool in ES management. The local master plan indicates borders and the development principles for protected areas or objects, mining areas as well as priority landscapes. Therefore, it can be concluded that the local master plan identifies areas with exceptional or reduced natural value. It also indicates problem areas where the negative effects of natural and ecosystem processes on humans (disservices) may appear (von Döhren and Haase, 2015). However, at the same time, the problem areas require specific services such as flood protection in flood risk areas or mass stabilisation and control of erosion rates in landslide-prone areas.

The local master plan can influence the maintenance of the ES potential and even enhances it. This particularly applies to regulating and cultural services. In this area, by designing the spatial order, specifying the principles of protection of the nature and landscape, environmental conditions, cultural heritage and monuments, including cultural landscapes and contemporary culture assets local master plan determines land development conditions and the limitations of their use, including the ban on development.

A significant element of the local master plan is the introduction of the principles and indices of land development, which directly shape the demand for ES (especially cultural and regulating ones). The indices such as the maximum and minimum intensity of development (understood as the total developed area relative to the surface area of the plot), the minimum percentage share of the biologically active surface with regard to the plot area, the maximum height of the development, shape the human environment as well as the degree to which their needs with regard to the ES demand will be satisfied.

The scope of environmental conditions, which, in accordance with the regulations, must be taken into account in the planning documents, shows a far-reaching focus on abiotic outputs from natural systems, which are not contained in the main table of CICES. However in the accompanying classification of abiotic outputs from natural systems special attention is devoted to section Abiotic Provisioning (including nutritional abiotic substances, abiotic materials, energy) and Regulation & Maintenance by natural physical structures and processes (including mediation of waste, toxics and other nuisances, mediation of flows by natural abiotic structures, maintenance of physical, chemical, abiotic conditions). In this light, one should agree with van der Meulen et al. (2016), who urge to include abiotic flows as inherent part in ecosystem services classification. Integration of abiotic flows in ES classification, such as in the main table of CICES, will contribute to a more consistent application of the ES concept and integration of the concept for environmental policy, spatial planning, and ecosystem management.

Although, it is argued that planning is the essential starting point for ES analysis (Hirokawa, 2011), the Act, apart from defining the framework and general planning principles, does not determine in detail which planning solutions are beneficial for the human environment. Therefore, it does not indicate, even indirectly, which development pattern is beneficial for ES and balancing the supply-demand relationship. Therefore, as shown in research by Kaczorowska et al. (in press), the urgent concern is how to fit current knowledge into currently used tools. Also, Mascarenhas et al. (2015) concluded that tools easy to use by practitioners are among important factors supporting implementation of the ES concept. Similarly, Woodruff and BenDor (2016) indicate that there is limited guidance about how ES should be used in the land-use and environmental planning. In this area, the development of ES mapping methods seems to be significant (Daily et al., 2011), since planning that integrates ES is still in an embryonic stage (Woodruff and BenDor, 2016).

Significant changes in the Act on Spatial Planning and Development, as regards the support and protection of cultural services related to the landscape were introduced by the Act of April 24, 2015 on changing certain acts in connection with the enhancement of landscape protection tools. The changes apply to, amongst other things, the introduction of a definition of the priority landscape and tools for landscape protection.

Particular care was taken of priority landscapes, i.e. particularly important for society due to their natural, cultural, historical, architectural, urban, rural or aesthetic value that require maintaining or defining the principles and conditions of their shaping.

The Act contains regulations regarding landscape protection and therefore influences the related services, especially aesthetic ones. At the municipal level, the Act gives a tool to local governments, i.e. the possibility of establishing principles and conditions for locating street furniture, advertising boards, advertising devices and fences. The Act provides for the possibility of taking actions aimed at landscape protection by prohibition of placing fences, advertising boards and advertising devices, thus protecting or shaping aesthetic ES of valuable landscapes. It provides also for the sanctions for failure to comply with this in the form of a fine for placing an advertising board or an advertising device against the regulations of the Municipal Council.

At the provincial level, the Act introduces tools in the form of landscape audits. It should be emphasized, however, that this is a new solution, which is yet developing. Detailed principles of auditing are to be specified in the executive regulation of the Council of Ministers, taking into account, amongst other things, the necessity of preserving landscapes,

which are the source of identity of the Polish nation. This shows unambiguously that it is aimed at protecting landscapes generating their highest symbolic services for people.

3.1.5. Monitoring of ecosystems and their services

Elements of legal regulations, which are gaining more and more importance, are those, which include the monitoring of the ecosystem condition. The legal framework for the State Environmental Monitoring Programme is established in the Act of 20 July 1991 on Inspectorate of Environmental Protection. Since 1994, the Integrated Environmental Monitoring Programme (IEMP) has been functioning within the State Environmental Monitoring Programme. The tasks of IEMP involve comprehensive definition of energy and matter flows in catchments representative for different landscape-ecological zones in Poland. Within the framework of the IEMP, a specialized ecosystem services programme is implemented in the years 2015-2017, which is aimed at developing methodological and application principles of MAES in Poland. The IEMP database is a good source of quantitative data in particular for analyses regulating ES connected with mediation by ecosystems (by filtration, dilution, storage), soil formation and composition, atmospheric composition and climate regulation, and mass flows (Kostrzewski et al., 2014).

3.2. Chosen types of ecosystems

3.2.1. Forests

Examples of direct reference to ES can be found in the Act of September 28, 1991 on Forests. Analysing the provisions of the Act through the prism of the ES concept, it can be concluded that it regulates issues related to:

- forest management taking ES into account;
- protection of forests of significant ES importance;
- making forests available that influence the ES flow.

Services generated by forest ecosystems are the aim of sustainable forest management, which is included in forest development plans or in simplified forest development plans. Aims of sustainable forest management listed in the regulations refer to ecosystem services at various levels of detail and they sometimes overlap (table 6).

Table 6. Referring ES to sustainable forest management objectives.

Objectives listed in the Forest Act	ES category

1. Maintaining forests and their advantageous influence on the climate, air, water, soil, living conditions and health of people and on natural balance;	Regulation and Maintenance (including mainly mediation of waste, toxics and other nuisances, mediation of flows and maintenance of physical, chemical, biological conditions).
2. Protection of forests, especially forests and forest ecosystems which are natural fragments of domestic nature or forests which are particularly valuable due to:	Regulation and Maintenance and Cultural
– conservation of biodiversity,	Regulation and Maintenance (Lifecycle maintenance, habitat and gene pool protection)
– conservation of genetic resources of forests,	
– landscape values,	Cultural (Aesthetic or Heritage, cultural)
– scientific needs.	Cultural (Scientific)
3. Protection of soils and areas at particular risk of pollution or damage and of special social importance;	Regulation and Maintenance (Mediation of flows, Maintenance of physical, chemical, biological conditions)
4. Protection of surface and deep water, catchment retention, especially in watershed areas and in areas of underground water supply;	Regulation and Maintenance (Mediation of waste, toxics and other nuisances, Mediation of flows , Maintenance of physical, chemical, biological conditions); Provisioning (water for drinking and non-drinking purposes)
5. Production of timber, raw materials and side products of land use, according to the principle of rational management.	Provisioning (nutrition, materials and energy)

As it can be noticed, the aims of sustainable forest management combine forest protection with the possibility of using them by emphasizing their role in the delivery of services from the Regulation and Maintenance Section, Cultural Section and Provisioning Section. However, the Act emphasizes that the use of forests, especially for economic purposes must take into account the necessity of their protection (Rakoczy, 2011).

For forest functions to be able to provide the entire range of benefits to people in a continuous manner, the Act provides for ensuring forest protection in particular by preventive and protective treatments which prevent the occurrence and spread of fires; prevention, detection and control of appearing and spreading pests; protection of soils and forest waters. However, it does not provide detailed guidelines for actions to be taken.

In accordance with the regulations of the above Act, forests which are distinguished by their character, location or the functions they fulfil (Chmielewski, 2014) have significant ES importance and can get a status of protective forests. In Poland, protective forests occupy 51.3% of the total forest area (PGL LP, 2015). In table 7, services that qualify a forest to get protective status are assigned to legal provisions contained in the Act. It does not mean that an ecosystem that meets the criteria obtains the protective forest status ex lege. Forests are recognized as protective by an administrative act (Rakoczy, 2011).

Table 7. Forest ecosystem services as a criterion for designating protective forests.

Criteria for legal provision which qualifies forest to get a status of protective forest	The ES referred to
Protect the soil against being washed or fatigue, prevent landslides, falling rocks or avalanches;	Mass stabilisation and control of erosion rates
Protect surface and underground water resources, regulate hydrological conditions in catchment areas and in watersheds;	Surface water for drinking purposes Ground water for drinking purposes Surface water for non-drinking purposes Ground water for non-drinking purposes Bio-remediation by micro-organisms, algae, plants, and animals Filtration, sequestration, storage, accumulation by micro-organisms, algae, plants and animals Filtration, sequestration, storage, accumulation by ecosystems Hydrological cycle and water flow maintenance Flood protection
Limit the occurrence or spreading of windblown sands;	Mass stabilisation and control of erosion rates
Constitute seed tree stands or animal refuges and plant sites covered by species protection;	Life cycle maintenance, habitat and gene pool protection
Particular natural and scientific importance for the country's defence and security.	Scientific; Security*
They are situated: a) within administrative limits of cities and at a distance of up to 10 km from administrative city limits with over 50 thousand inhabitants;	Cultural & Regulation & Provisioning
b) in protective areas of health-resorts and areas of health-resort protection;	Cultural; Health*
c) in the upper forest limit area.	Mass stabilisation and control of erosion rates

*Outside the CICES version 4.3.

The summary above shows that this Act also takes into account a broader range of benefits than the commonly known CICES version 4.3. For instance such services include the influence of forest ecosystems on human health. Another example is the importance of this ecosystem for the country's defence and security. Forests that are situated in military training areas, exercise yards, airports, closed military facilities and in protective zones for such places (Executive Regulation 1992) are appreciated for their defence and security role, which is not included in the aforementioned classification.

In the Act on Forests, we find direct references to the ES concept also by the necessity of taking into account the quantity of timber to be acquired in the plan and the issues of hunting management (provisioning ES) as well as forest tending and protection (regulating ES), taking into account the aforementioned sustainable forest management objectives.

Another issue important for human health and welfare is the availability of forest for recreation. As shown by Bauer et al. (2004), most of the 23 countries investigated by them guarantee free access to certain categories of forests. This is also the case in public forests of Poland. However, the Act regulates the availability of forests by identifying forests to which access is permanently forbidden.

Protection against pressure, which at the same time influences the ES flow, is aimed at protection of forest cultivations up to 4 m high, experimental areas (scientific ES) and seed tree stands (seed dispersal), protected animal refuges and plant sites (maintaining nursery population and habitats), spring areas of rivers and streams (hydrological cycle and water flow maintenance) and areas threatened by erosion (mass stabilisation and control of erosion rates). The obligation of not to enter the forest resulting from legal regulations is obligatory in the cases listed above. It is a restriction on personal liberty to protect ecosystems and/or valuable services (Rakoczy 2011).

Procedures aimed at changing forest areas into another type of land use (e.g. built-up areas) are long and difficult. Regardless of the change in the intended use of the land in the local master plan, the deforestation requires actions specified in the Act of February 3, 1995 on protection of agricultural areas and forests. Within the meaning of the Act, the deforestation requires a consent form the minister of the environment (for areas which are the property of the State Treasury) or the provincial marshal (for remaining areas). The deforestation, apart from administrative procedures, involves high fees. These fees can be seen as a fine for losing ES provided by forests.

3.2.2. Freshwaters

In relation to freshwater, a lot of regulations, which are compatible with the ES approach, are formulated in the Act of July 18, 2001 on the Water Law. It is the main Act regulating the issues of water management at the national level in Poland. The Act introduces various levels of restrictions, depending on the character of using freshwaters and their services. In this way, the Act distinguishes ordinary, common and special use of waters. There are no special restrictions regarding the first one; however, the second one involves quantitative limitations and the third one requires administrative permits.

Concerning water protection, the Act distinguishes qualitative and quantitative protection. Qualitative protection applies to regulating ES, quantitative protection to provisioning ES, while both of these apply to cultural ES. Qualitative protection includes restrictions concerning releasing of pollutants into waters, with special attention paid to

municipal wastewater and agricultural pollutants. The Act also creates conditions for actions on a regional and local scale pertaining to restoration and enhancement of regulating ES in the area of protection against floods and droughts. Flood and drought protection may be achieved in particular by shaping spatial management of valleys and floodplains and by maintaining and creating water retention systems. The Act does not see the trade-offs between flood protection and other regulating services (e.g. natural fertilization, habitats of plants and animals).

Quantitative protection is mostly related to the limits on water intake and changes in the water regime, e.g. water transfer, irrigation, drainage, and water retention. Protection zones of water intake and protective areas of inland bodies of water are of special importance for provisioning ES, where specific restrictions for economic activity can be introduced. From the economic point of view, the principle of recovering the costs of water services is very important. This principle creates conditions for refunding the costs of the production of ES (e.g. water provision) in specific locations for a greater number of external beneficiaries. The connection between interests of stakeholders from areas of supply and use of ES is of key importance for ensuring continuous ES supply (Hein et al., 2006). At present, advanced work on the amendment of Water Law is in progress (Kropiewnicka et al., 2015); however, main controversies pertain to social and political resistance against an increase in the cost of water services which would result in a further increase in prices of water supply and wastewater removal which are already high in Poland (as compared to the average household disposable income).

According to the Act, the management of freshwaters and their services includes monitoring, planning and direct management actions. The main instruments of these actions are restrictions concerning the conditions for usage. Economic instruments are of growing importance, including the recovery of water service costs. However, the basis for these actions is the identification of the amount and conditions of water resources and their on-going monitoring.

3.3 Specific elements of ecosystems

The regulations of the Act of April 16, 2004 on Nature Conservation apply to trees and shrubs growing outside forests. Vegetation is the key element of ecosystems upon which the supply of multiple ES largely depends. Trees, in particular, play an important role.

The regulations of the aforementioned Act in the section pertaining to the green areas and tree stands focus on reducing the pressure on them by:

- limitation of the possibilities of their removal (on the basis of permits), and indication of forbidden and harmful actions and their rational use (limitations in use);
- compensation for removed trees or shrubs by replacement planting or payments for removing trees or shrubs;
- sanctions for illegal removal of trees or shrubs.

In this way, the provisions of the Act have influenced ES indirectly. Their examples with reference to the ES concept are presented in table 8.

Table 8. Examples of the regulations of the Nature Conservation Act supporting the supply of ecosystem services.

Provisions of the Act	Reference to the concept of ES
Trees and shrubs can be removed from the property after obtaining a permit.	Prevention
The issuance of a permit for removing a tree or a shrub may depend on the duty to make replacement plantings or replant a given tree or a shrub.	Compensation
Fees are charged for removing a tree or a shrub. The fee depends on the trunk perimeter and from the trunk growth rate in individual types and species, depending on the tree location.	Charges for ES degradation
Protection in the investment process Earthworks and other works within the root system, trunk or crown of a tree or within the root system or shoots of a shrub are performed in a way, which is least harmful to trees or shrubs.	Prevention and protection of ES
Protection in the tending process Works within the tree crown may not lead to the removal of over 30% of crown branches, which have developed over the entire tree development period. The removal of over 30% of branches in the crown constitutes tree damage, and the removal of over 50% of branches is regarded as tree destruction. On public roads, streets and yards, chemical agents should be used in the least harmful manner for green areas and tree stands.	
Fines are imposed for illegal removal of a tree or a shrub, damage to a tree or a shrub or its destruction.	Sanctions for ES degradation

In accordance with the most recent changes in the regulations, the fees for individual types of tree species will be calculated depending on the trunk perimeter and the trunk growth speed, taking into account the location of the tree or shrub (such as health resorts, areas of health-resort protection or the area of a property entered in the register of monuments, green spaces, urban areas, right of way, village area). The basis for their calculation is different costs of production of individual types and species of trees, taking into consideration their varied conditions of growth and the functions they fulfil. The rates are specified in the executive regulation.

However, the Act provides a range of exceptions when it is not necessary to obtain a permit to remove a tree and when no fee is charged. The catalogue of exceptions contained in the Act concerns, for example, trees or shrubs which have died or which are a threat to the safety of property and people, which are very young or characterized by a small perimeter. These are situations in which trees are perceived as sources of insignificant services or even disservices. With respect to the regulations concerning replacement planting, Łukaszkiewicz (2013) noticed that they are very general and discussed that in extreme cases they may lead to remission of environmental fees.

As pinpointed by Szczepanowska et al. (2010), the basis for financial compensation for damage are actual costs of "reconstructing" a tree, understood as costs of a comparable replacement tree. Therefore, ES are not a valuation criterion, and the indirect reference to benefits provided by trees also takes into account the size of the tree.

4. Conclusions

The results of study show that the concept of ES does not appear in Polish national environmental law in a manifest form, but implicitly. Despite the absence of the term "ecosystem services" in Polish legal acts, they contain a range of regulations related to managing ecosystems and their services. The presented analysis has allowed illustration of the condition and differentiation of references to the ES concept in the existing law. All of the analysed legal acts transpose the respective EU directives, so many of the findings could be interesting for other countries, which implement the EU law in their own way.

The results of conducted analysis show that the character of regulations is preventive, maintaining, restoring and ES enhancing. These are regulations that incorporate both the services, which are already captured by the market mechanisms, and non-market services (i.e. life cycle maintenance, habitat, and gene pool protection). The instruments used for ES management are mostly legal and economic. The economic instruments include user-charges, access-fees, and penalties for non-compliance (Rogulski, 2015), rather than financial incentives to provide ES such as payments for ES.

From the point of view of the implementation of the ES approach into the legal systems, we can conclude that the existing law provides space and basis for ES implementation. Perceiving an ecosystem as beneficial for human beings is, in Polish regulations, clearly visible in the spatial management, nature conservation, forestry, and water management; however, the regulations are not harmonized with each other. Thus, there is a need for a wider and comprehensive incorporation of the concept into the legislation. This

will require widening of scope of protection from protection of ecosystem and their functions to protection of ES. Further effort should be aimed at:

- introducing the ES notion directly into legal acts in the area of protection and use of natural capital;
- the implementation of ES approach in executive regulations.

As long as the ES notion is not introduced into acts, it cannot appear at the operating level in executive regulations. They determine very detailed and often technical issues or decisions, facilitating the application of regulations in the day-to-day decision making processes. The operationalization of the ES approach in executive regulations will allow the adjustment of existing legal tools. Some of them, such as land development plans, already contain elements, which are core issues in the ES concept, and others such as EIA and SEA reports can be adjusted to fit the concept.

Owing to the introduction of the ES notion directly into legal acts, one should anticipate an increase in the social awareness of benefits which we obtain from ecosystems. Moreover, the direct introduction of an ES approach would mean the sanctioning of a change in the paradigm for the human- nature relationship from the opposition between the nature and people who exploit it to a search for harmony by ensuring sustainable provision of services for humans.

The state of implementation of the ES approach into the Polish law reflects the level of perception of this concept by politicians and, indirectly, also in society. If this assumption is adopted, to increase the ES-presence in the law, science should offer applicable solutions (Stępniewska, 2016) and they should be approved by decision-makers for it. It can be expected that the next generations of regulations in Poland will gradually implement the ES concept as a socially acceptable approach, which is economically feasible and politically attractive. The introduction of ES into the legal acts will be a formal obligation for implementation However, the quality of implementation will depend on the operational knowledge of the experts and administration, and the public awareness.

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