
The Economic Function of Land Use and its Selected Ecosystem Services

Submitted 12/07/21, 1st revision 03/08/21, 2nd revision 23/08/21, accepted 15/09/21

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Abstract:

Purpose: The article aims to indicate the essence of land use in the context of its economic functions and selected ecosystem services, mainly generated by agriculture. The dilemmas surrounding the issues mentioned above are the subject of the following study. The essence of the perception of the land and its ecosystem services was indicated, primarily in sustainable development, which requires clarification and in-depth discussion in the literature.

Design/Methodology/Approach: Bearing in mind that cognitive activity, like practical activity, contributes to the development of knowledge specialization and an in-depth study of phenomena, the article uses theoretical research methods, mainly based on hypothesis and concretization.

Findings: The considerations show that the essential element of shaping the present and future structure of land use and its ecosystem services is a rational ecological policy and environmental protection. The management of rural areas must be carried out following the principles of sustainable development. It is important to monitor local potential environmental threats closely related to land use and its services.

Practical Implications: The article contains much valuable information, which may constitute the base material and reference further research conducted by scientific specialists studying the agricultural land market or agricultural property management institutions of the Agricultural Property Stock of the State Treasury.

Originality/Value: Theoretical considerations complement the research conducted so far in shaping the functions of the land and its ecosystem services and may become a valuable resource of valuable knowledge in the preparation of dissertations in the field of economic use of the environment.

Keywords: Land, ecology, sustainable development, economy, agriculture, multifunctionality.

JEL Classification: B1, B2, Q01, Q18.

Paper type: Review article.

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1. Introduction

The surface of the globe, briefly called the land, is the essential common good of humanity, necessary for creating and acquiring other goods. By its very nature, the resources of the land are immutable. Their management must be rational, especially now that the devastation of the natural environment and overpopulation disasters threaten entire continents. The privilege and obligation to manage land are given to those who have specific rights to the land. They can be individual owners or properly formed communities, tribes, local governments, or economic organizations (Gaździcki, 1995).

Land, due to its role in the economy and human life, has always been a value. It also added value to what was associated with it: the farmer's work, nature, residence, landscape, and folk culture. The appreciation of the multidimensional value of the land and what is closely related to it becomes a symbol of the humanization of the economic development of contemporary civilizations (Wilkin, 1996). The land is a productive factor and, at the same time, an indispensable component of the economic process, which is the unity of all forces of nature related to a given territorial unit.

The literature on the subject indicates various areas of land use, e.g., production (agriculture, forestry, industry, production services), consumption (non-production services: housing estates, tourist-recreational, and sports areas, national parks, military training grounds, etc.), and wastelands (deserts, swampy areas, slopes, dunes, mine workings, heaps, areas contaminated by industry and communal management). These zones overlap, e.g., agriculture and forestry, to an increasing extent, serve recreational purposes and thus consumption. There are constant shifts between and within land-use zones, determined by agricultural legislation and environmental laws (regulating environmental protection) in line with society's current and future interests. In production, land plays a two-fold role, as an object of work (in agriculture, forestry, mining, construction industry) and as a means of labor to produce goods (Kapusta, 2008).

The 1980s began the ecological dimension of the land's functions. The enactment of the state's ecological policy in the 1990s launched intensified activities to protect the environment, creating conditions for Poland's durable and sustainable socio-economic development. Poland's accession to the European Union and the implementation of the EU Common Agricultural Policy defined the new ecological functions of agricultural land, inseparable from the idea of sustainable development, implemented through the multifunctional development of agriculture and rural areas.

Historical and doctrinal connections between the concept of sustainable development and the economical use of the environment are indisputable (Bukowski, 2009). Besides, it should be remembered that, at the international community's interest level, practical solutions to the theory of sustainable development with nature protection were pointed out from the very beginning. In the documents from the 2nd session of

the UNEP Governing Council in 1975, it was assumed that a society implementing the idea of sustainable development is "a society that recognizes the primacy of ecological requirements, which cannot be disturbed by the growth of civilization, cultural and economic development, and able to self-control its development to maintain homeostasis and symbiosis with nature, thus respecting the economical production and consumption and use of waste, taking care of the future consequences of undertaken actions, and thus also of the needs and health of future generations" (Fiedor, 2002).

Because the connection of the concept of sustainable development with the issues of economic use of the environment is inevitable, it should be stated after Woś (1992) that the basic principle of land management is sustainable development. Considering this issue from a historical perspective, it is evident that two socio-economic development strategies and related concepts of spatial management were implemented in the entire post-war period. The first was the strategy of industrialization and urbanization of Poland and the interdependent concept of a more even distribution of productive forces. The second was the strategy of Poland's accelerated and harmonious socio-economic development and the concept of moderate polycentric concentration referring to it. In both strategies, the environmental protection and rational shaping of the environment did not play a fundamental role. It was not until the beginning of the 1990s that a new socio-economic development model was adopted, in which the natural environment took the first place (Więckowicz, 1993).

2. Research Methodology

There are many concepts of the division of land functions in the scientific literature. The article presents a selected one that has become more widely popular in the international arena, i.e., Blum's concept of the land function (Blum, 2005). According to it, the land functions can be divided into ecological (environmental) and non-ecological (social and economic). The following are classified as ecological functions of soils by Blum: 1) biomass and food production; 2) protection of people and the environment; and 3) gene pool, and for non-ecological functions: 4) use of soil as the basis for human activity, including the development of construction and infrastructure; 5) the source of materials such as sand, clay, and gravel; and 6) cultural heritage.

Since the land performs specific functions, it can provide selected ecosystem services and benefit humans (Adhikari and Hertemink, 2016). This article aims to indicate the essence of land use in the context of its economic functions and selected ecosystem services, mainly generated by agriculture. In economic science, the land is considered a factor of production and a source of wealth primarily, and the income can determine the value it brings to its owner. On the other hand, in terms of the policy of sustainable development of rural areas, the ecological dimension of the land is essential, mainly in terms of living space and the natural environment. This function is a critical element of the integrated order, which is the basis of sustainable development. Taking over

other than the traditional (agricultural) function by land causes economic but also environmental effects. In connection with the above, it is necessary to consider the economic function of using the land surface and its ecosystem services? An attempt to answer this question and the dilemmas surrounding the issues mentioned above is the subject of the following study. The essence of the perception of the land and its ecosystem services was indicated, primarily in sustainable development, which requires clarification and in-depth discussion in the literature. Bearing in mind that cognitive activity, like practical activity, contributes to knowledge specialization and an in-depth study of phenomena, the article uses theoretical research methods, mainly based on hypothesis and concretization.

3. Results and Discussion

3.1 Economic Aspect of Land Use

Since the times of Ricardo and Goltz, land as a factor of production has been characterized by three essential features: immovability, non-multiple ability, and indestructibility, while the literature of the subject also pays particular attention to its spatiality (Wilkin, 1986). The productive importance of agriculture and agricultural land, measured in absolute terms, increases with the growth of the total world population. On the one hand, it requires the intensification of agricultural production, and on the other, the allocation of agricultural land to other purposes related to human living needs.

By owning land as real estate, one may derive income from it, either from its productive use or the property. This income is called land rent (Dębniewski Nowak and Suchta, 1996). Ricardo (1772-1823) considered the subject of land rent, assuming free competition and the lack of technical progress that could temporarily suspend the rent increase or reduce its amount. The land income thus obtained would constitute a differential rent. Land rent, however, is not only a phenomenon related to agriculture but may also apply to other production resources. Therefore, the land does not have to be used solely for agricultural purposes. It may have other alternative use, resulting from which the income obtained may be higher than that achieved for agricultural purposes.

Land rent is, therefore, a critical case and historically the oldest of general economic theory. The opportunity cost of the land factor is influenced by various conditions, including differences in the quality of units of a given resource, location issues, differentiated mineral resources. Contemporary land rent is created utilizing the land as a production factor in the agricultural sector, but also using land as a place for the location of an enterprise, residential facility, etc., acting as a function of expectations that can be associated with the development of a given area (Woś, 1996).

For Ricardo, the most critical factor determining the amount of land rent was the difference in land quality. At the same time, von Thünen (1783-1850) explained land

rent mainly by the marginal product market's distance. Currently, in addition to historically shaped land rents related to the quality of soil determining the number of crops and income obtained from land, with the title of ownership, with the location of land relating to urban centers, there are new rents related to, for example, the functioning of Polish agriculture under the Common Agricultural Policy. With the possession or use of land, it is possible to obtain financial support. In realizing the rent due to land ownership, the role of land quality has decreased. For the land of lower quality near an urban center, intended for construction or other investments, one can get a higher price than a good valuation class, which cannot be detached and has only one productive use.

The contemporary economic reality and the literature on the subject indicate the existence of various types of rents that can be obtained by owners/tenants in the process of land management. By analyzing the literature on the subject, we can classify rents, where the main criterion for the division will be land use. So we can distinguish land rents related to production (differential I, differential II, production scale rent) and rents related to its alternative use (planning, location, construction, settlement, mining, environmental). Many economists considered the agricultural land factor's functions constant, predicting its almost complete substitution by capital. The consumer *de facto* changes in highly developed countries are essentially reversing the land utility trend from falling to rising. In the era of globalization, developed industry and its infrastructure, the natural environment, and the land factor regains their former usefulness for consumers and even gains a new one, as evidenced by the growing dynamics of agricultural land prices. The land factor in highly developed countries is becoming more and more complementary to capital (Czyżewski, 2009).

In the era of globalization, the classical theory of land rents requires alterations. Due to the growing demand for environmental services and landless use for agriculture, differential rents are disappearing in their creation and implementation. The reason is an equalization of marginal costs and cost-consumption of revenues from agricultural land resources with different soil valuation classes.

The foundations of rational space management in the context of the distribution of agriculture were comprehensively presented for the first time by Johan Heinrich von Thünen in 1826. Thünen, analyzing the location of individual types of agricultural production relating to the market center of consumption, determined the rules of production specialization, depending on the city's distance, resulting in transport costs and profits (Kamiński, 1998). On these principles, he arranged and prioritized individual forms and types of agricultural production in circles/rings, based on the function of distance from the market. The development of the ideas of central markets was created by Sinclair (Sinclair, 1967), the so-called Thünen's theory of inverted circles, according to which the production results and the productivity of a unit area increase with the distance from the urban center (decrease in urbanization). Simultaneously, the value of agricultural land near cities is inversely proportional to

its market price (Wigier, 2012). The originally shaped distribution of production relating to economic centers was based on production around the outlets for products with a higher value per hectare, expensive, and economically or physically sensitive to transport. Far from the outlets, products that were easier and cheaper to transport were produced. Due to the tendencies of increasing real wages around large cities, and at the same time agricultural production outlets, economic relations are unfavorable for agricultural employment. The alternative of non-agricultural employment increases the number of people abandoning less-paid employment in agriculture, favoring less risky and more economically justified non-agricultural employment.

Thus, the classical Thünen circles around cities are reversed, the abandonment of agricultural land (significantly fragmented for commercial development) becomes a mass phenomenon, especially in mountainous areas, and finds additional justification due to its generally lower productivity (and lower quality-related land rent) or not at all. Therefore, in the sub-regions of weak, unproductive soils located around the city, the share of extensively used land increases, and as it moves away from economic centers, where it is more difficult to find employment and non-agricultural income, due to the lack of alternative income, agricultural land use remains economically and socially justified.

The city creates financially attractive non-agricultural jobs, contributing to the emergence of agricultural problem areas (Musiał, 2008). Such a hypothesis, considering the problems of contemporary problems and threats to the natural environment, was put forward by Sinclair. As a result, as Siekierski notes (Siekierski, 2004), the zones further away from large urban agglomerations represent a potential that is particularly valuable for producing organic food, reaching prices on the market above the standard.

In the process of systemic transformation of the Polish economy, the concept and importance of land management took on a new dimension. The introduction of a market economy has highlighted the economic importance of land as an essential factor in generating income. The land became the subject of changes in ownership relations and restructuring and organizational transformations of the Polish economy. Moreover, after the transition from a command-and-*mind* economy to a market economy, there was a solid need to transform rural areas by skillfully integrating new non-agricultural functions into the rural space. The consequence of this is changing in land use, which determines the development of urbanization, transport, and agricultural production, leading to changes in the functions and value of land in rural areas (Zaremba, 2007). The changes in use occurring in these areas intensify along with the development of the market economy, often stimulating environmental conflicts and changing the function and value of the land.

According to Sabina Żróbek (Żróbek, 1994), the emergence of other conflicts in spatial management is the result of the size of the factors involved in the peripheral

areas of cities and the variety of motivations for their operation, resulting to a large extent from the flexibility of land use transformation.

It should be remembered that the consequence of incorrectly distributed functions of the area is inadequate allocation of land resources in space, which inhibits the sustainable development of rural areas and hinders the economic functioning of many entities. Moreover, the use of land must depend not only on a set of external conditions relating to a farm (distance from outlets, transport costs, market demand, price system, labor resources, state interventionism) but also on internal conditions (labor productivity, capital resources, technical infrastructure, farm size and spatial structure, soil quality, professional qualifications, connection with industry (Kuciński, 2000).

A feature that distinguishes agriculture from other sectors of the economy is the connection with the land, as the primary factor and means of production, the dependence of the effects of agricultural production on natural conditions, which also determines the market value of agricultural properties within their range of influence (Łaguna, 2006).

Agriculture is a complex system in which relations concerning various spheres of life: economic, social, cultural, and natural, are intertwined. This system is generally studied in "crumbs," i.e., its components are the subject of analyses of specific disciplines, e.g., agrotechnical, animal husbandry, agricultural economics, melioration, spatial management, rural sociology, cultural anthropology, agrophysics, etc. It is a tendency occurring in all modern fields of science. As a result, the avalanche of detailed knowledge does not go together with the increase in knowledge and understanding of how complex systems function and change, studied from the point of view of various disciplines (Wilkin, 2007). Agriculture is a branch of the economy in which, on the one hand, the resources of the natural environment are used. On the other hand, farmers shape this environment through their activities (Krasowicz and Kuś, 1998). Therefore, the need for rational shaping of space, with particular emphasis on protecting natural resources, does not raise any doubts, and there are still more and more arguments favoring their implementation.

In the times of the centrally planned economy, the main goal of Polish agriculture was to meet society's food needs, ensure the country's nutritional self-sufficiency, and improve the balance of agri-food turnover in foreign trade. Therefore, Polish agriculture, and hence the land, was identified primarily with the production and economic function. The separation of the sphere of economic activity in rural areas arose due to the industrialization of agriculture, i.e., the taking over by industrial production of processes and functions from agricultural farming, the sphere of production supplies and services, and the processing of agricultural raw materials. Enterprises implementing industrialization of agriculture were primarily located in rural areas, close to agricultural production. Besides, the economic growth of these

areas created the creation of enterprises and institutions that support social, educational, cultural life, and health care for local and rural communities.

Additionally, in the last 15-20 years, migration of people from the city to the countryside has intensified, both for recreational purposes and economic activity, especially in connection with the development of new information technologies. As a result of these processes in rural areas, next to the sphere of economic activity, referred to as agriculture, a parallel zone of economic activity is created, both connected with agricultural production and utterly independent of it. As a result, rural areas are no longer determined solely by agriculture but are determined to a greater extent by non-agricultural economic activity (Hunek, 2000).

3.2 Selected Land Ecosystem Services, Mainly Generated by Agriculture

It is generally known that the land performs various functions in the economy, provides selected ecosystem services, and benefits humans. In the literature on the subject, different functions of the land's surface are mentioned, depending on the purpose of the classification. Apart from the basic ones, such as production, service and residential, tourism, other functions are mentioned, e.g., ecological or environmental. Particularly noteworthy is the ecological function, in connection with the market use of land, e.g., organic farming, eco and agro-tourism, and non-market purposes, e.g., buffer zones. Alternative possibilities of using land for purposes other than production favor the theory of maintaining the existing public goods in good condition and prove that treating nature from the economic point of view does not have to conflict between human interests and the requirements of nature. The belief about it is the essential condition of proper human behavior in the natural environment.

One of the most important examples of the ecological function of land use and its commercial use in agriculture. In agriculture, ecosystem services concern the soil's capacity to produce food and support and regulate services. On the one hand, agriculture is responsible for the quality and quantity of ecosystem services, but at the same time, it is dependent on these services. It is one of those sectors that most shapes and emphasizes the essence of sustainable development because it is a sector on which all humanity depends directly and indirectly on the natural environment. Moreover, here, undoubtedly, the most critical issue is the production of organic food.

Food and Agriculture Organization of the United Nations (FAO, 2021) characterizes organic farming as a holistic management system that supports biodiversity, ecological cycles, and soil fertility. This definition also considers the fact that regional conditions require the creation of local systems. Besides, WHO emphasizes that organic farming guarantees that no agrochemical treatments have been used in production but cannot guarantee the complete absence of chemical residues due to global pollution of the environment, on the other hand, the legislation of the European Union (EEC, 1991) defines *organic farming* as a system of sustainable management

of plant and animal products within a farm, based on technologically unprocessed biological and mineral substances.

The basic rule is to reject agricultural, veterinary, and food chemicals in the food production process. It is a sustainable, self-sufficient, ecologically, economically, and socially sustainable system. The development of organic farming, based on environmental processes, supports the provision of ecosystem services by the soil. By activating the natural production mechanisms on the farm, this system ensures sustainable soil fertility, animal health, and high-quality agricultural products. Also, by excluding the production of industrially processed pesticides and fertilizers and sustainable animal husbandry, it does not cause soil, groundwater, or air pollution, and also reduces the leaching of minerals from the soil and at the same time promotes biodiversity of ecosystems. The most extensive and officially accepted definition of organic farming is recognized in Europe (Głodkowska and Gałązka, 2017).

Modern agriculture is characterized by enormous productivity and efficiency, but often at the expense of the environment. Ecological production is not only healthier and safer food. It is also a form of environmental protection and responsible management of natural resources. Due to agricultural activities, water, soil, biodiversity, and landscape are just some elements of the constantly changing environment. The studies of many authors indicate that organic farming improves landscape values, contributes to the preservation and enhancement of biodiversity, protects wild nature, prevents contamination of waters and soils, and contributes to the improvement of their quality.

Ecotourism is an important form of land use, especially possible in Natura 2000 areas. Broadly understood as an example of ecosystem services, tourism focuses on the proper contact between humans and nature. It can be carried out in various forms, and each time adapted to the specifics of a given area and tourists' interests. For example, it can be ornithological, botanical, or sightseeing tours. Naturally valuable places, being a magnet for people looking for peace, peace, and contact with nature, can also activate local communities living in Natura 2000 areas and their immediate vicinity. Natura 2000 areas can become a place for the development of agro-tourism. This concept should be understood as tourist activity conducted on farms. It is addressed to enthusiasts of rural recreation who want to know the charms of working on such a farm up close. Usually, it is combined with the willingness to commune with nature and enjoy various forms of active recreation in the bosom of nature.

An exciting and noteworthy form of economic activity that can be successfully implemented in rural areas, especially in Natura 2000 areas, is educational tourism, focused on organizing recreation combined with learning about a given area's natural and landscape values. Green schools and shorter thematic trips are proven methods of teaching children and adolescents to respect nature and the need to protect it.

Unfortunately, an increasing amount of agricultural land and forests is absorbed by developing industry, transport, technical infrastructure, etc. In modern developing societies, more and more land is devoted to various forms of recreation, which are treated as one of the essential needs, undoubtedly gaining importance as society's level of wealth increases.

Forests are of great importance from an ecological, economic and recreational point of view. A problem in Poland and the world is progressive deforestation, threatening the biocenosis balance and multilateral interests. It should be mentioned that the issue of afforestation of agricultural land in Poland gained particular importance after 1989. The market mechanisms introduced due to changes in the political conditions and the economic system turned out to be particularly difficult for rural areas and agriculture, which resulted from the structure of the existing rural development. Systemic changes in agriculture, structural and technical neglect, and low profitability of agricultural production resulted in a rapid increase in the area of agricultural land where agricultural activity was stopped.

Moreover, by becoming a member of the European Union, Poland undertook to comply with the Common Agricultural Policy, one of the assumptions of limiting food production and excluding some agricultural land from use. The spatial and structural transformations that have taken place in recent years have also affected the mountain areas of Poland, where they are concerned mainly with agricultural land.

Arrangement and agricultural works most often lead to selecting areas that, for various reasons related to the demographic structure of inhabitants, natural conditions, soil conditions, shape, and area of plots, have already been or will be excluded from agricultural production in the future. Such areas, in the future, enlarge the already existing forest complexes or become a "buffer" between the forest and agricultural land, such as ecological lands or pastures. Proper selection of such areas allows for good forest management in the areas designated for afforestation and improved working conditions on agricultural land. Therefore, an effective way to properly control the development of agricultural land and afforestation is agricultural equipment. They make it possible to make an inventory of areas which, for various reasons, are gradually succession, and to identify the causes (infrastructural deficiencies, problems in the social sphere, etc.) and areas where farming should be conducted (compact complexes located on better-class soils), as well as to identify areas that, due to their location (near forests), poor soil quality, and water conditions (floodplains, wetlands), can be excluded from agricultural production and designated for afforestation. As part of a consolidation, creating "buffers" between forest complexes and agricultural land is also possible. It also applies to areas considered unsuitable for agriculture, located near forest complexes, which may be used for ecological performance.

In Poland, almost all-natural and environmental resources are currently covered by the "planned economy." A forest management plan is obligatory for all forests. In-

state forests, its separate part is the nature protection program on a forest holding. The fishery management is carried out based on a plan - a fishing survey. For water management purposes, river catchment management plans and flood protection plans are prepared. For a significant part of agricultural areas, programs are prepared to limit nitrogen inflow from agricultural sources. Each commune compulsorily prepares a waste management plan, and space is managed through appropriate planning studies (Iddle and Bines, 2004).

It is generally known that the idea of developing the ecological function of the land is conducive to the preservation of public goods in good condition and the creation of new values, e.g., through better quality of air, surface waters and land, soil, enriched landscape values and the valuation of biodiversity. The main environmental problems, from which Polish space is not entirely free, result from errors initiated in the past, such as (Liro, 2003):

- irrational water management in agricultural catchments,
- low level of good agricultural practices in the management of fertilizers and plant protection products,
- excessive productization of soils in areas prone to erosive phenomena,
- neglect of infrastructure,
- soil contamination with pollution from non-agricultural sources,
- the phenomenon of farrowing.
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It should be noted that unfavorable ecosystem services are significantly worsened in heavily transformed areas and near large industrial regions. Pollution getting into the environment, chain reactions, i.e., changes in one factor, e.g., water, will influence other elements of the ecological system through the circulation of matter and energy. Therefore, an essential instrument in the eco-development of rural areas is agri-environmental programs, which, assuming subsidies for farmers who voluntarily undertake agricultural practices aimed at environmental protection, preserving nature protection, and elements of rural cultural heritage, allow them to obtain an environmental rent. Nowadays, rural areas must be becoming more critical regions for producing renewable energy, mainly from wind turbines and biomass. This development should be considered one of the prospects, bearing in mind that it should be implemented with full respect for environmental and landscape conditions.

4. Conclusions

Land use, distribution, accessibility, economic importance, and ecosystem services are subject to strong interactions and dependencies of a different nature on a global or international level. This problem causes many disturbing consequences that must be the subject of scientific analyzes and the attention of politicians because land in general, and agricultural land in particular, has been and will be a crucial and limited

production, natural and cultural resource. It is essential to properly evaluate and display it in the economic and environmental context connected to the above.

A developing economy uses land differently. Due to the interest of agriculture and the entire national economy, agriculture must not lose the land of high agricultural value, and marginal lands are designated for other purposes, bringing a better social effect.

It is generally known that in the past, rare natural factors received meager prices in financial accounts, sometimes they were even treated as free goods, and yet every plot of land, if only it is helpful from an economic and ecological point of view, has its first of all its value, but also its price. The land has a price not because some inputs have been made to create it but because it performs certain ecosystem functions and services. From an economic point of view, the problem of ecosystem services is that they are not reflected in the economic calculation. Processes taking place in nature are invisible in economic activity, and natural processes taking place in nature, which are of fundamental importance for human survival, are successively limited due to human environmental pressure.

Contemporary agriculture faces many external and internal challenges that are important not only for farmers and rural residents but also for consumers and taxpayers. These challenges lead to a revaluation of the objectives of the Agricultural Policy and the forms of its implementation. The evolution of the Common Agricultural Policy indicates a clear departure from a typically sectoral agricultural policy to a multifunctional rural development policy, an essential element of which is the sustainable and sustainable development of agriculture and other areas of the rural economy, social progress, and the preservation of the natural environment (Adamowicz, 2003).

The issues presented above do not exhaust the topic. They only outline vital issues. However, bearing in mind the importance of the problem and the future of our existence, it should be stated that the essential element of shaping the present and future structure of land use and its ecosystem services must be a rational ecological policy and environmental protection. The management of rural areas must be carried out following the principles of sustainable development. It is important to monitor local, potential environmental threats closely related to land use and its services.

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